Cyprus

National Greenhouse Gases Inventory Report 1990 – 2011

2013 Submission
under the United Nations Framework Convention
on Climate Change

Department of Environment
Ministry of Agriculture, Natural Resources and Environment

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ES.1.1 Background information on climate change

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. Recognizing 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).

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 non-Annex I to Annex I party to the UNFCCC.

ES.1.2 Background information on greenhouse gas inventories

This is the first National Inventory Report (NIR) being submitted by Cyprus to the UNFCCC secretariat in April 2013.

It contains GHG emissions estimates for the period 1990 to 2011, and describes the methodology on which the estimates are based. This report and the accompanying Common Reporting Format (CRF) tables have been compiled in accordance with UNFCCC reporting guidelines on annual inventories contained in document FCCC/CP/2002/8 and Decision 18/CP8 of the Conference of Parties.

The greenhouse gas inventory of Cyprus is compiled by the National Inventory Systems Team within the Department of Environment (Ministry of Agriculture, Natural Resources and Environment). The Climate Action Unit is responsible for all functions of the inventory system, from data collection from other stakeholders within different sectors, to data management, through to the preparation and submission of reports.

The inventory covers in detail the six direct greenhouse gases under the Kyoto Protocol; Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF6). Emissions of the four indirect greenhouse gases are also reported Nitrogen oxides (reported as NO_2), Carbon monoxide (CO), Non-Methane Volatile Organic Compounds (NMVOC) and Sulphur oxides (reported as SO_2).

The structure of this report follows the “Annotated outline of the National Inventory Report including reporting elements under the Kyoto Protocol” published by the UNFCCC secretariat.

Chapter 1 provides an introduction and background information on greenhouse gas inventories. Chapter 2 provides a summary of the emission trends for aggregated greenhouse gas emissions by source and gas. Chapters 3 to 9 presents in detail the emissions from Energy (chapter 3), Industrial processes (chapter 4), Solvent and other product (chapter 5), Agriculture (chapter 6), LULUCF (chapter 7), waste (chapter 8) and other (chapter 9). Chapter 10 presents information on recalculations, improvements and a summary of responses to review processes. The Annexes provide more detailed information regarding specific topics and issues as set out in the Guidelines.

ES.2 Summary of national emission and removal related trends

The GHG emissions trends (CO_2, CH_4, N_2O, HFC, PFC and SF_6) for the period 1990 - 2010 are presented in Table ES.1 (in kt CO_2 eq). Emissions estimates for international marine and aviation bunkers were not included in the national totals, but are reported separately as memo items. The total GHG emissions in Cyprus for the period 2001-2011 are presented in Table ES1. In the present submission there are the following major gaps:

(a) *Solvent and other product use*: According to the Revised IPCC 1996 guidelines, "no methods for the calculation of greenhouse gases from solvent and other product use are included in the phase I version of the workbook". Therefore all data under this sector with the exception of NMVOCs has been reported as NE, due to lack of method. It is planned to estimate the emissions of the sector by the next submission.

(b) *LULUCF*: the national system is not yet ready to completely estimate the emissions and or absorptions from LULUCF. Only absorptions from land converted to forest-land, emissions from wildfires and use of wood products are reported. It is planned to improve the system by the next submission.

Table ES1. Total GHG emissions in Cyprus (in Gg CO_2 eq) with and without LULUCF for the period 1990-2011

	1990	1991	1992	1993	1994	1995
Total GHG emissions including LULUCF (Gg CO_2 eq.)						
CO_2	4780	5006	5346	5660	6081	5937
CH_4	720	743	782	820	837	868
N_2O	452	449	494	512	507	512
HFCs & SF_6	0	0	0	0	25	0
TOTAL	5952	6198	6622	6991	7450	7317
Total GHG emissions excluding LULUCF (Gg CO_2 eq.)						
CO_2	4922	5163	5506	5766	6204	6088
CH_4	719	743	782	818	836	868
N_2O	450	449	494	502	500	510
HFCs & SF_6	0	0	0	0	25	0
TOTAL	6091	6355	6782	7086	7564	7465

	1996	1997	1998	1999	2000	2001
Total GHG emissions including LULUCF (Gg CO_2 eq.)						
CO_2	6296	6390	6616	6723	6989	6868
CH_4	895	901	910	912	928	932
N_2O	524	503	532	504	488	529
HFCs & SF_6	10	0	0	19	19	18
TOTAL	7725	7793	8057	8158	8424	8348
Total GHG emissions excluding LULUCF (Gg CO_2 eq.)						

CO_2	6451	6542	6624	6894	7144	7000
CH_4	894	900	906	912	927	931
N_2O	522	500	501	504	484	521
HFCs & SF_6	10	0	0	19	19	18
TOTAL	7877	7942	8032	8329	8574	8470

	2002	2003	2004	2005	2006	2007
Total GHG emissions including LULUCF (Gg CO_2 eq.)						
CO_2	7017	7419	7632	7682	7958	8254
CH_4	964	961	978	960	957	956
N_2O	548	538	514	473	452	466
HFCs & SF_6	19	19	20	22	24	26
TOTAL	8548	8937	9143	9137	9392	9702
Total GHG emissions excluding LULUCF (Gg CO_2 eq.)						
CO_2	7192	7584	7805	7857	8127	8372
CH_4	964	961	978	960	957	955
N_2O	548	536	513	472	450	455
HFCs & SF_6	19	19	20	22	24	26
TOTAL	8722	9099	9315	9311	9558	9808

	2008	2009	2010	2011		
Total GHG emissions including LULUCF (Gg CO_2 eq.)						
CO_2	8456	8177	7824	7579		
CH_4	966	976	945	899		
N_2O	444	436	452	473		
HFCs & SF_6	26	40	56	127		
TOTAL	9893	9629	9278	9078		
Total GHG emissions excluding LULUCF (Gg CO_2 eq.)						
CO_2	8630	8352	7992	7672		
CH_4	966	976	945	898		
N_2O	444	436	450	458		
HFCs & SF_6	26	40	56	127		
TOTAL	10065	9803	9444	9154		

ES.3 Overview of source and sink category emission estimates and trends

GHG emissions trends by sector for the period 1990 - 2011 are presented in Figure ES11 and Table ES2.

Energy

Emissions from Energy in 2011 (Figure ES2) accounted for 78% of total GHG emissions (without LULUCF) and increased by 69% compared to 1990 levels.

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. This behaviour of economic growth was also reflected in the emission trends.

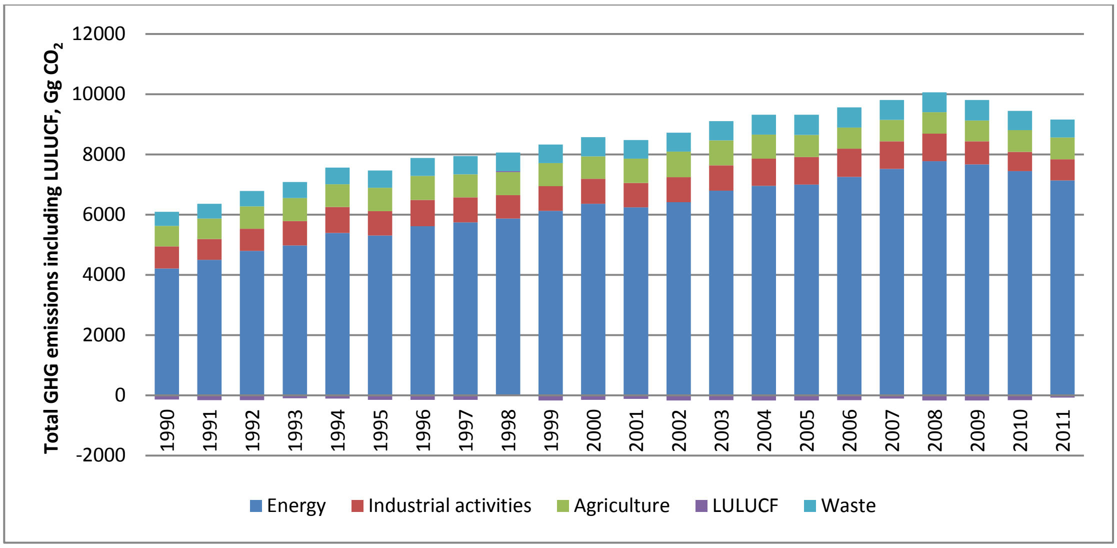

Figure ES1. Contribution of activity sectors to total GHG emissions during the period 1990-2011 (including LULUCF)

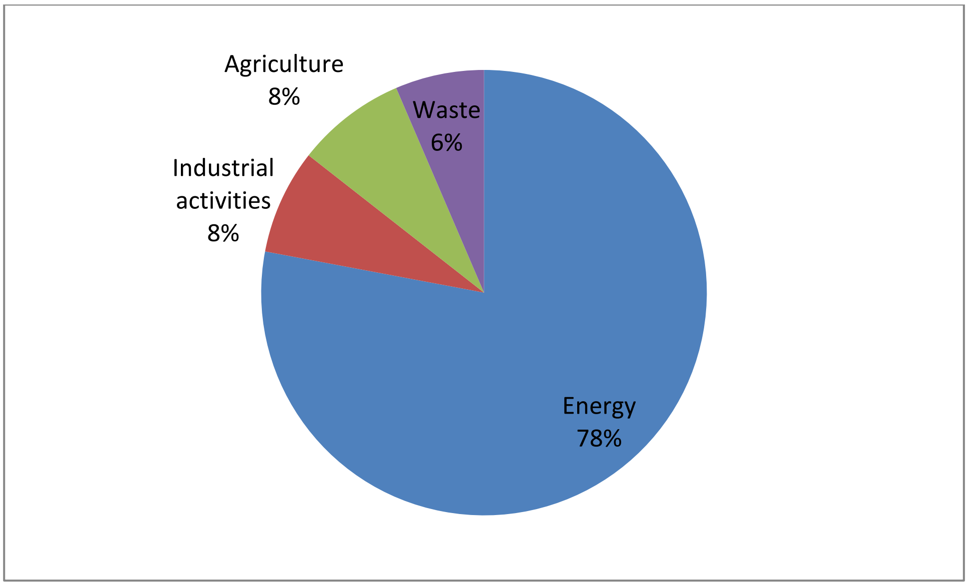

Figure ES2. Relative contribution of activity sectors to total GHG emissions in 2011 excluding LULUCF

The majority of energy related GHG emissions (52.2%) in 2011 was derived from energy industries, while the contribution of transport, manufacturing industries and construction and other sectors is estimated at 32%, 7.2% and 8.9% respectively.

The substantial increase of GHG emissions from road transport 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.

Table ES2. Total GHG emissions in Cyprus (in Gg CO_2 eq) by sector for the period 1990-2011

	1990	1991	1992	1993	1994	1995
Energy	4214	4497	4791	4981	5389	5308
Industry	728	687	737	808	864	805
Agriculture	679	680	742	764	758	779
Waste	470	491	512	533	553	574
Total[1]	6091	6355	6782	7086	7564	7465
LULUCF	-139	-157	-160	-95	-114	-149

	1996	1997	1998	1999	2000	2001
Energy	5614	5738	5865	6129	6361	6244
Industry	872	830	785	812	831	802
Agriculture	799	769	766	765	744	808
Waste	592	606	616	624	639	617
Total[4]	7877	7942	8032	8329	8574	8470
LULUCF	-152	-149	26	-171	-150	-122

	2002	2003	2004	2005	2006	2007
Energy	6409	6793	6952	6995	7256	7513
Industry	831	840	903	915	927	919
Agriculture	856	828	803	738	712	717
Waste	627	638	658	663	663	659
Total[4]	8722	9099	9315	9311	9558	9808
LULUCF	-174	-163	-172	-174	-166	-106

	2008	2009	2010	2011		
Energy	7771	7665	7441	7137		
Industry	921	763	642	697		
Agriculture	708	698	722	730		
Waste	666	677	639	590		
Total[4]	10065	9803	9444	9154		
LULUCF	-173	-175	-166	-76		

Industrial Processes

Emissions from Industrial processes in 2011 accounted for 8% of the total emissions (without LULUCF) and decreased by 4% compared to 1990 levels. Between 1990 and 2008 the emissions of the sector were increasing (mainly depicted in the CO_2 emissions) and are mainly attributed to the growth of the constructions sector. However, during 2008-2010, the constructions sector experienced the same impact as all economic activities and the emissions of the sector in 2010 decreased by 24% compared to 2008. An additional cause of the increase between 1990 and 2008 is that emissions from consumption of f-gases, was mainly available for years after 2005. Total emissions of the sector in 2011 are higher than emissions of 2010 by 9% due to a better estimation of the emissions from consumption of f-gases.

Solvents and other products use

Emissions from Solvents and other products use have not been estimated due to lack of IPCC methodology.

[1]Emissions / removals from Land Use, Land Use Change and Forestry are not included in national totals

Agriculture

Emissions from Agriculture accounted for 8% of total emissions in 2011 (without LULUCF), and increased by approximately 7% compared to 1990 levels. The peak of Agriculture emissions was in 2002 when an in increase of 26% 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 fertilizers. 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 and the reduction in the animal population.

Waste

Emissions from the Waste Sector in 2011 contributed 6% of the total emissions (without LULUCF). Even though waste management of both liquid and solid wastes improved significantly since 1990, due to the increase in population and solid waste production per capita due to the changes in social conditions, the emissions of the sector increased by 26% between 1990 and 2011.

Land Use, Land Use Change and Forestry

The Land Use, Land Use Change and Forestry sector was a net sink of greenhouse gases during the period 1990 – 2011. During this period, the LULUCF sector offset about 1% of the total national emissions (without LULUCF). The magnitude of this sink decreased from approximately 139 Gg CO_2 eq in 1990, to 76 Gg CO_2 eq in 2011, i.e. a decrease of 45%. Even though during 2011 there was an increase of the area covered with forests by 211 ha, the CO_2 balance is reduced due to a large wildfire (1974 ha burnt).

ES.4 Other information

The current submission also includes information on indirect greenhouse gases. 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 trends for indirect greenhouse gases and SO_2 are presented in Table ES3.

Table ES3. Emissions trends for indirect greenhouse gases and SO_2 (in Gg) for the period 1990-2011

	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011
Energy										
NOx	15.23	17.49	20.07	19.42	19.26	19.72	18.43	18.05	16.17	20.38
CO	50.67	43.65	33.13	25.11	23.76	23.25	21.30	19.13	17.92	IE,NA,NE,NO
NMVOC	11.56	10.71	8.54	5.57	4.54	4.74	4.53	4.11	3.82	3.75
SO_2	29.08	36.58	45.25	35.49	28.97	26.88	21.60	17.00	21.25	20.87
Industrial processes										
NOx	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
CO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA,NE,NO	NA,NE,NO
NMVOC	0.05	0.05	0.07	0.06	0.05	0.05	0.05	0.10	0.22	0.22
SO_2	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	0.02	0.02
Solvent and other product use										
NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NMVOC	2.65	2.31	2.54	5.06	5.90	5.54	4.47	4.25	4.51	2.73
SO_2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Agriculture										
NOx	0.98	0.67	0.19	0.10	0.11	0.06	0.03	0.04	0.04	0.06
CO	8.78	8.25	2.08	1.45	1.85	0.82	0.17	0.46	0.49	0.53
NMVOC	2.02	2.50	2.50	2.51	2.46	2.46	2.42	2.37	2.47	2.47
SO_2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Waste										
NOx	0.0006	0.0007	0.0007	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
CO	0.0012	0.0013	0.0014	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
NMVOC	0.03	0.04	0.05	0.07	0.07	0.07	0.07	0.07	0.04	0.04
SO_2	0.0006	0.0007	0.0007	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

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 (NOx), non-methane volatile organic compounds (NMVOC) and sulphur dioxide (SO_2).

1.1.1. Background information on climate change

United Nations Framework Convention on Climate Change

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 recognizes 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

Recognizing 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 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.KP was ratified by the Republic of Cyprus in 2003 with Law No. 29(III) / 2003.

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.

At the first Conference of the Parties serving as the Meeting of the Parties to the Protocol (COP / CMP) held in Canada (December 2005) the rules for the implementation of the Protocol agreed at COP7 were adopted. The same COP / CMP established a working group, called the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP), to discuss future commitments for industrialized countries under the Kyoto Protocol. The Conference of the Parties in 2007, by its decision 1 / CP.13 (the Bali Action Plan) launched a comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action, now, up to and beyond 2012, to be conducted under a subsidiary body under the Convention, the Ad Hoc Working Group on Long-Term Cooperative Action under the Convention (AWG-LCA). Additionally, in COP17 held in Durban, it was agreed that the two ad-hoc working groups (AWG-KP and AWG-LCA) would complete their work in COP18 in 2012. In the same COP (COP17) a new ad-hoc working group was created, the Durban Platform, which was given the task to prepare by 2015 the new climate agreement to be implemented for 2020 and beyond. In COP18, it was also agreed that the Kyoto Protocol would continue for a second commitment period, for the years 2013-2020.

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 non-Annex I to Annex I party to the UNFCCC.

1.1.2. Background information on greenhouse gas inventories

Annual inventories of greenhouse and other gases 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 gases 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" (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" (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.

At COP9 the use of the IPCC "Good Practice Guidance for Land Use, Land Use Change and Forestry" (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.

In the framework of the project "Strategic Plan for the Limitation of Greenhouse Gases Emissions in Cyprus", which was assigned by the Ministry of Agriculture, Natural Resources and Environment of Cyprus, to the National Observatory of Athens and was completed on December 2001, the first national inventory report for Cyprus was prepared, and was for the years 1990-1998[2]. The first Inventory report submitted by Cyprus for the purposes of Decision no. 280 / 2004 / EC was in 2006 for the period 1990-2004[3].

1.1.3. Background information on supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

Under the Kyoto Protocol, Parties that are included in Annex B to the Kyoto Protocol are required to report data on the issuance and transactions of assigned amount units (AAUs), emission reduction units (ERUs), certified emission reductions (CERs), removal units (RMUs) and also on various parameters and definitions that are necessary for accounting under the Kyoto Protocol.

Cyprus not being an Annex B country and not operating a Kyoto registry does not generate trade or surrender Kyoto units thus it is not considered relevant for Cyprus to compile SEF tables. Moreover, this inventory does not include information on activities under Article 3, 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.

Information related to accounting of emissions under the European Union Emissions Trading Scheme is presented in Annex V.

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[2] Ministry of Agriculture, Natural Resources and Environment, 2001, Strategic Plan for the Limitation of Greenhouse Gases Emissions in Cyprus, deliverable 3 "Inventory of greenhouse gases emissions in Cyprus for the period 1990-1998", prepared by the National Observatory of Athens.

[3] Environment Service, Ministry of Agriculture, Natural Resources and Environment, 2007, Report under the Decision No 280 / 2004 / EC.

1.2. A description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

1.2.1. Overview of institutional, legal and procedural arrangements for compiling GHG inventory

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

The Ministry of Agriculture, Natural Resources and Environment (MANRE) is the governmental body responsible for the development and implementation of the majority of the environmental policy in Cyprus. Moreover, the MANRE is responsible for the co-ordination of all involved ministries, as well as any relevant public or private organisation, in relation to the implementation of the provisions of the European legislation associated with climate change.

In this context, the MANRE has the overall responsibility for the national GHG inventory, and the official preparation and approval of the inventory prior to its submission. (Contact person: Nicoletta Kythreotou, Address: Department of Environment, 1498 Nicosia, Cyprus, e-mail: nkythreotou@environment.moa.gov.cy, tel.: +357 22 408947, fax: +357 22 774945).

Figure 1.1 provides an overview of the organisational structure of the National Inventory System. The entities participating in it are:

- The MANRE designated as the national entity responsible for the national inventory, which keeps the overall responsibility, plays an active role in the inventory planning, preparation and management, and also compiles the annual inventory.
- Governmental ministries and agencies through their appointed focal persons, ensure the data provision.

No legal framework is available defining the roles-responsibilities and the co-operation between the MANRE and contact points of the involved ministries and agencies.

1.2.2. Overview of inventory planning

The preparation of the Cypriot GHG emissions inventory is the responsibility of the Climate Action Unit of the Department of Environment of the Ministry of Agriculture, Natural Resources and Environment.

The compilation of the inventory starts with the collection of the ETS data from the ETS team, which is also part of the Climate Action Unit, in June before the submission deadline. When the first comments on the inventory are received by the European Commission for the submission of the previous year (approximately June), changes are made to the calculation sheets resulting to the CRFreporter data or notes are taken for the National Inventory Report, by the responsible person for the compilation of the inventory.

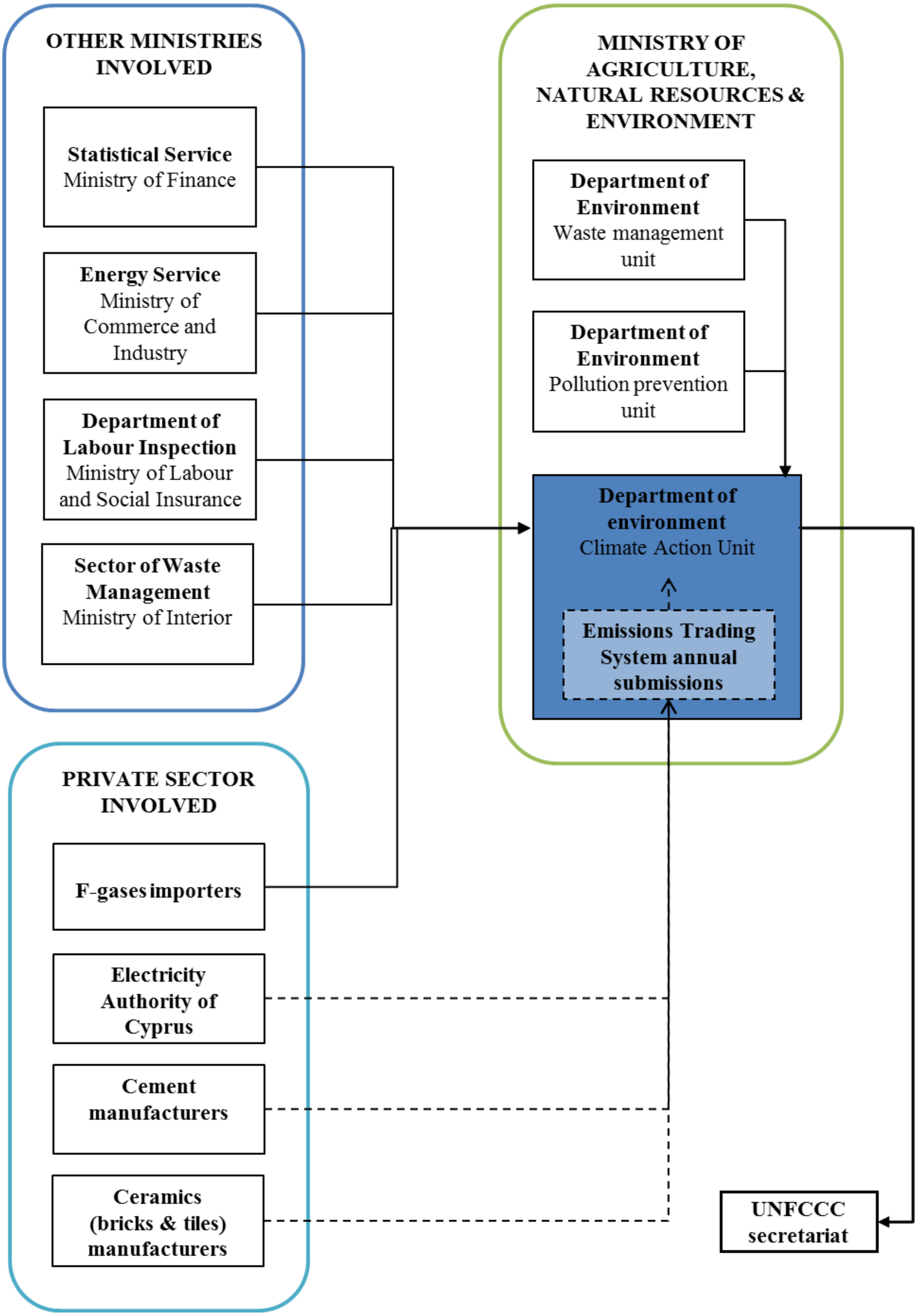

Figure 1.1 Organizational Structure of the National Inventory System

The energy balance is obtained in October before the submission deadline, from the Energy Service of the Ministry of Commerce, Industry and Tourism. Energy data is compared with the data included in the report sent by the Statistical Service to the EUROSTAT. During November, other data from the National Statistical Service of the Ministry of Finance is obtained. Data is also obtained from other units of the Department of Environment, namely Waste Management Unit (waste production and management data for sector 6) and Pollution Control Unit (liquid waste production and management data for sector 6 and agriculture waste data for sector 4). Municipal solid waste management data is obtained from the Sector of Waste Management of the Ministry of Interior. In December the final National inventory report for the NEC Directive prepared by the Department of Labour Inspection of the Ministry of Labour and Social Insurance, is communicated to the inventory compiler.

Inventory compilation team

The calculations, report preparation and overall management of the compilation of the inventory (inventory compiler) is the responsibility of Ms Nicoletta Kythreotou, Environment Officer at the Department of Environment since 2006. Ms Kythreotou has a BSc in Environmental Science, an MSc in Environmental Engineering and has been preparing the Cypriot NIR for the purpose of EU Decision 280/2004/EC for 6 years.

The activity data for the estimation of emissions from F-gases (sectors 2F and 2FP) is obtained by Mr Pavlos Pavlou, who is also an Environment Officer at the Department of Environment since 2006. Mr Pavlou has a MEng in Chemical Engineering, an MSc in Science and Technology of Materials, and has been assisting in the estimation of the NIR for three years.

The final assessment of the national inventory is performed by Dr Theodoulos Mesimeris, who is a Senior Environment Officer. 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 a MEng in Chemical Engineering, MSc in Environmental Management and PhD in Chemical Engineering.

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

The contact details of the team described above is presented in Table 1.1.

Table 1.1 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
Ms Nicoletta Kythreotou	Environment Officer	+357 22 408947	nkythreotou@environment.moa.gov.cy
Mr Pavlos Pavlou	Environment Officer	+357 22 408925	ppavlou@environment.moa.gov.cy

Contact points for data collection

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

The contact point for the energy balance prepared by the National Statistical Service for the submission to EUROSTAT is Mrs Nafsika Apostolou (tel. no. +357 22602199, napostolous@cystat.mof.gov.cy), for population and waste data is Mrs Marilena Kythreotou (tel no. +357 22602137, mkythreotou@cystat.mof.gov.cy) and for agricultural data (cultivated areas and animal population) is Mrs Sofia Pelagia (spelagia@cystat.mof.gov.cy).

The National Inventory Report prepared by the Department of Labour Inspection of the Ministry of Labour and Social Insurance for the needs of the NEC Directive, is communicated to the inventory compiler by Dr Chrysanthos Savvides (tel. no. +357 22405672, csavvides@dli.mlsi.gov.cy).

The contact point for data on packaging waste production and management is Mrs Elena Christodoulidou, part of the Waste Management Unit, Department of Environment (tel. no. +357 22408951, echristodoulidou@environment.moa.gov.cy).

Other data on municipal solid waste production and management is obtained from Mr Stergios Palpanis, part of the sector of Waste Management, at the Ministry of Interior (+357 22806454, spalpanis@moi.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 production and management data 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 production and 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).

Land use, land use change and forestry data is obtained from Mr Andreas Antoniou, part of the Protection of Nature Unit, Department of Environment (tel. no. +357 22408918, aantoniou@environment.moa.gov.cy).

1.2.3. Overview of inventory preparation and management

The preparation of the Cypriot GHG emissions inventory is based on the application of the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, as elaborated by the IPCC good practice guidance. The compilation of the inventory is completed in three main stages (Figure 1.2), while the timetable for the completion of those stages in the annual inventory cycle is presented in Figure 1.3.

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.

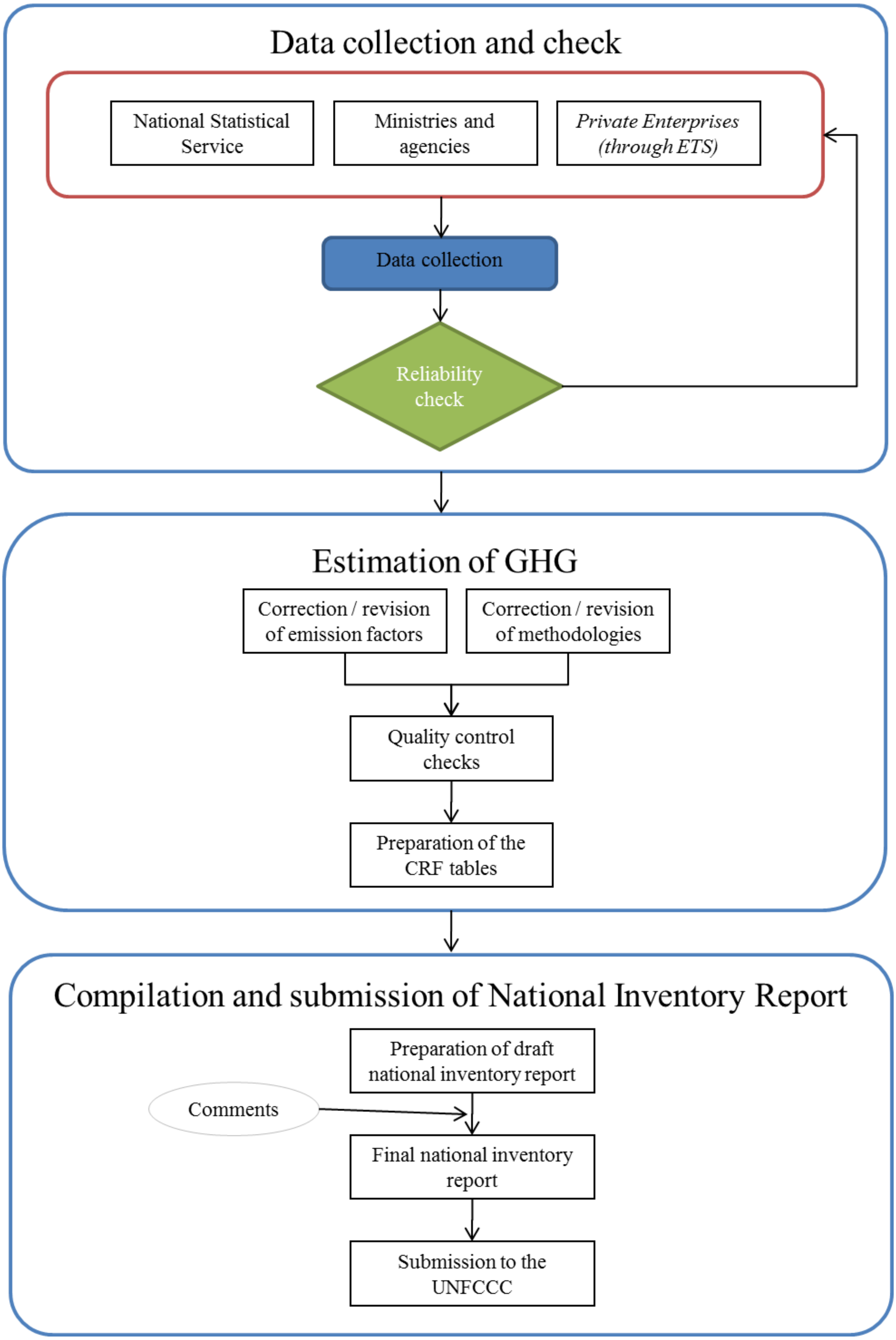

Figure 1.2 GHG emissions inventory preparation process in Cyprus

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

Stage 3: The last stage involves the compilation of the NIR and its internal check. During this period, the Inventory Team has to revise the report according to the observations and recommendations of the 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 MANRE submits the NIR to the UNFCCC secretariat.

1.3. Inventory preparation

1.3.1. GHG inventory

The preparation of the Cypriot GHG emissions inventory is predominately based on the application of the Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, as elaborated by the IPCC good practice guidance. The compilation of the inventory is completed in three main stages (Figure 1.2), while the timetable for the completion of those stages in the annual inventory cycle is presented in Figure 1.3.

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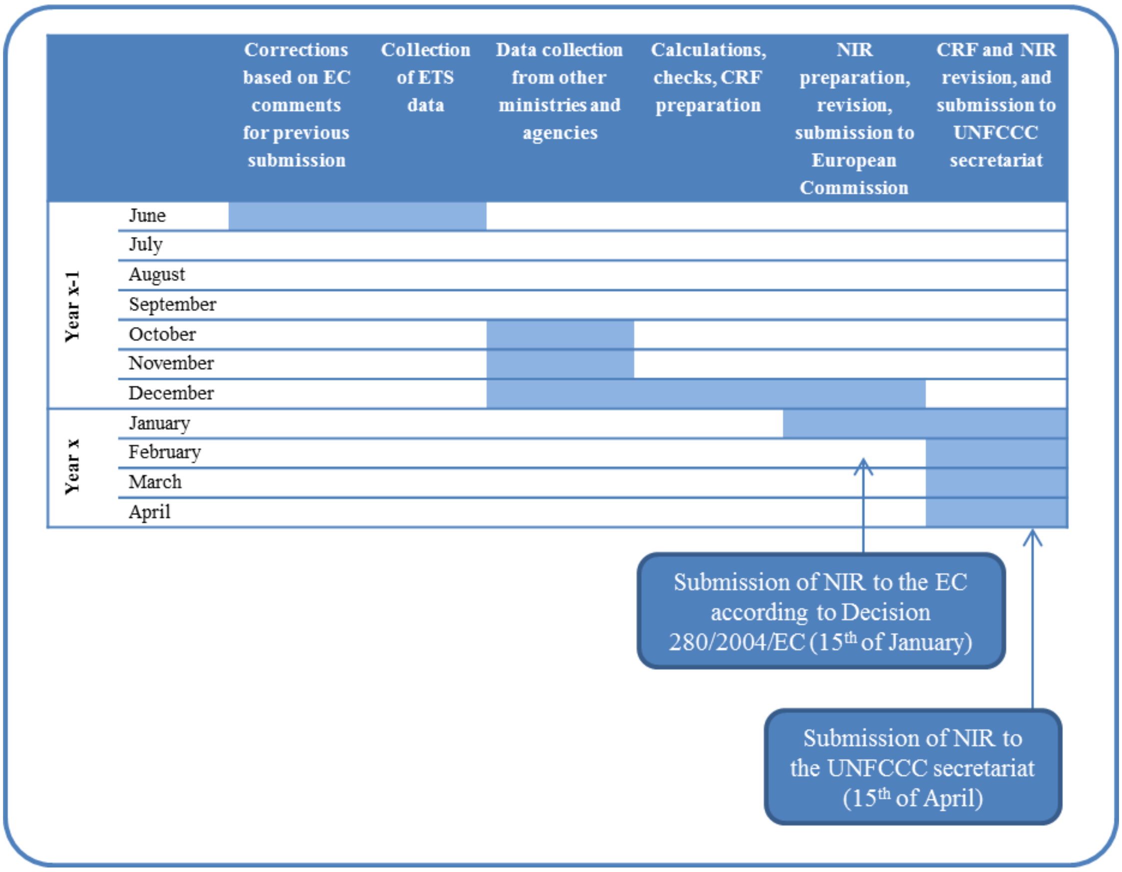

Figure 1.3 Timetable for the preparation and submission of GHG emissions/removals inventory in Cyprus

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 GHGs.

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 for the GHG inventory

1.4.1 Emission factors

The estimation of GHG emissions / removals per source / sink category is based on the methods described in the IPCC Guidelines, the IPCC Good Practice Guidance, the LULUCF

Good Practice Guidance and the CORINAIR methodology[4]. The emission factors used derive from the abovementioned methodological sources and special attention was paid in selecting the emission factors that better describe practices in Cyprus. Furthermore, emission factors were obtained from plant specific information contained in EU ETS reports. Details on the methods applied for the calculation of emissions / removals are given the xml file accompanying this report.

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 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 1.2 gives an overview of the main data sets used for the estimation of GHG emissions /removals. Data from international organizations 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 2005-2010 constituted significant source of information and an additional quality control check.

Table 1.2 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 • Department of Labour Inspection
1A2 Manufacturing industry	Fuel consumption	• ETS verified reports • Statistical Service

[4] Emissions estimates from road transport presented in this inventory derive from the implementation of the COPERT IV model (COmputer Program to calculate Emissions from Road Transport), developed for the Commission of the European Communities in the framework of the CORINAIR methodology.

Sector	Data	Sources
and construction		• Energy Service • Department of Labour Inspection
1A3 Transport	Fuel consumption	• Statistical Service • Energy Service • Department of Labour Inspection
1A4 Residential / Commercial / Agriculture	Fuel consumption	• Statistical Service • Energy Service • Department of Labour Inspection
1B Fugitive emissions from fuels	Fuel consumption	• Statistical Service • Energy Service • Department of Labour Inspection
2 Industrial processes	Industrial production	• ETS verified reports • Statistical Service • Department of Labour Inspection
3 Solvents and other products use	NMVOCs emissions	• Department of Labour Inspection
4 Agriculture	Cultivated areas Agricultural production Livestock population Fertilizer use	• Statistical Service
5 LULUCF	Area and wood stocks of managed forests Areas affected by wildfires	• Department of Forestry
6 Waste	Quantities/composition of solid waste generated Recycling Population Industrial production	• Department of Environment • Ministry of Interior • Statistical Service

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 some of the most common greenhouse gases are given in Table 1.3.

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 1.3 Global Warming Potential (in t of CO_2 eq) for the 100-year horizon

Gas	GWP
Carbon dioxide (CO_2)	1
Methane (CH_4)	21
Nitrous Oxide (N_2O)	310
Hydrofluorocarbons (HFC)	
HFC-32	650
HFC-125	2800
HFC-134a	1300
HFC-143a	3800
Sulphur hexafluoride (SF_6)	23900

1.5. Brief description of key categories

1.5.1. GHG inventory (including and excluding LULUCF)

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 Cypriot inventory system is based on the application of the Tier 1 methodology (see Annex I for an 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.

It should be mentioned that:

- Source category uncertainty estimates are not taken into consideration.
- Base year estimates were calculated considering 1990 as base year.

The summary of the key categories assessment for the Cypriot inventory system (without LULUCF) for the year 2011 are presented in Table 1.4.

Table 1.4 Key categories for the Cypriot inventory system without LULUCF for 2011

IPCC Source category	GHG	Level assessment	Trend assessment
1AA1A. Public electricity and heat production	CO_2	✓	✓
1AA2F1. Other	CO_2	✓	✓
1AA2F2. Non-metallic minerals	CO_2	✓	✓
1AA3B. Road transport	CO_2	✓	✓
1AA4A. Commercial/ Institutional	CO_2		✓
1AA4B. Residential	CO_2	✓	✓
1AA4C. Agriculture/ Forestry/ Fisheries	CO_2		✓
2A1. Cement Production	CO_2	✓	✓
2F. Consumption of halocarbons and SF_6	HFC&SF_6	✓	✓
4A. Enteric Fermentation	CH_4	✓	
4B. Manure Management	N_2O	✓	
4D1. Direct Soil Emissions	N_2O	✓	✓
4D3. Indirect emissions	N_2O		✓
6A. Solid waste disposal on land	CH_4	✓	✓

The methodology applied for the determination of the key categories with LULUCF is similar to the one presented above. The key categories identified for the year 2011 are presented in Table 1.5 (see Annex I for presentation of calculations). The comparison of the results of the analysis with and without LULUCF reveals no major differences in the source categories identified (apart from the categories from the LULUCF sector).

Table 1.5 Key categories for the Cypriot inventory system with LULUCF for 2011

IPCC Source category	Direct GHG	Level assessment	Trend assessment
1AA1A. Public electricity and heat production	CO_2	✓	✓
1AA2F1. Other	CO_2	✓	✓
1AA2F2. Non-metallic minerals	CO_2	✓	✓
1AA3B. Road transport	CO_2	✓	✓
1AA4A. Commercial/ Institutional	CO_2		✓
1AA4B. Residential	CO_2	✓	✓
1AA4C. Agriculture/ Forestry/ Fisheries	CO_2		✓
2A1. Cement Production	CO_2	✓	✓
2F. Consumption of halocarbons and SF6	HFC & SF_6	✓	✓
4A. Enteric Fermentation	CH_4	✓	
4B. Manure Management	N_2O	✓	
4D1. Direct Soil Emissions	N_2O	✓	✓
4D3. Indirect emissions	N_2O	✓	✓
5. LULUCF	CO_2		✓
6A. Solid waste disposal on land	CH_4	✓	✓

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

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, Natural Resources and Environment is responsible for the implementation of the QA/QC system. The system has the following objectives:

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

Table 1.6 Quality assurance / quality control procedures for the Cypriot 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

The accomplishment of the above-mentioned objectives can only be ensured by the implementation, from all the members of the Inventory Team (see Figure 1.4 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.
- 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 1.6 for the list of procedures within each process and Figure 1.5 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.

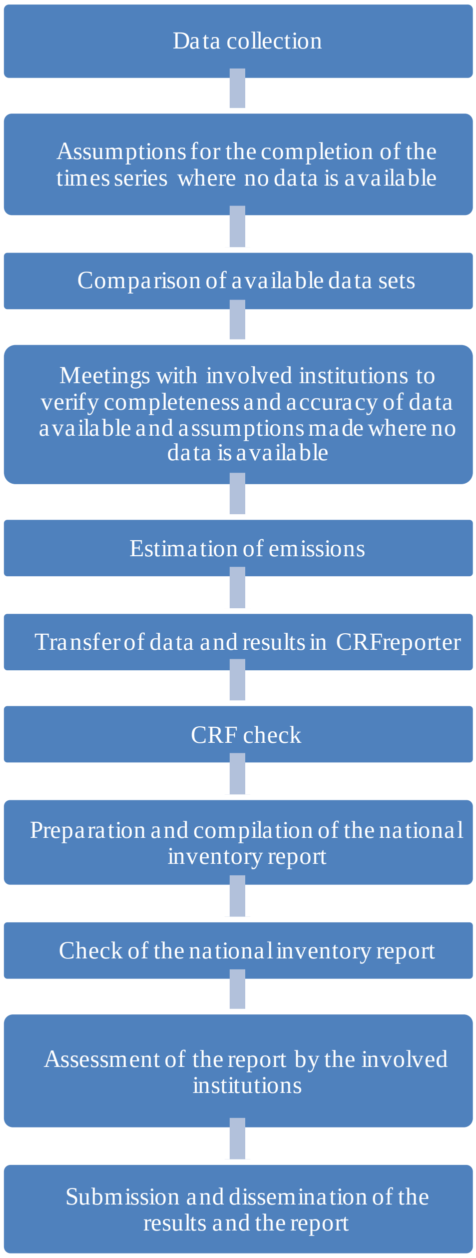

Figure 1.4 Flow chart activities concerning the GHG emissions inventory preparation

The implementation of the plan started in May 2007 and the first internal review was carried out in October 2011.The outcome of the review is the current version of the QA/QC. No activities have yet taken place for the procedure no. QM 03 concerning training.

1.6.2. Verification activities

Verification is only applied to the activities included in the EU ETS, namely electricity production, cement production and ceramics production.

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 of the GHG inventory

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 II. The uncertainty analysis for the Cypriot 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 forCO_2, CH_4, N_2O and F-gases emissions.

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.

Table 1.7 presents the uncertainty estimates as % of total national emissions in 2011 per source category and gas without LULUCF, while the detailed calculations are presented in Annex II. The combined uncertainty estimates for GHG emissions per gas in 2011, were estimated at: 3.39% for CO_2 emissions, 2.82% for CH_4emissions, 6.43% for N_2O emissions and 2.85% for the F-gases emissions.

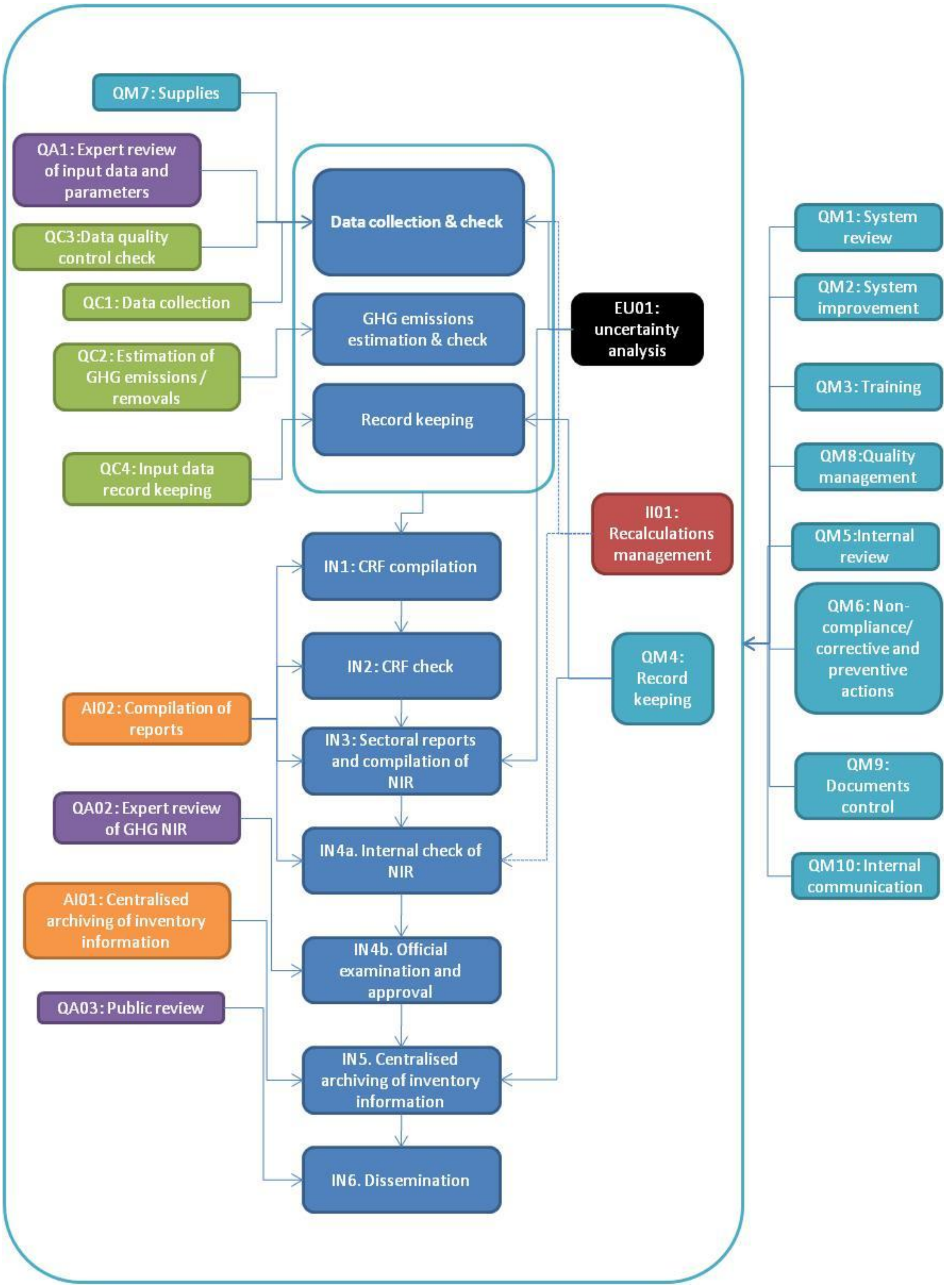

Figure 1.5 QA/QC processes and procedures and inventory related activities

Table 1.7 Uncertainty estimates as % of total national emissions in 2011 per source category and gas (without LULUCF)

Source category	Combined uncertainty as % of total national emissions in 2011	Uncertainty introduced into the trend in total national emissions
CO_2		
1AA1A. Public electricity and heat production	2.87%	4.40%
1AA1B. Petroleum refining	0.00%	0.11%
1AA2F1. Other	0.10%	0.44%
1AA2F2. Non-metallic minerals	0.29%	0.65%
1AA3B. Road transport	1.73%	2.61%
1AA4A. Commercial/ Institutional	0.05%	0.10%
1AA4B. Residential	0.37%	0.58%
1AA4C. Agriculture/ Forestry/ Fisheries	0.06%	0.11%
1AA5A. Other Stationary	0.01%	0.03%
2A1. Cement Production	0.17%	0.29%
2A2. Lime production	0.00%	0.00%
2A7.2. Ceramics Production	0.01%	0.02%
TOTAL	**3.39%**	**9.36%**
CH_4		
1AA1A. Public electricity and heat production	0.03%	0.02%
1AA1B. Petroleum refining	0.00%	0.00%
1AA2F1. Other	0.00%	0.01%
1AA2F2. Non-metallic minerals	0.00%	0.01%
1AA3B. Road transport	0.04%	0.02%
1AA4A. Commercial/ Institutional	0.01%	0.01%
1AA4B. Residential	0.03%	0.03%
1AA4C. Agriculture/ Forestry/ Fisheries	0.00%	0.00%
1AA5A. Other Stationary	0.00%	0.02%
1B2A4. Refining / Storage	0.00%	0.07%
4A. Enteric Fermentation	0.63%	0.33%
4B. Manure Management	0.68%	0.16%
4F. Field burning of agricultural residues	0.00%	0.04%
6A. Solid waste disposal on land	2.64%	2.60%
6B. Wastewater handling	0.29%	0.19%
TOTAL	**2.82%**	**3.52%**
N_2O		
1AA1A. Public electricity and heat production	0.29%	0.14%
1AA1B. Petroleum refining	0.00%	0.02%
1AA2F1. Other	0.01%	0.06%
1AA2F2. Non-metallic minerals	0.04%	0.09%
1AA3B. Road transport	0.03%	0.01%
1AA4A. Commercial/ Institutional	0.01%	0.02%
1AA4B. Residential	0.05%	0.04%
1AA4C. Agriculture/ Forestry/ Fisheries	0.01%	0.01%

Source category	Combined uncertainty as % of total national emissions in 2011	Uncertainty introduced into the trend in total national emissions
1AA5A. Other Stationary	0.00%	0.01%
4B. Manure Management	1.64%	0.71%
4D1. Direct Soil Emissions	6.17%	5.77%
4D3. Indirect emissions	0.73%	0.83%
4F. Field burning of agricultural residues	0.00%	0.04%
6B. Wastewater handling	0.03%	0.03%
TOTAL	**6.43%**	**0.38%**
HCFs		
2F. Consumption of Halocarbons and SF6	2.85%	3.28%
TOTAL	**2.85%**	**3.28%**
TOTAL emissions uncertainty	**15.49%**	**16.53%**
Percentage uncertainty in total inventory	**39.36%**	**40.66%**

1.8. General assessment of the completeness of the GHG inventory

In the present inventory report, estimates of GHG emissions in Cyprus for the years 1990-2011 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. The deficiencies are the following:

- Civil aviation emissions (1AA3a): no data available on consumption of fuel for inland aviation.
- Navigation (1AA3d): no data available on consumption of fuel for domestic navigation.
- Fugitive emissions from transport of oil (1B2a3): lack of IPCC methodology.
- Fugitive emissions from distribution of products (1B2a5): lack of IPCC methodology.
- Fugitive emissions from venting of oil (1B2C1.1): lack of IPCC methodology.
- CO_2 emissions from asphalt roofing (2A5): lack of IPCC methodology.
- CO_2 emissions from asphalt roofing-road paving (2A6): lack of IPCC methodology.
- CH_4 and N_2O from ceramics production (2A7.2): lack of IPCC methodology.
- Emissions from metal production (2C): no activity data available.
- Emissions from food and drink industries (2D2): no activity data available.
- Consumption of halocarbons and SF6 (2F) and Consumption of halocarbons and SF6 potential emissions (2FP): lack of activity data to complete the time series.
- Emissions from solvent and other product use (3): lack of IPCC method.
- Emissions from LULUCF (5): no activity data available other that forest land remaining forest land (5A1), wildfires (5(V)) and harvested wood products (5G).
- N_2O emissions from industrial wastewater handling: lack of IPCC methodology.

1.9. Additional information

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

1. The uncertainty analysis in .xls format.
2. The key category analysis in .xls format.

Chapter 2: Trends in greenhouse gas emissions

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

The GHG emissions (CO_2, CH_4, N_2O, HFC) for the period 1990 - 2011 are presented in Table 2.1 (in kt CO_2 eq). The GWP values used for the conversion of emissions estimates into the common unit of carbon dioxide equivalent are those presented in Table 1.3.

It is noted that according to the IPCC Guidelines, emissions estimates for international marine and aviation bunkers were not included in the national totals, but are reported separately as memo items.

Base year GHG emissions for Cyprus (1990) were estimated at 6091 Gg CO_2 eq. LULUCF emissions are not considered in estimating base year emissions for Cyprus.

In 2011, GHG emissions (without LULUCF) amounted to 9154 Gg CO_2 eq. showing an increase of 50% compared to base year emissions. If emissions /removals from LULUCF were to be included then the increase would be 53%.

Carbon dioxide emissions accounted for 84% of total GHG emissions in 2011 (without LULUCF) and increased by 56% from 1990. Methane emissions accounted for 10% of total GHG emissions in 2011 (without LULUCF) and increased by 25% from 1990, while nitrous oxide emissions accounted for 2% of the total GHG emissions in 2011 (without LULUCF) and increased by 2% from1990. Finally, F-gases and SF_6 emissions accounted for 1% of total GHG emissions in 2011.

The summary tables for each year of the inventory by gas and source as these were generated by *CRFreporter v. 6.3* are presented in Annex III.

Table 2.1 Total GHG emissions in Cyprus (in Gg CO_2 eq) with and without LULUCF for the period 1990-2011

	1990	1991	1992	1993	1994	1995
Total GHG emissions including LULUCF (Gg CO_2 eq.)						
CO_2	4780	5006	5346	5660	6081	5937
CH_4	720	743	782	820	837	868
N_2O	452	449	494	512	507	512
HFCs & SF_6	0	0	0	0	25	0
TOTAL	5952	6198	6622	6991	7450	7317
Total GHG emissions excluding LULUCF (Gg CO_2 eq.)						
CO_2	4922	5163	5506	5766	6204	6088
CH_4	719	743	782	818	836	868
N_2O	450	449	494	502	500	510
HFCs & SF_6	0	0	0	0	25	0
TOTAL	6091	6355	6782	7086	7564	7465

	1996	1997	1998	1999	2000	2001
Total GHG emissions including LULUCF (Gg CO_2 eq.)						

CO_2	6296	6390	6616	6723	6989	6868
CH_4	895	901	910	912	928	932
N_2O	524	503	532	504	488	529
HFCs & SF_6	10	0	0	19	19	18
TOTAL	7725	7793	8057	8158	8424	8348
Total GHG emissions excluding LULUCF (Gg CO_2 eq.)						
CO_2	6451	6542	6624	6894	7144	7000
CH_4	894	900	906	912	927	931
N_2O	522	500	501	504	484	521
HFCs & SF_6	10	0	0	19	19	18
TOTAL	7877	7942	8032	8329	8574	8470

	2002	**2003**	**2004**	**2005**	**2006**	**2007**
Total GHG emissions including LULUCF (Gg CO_2 eq.)						
CO_2	7017	7419	7632	7682	7958	8254
CH_4	964	961	978	960	957	956
N_2O	548	538	514	473	452	466
HFCs & SF_6	19	19	20	22	24	26
TOTAL	8548	8937	9143	9137	9392	9702
Total GHG emissions excluding LULUCF (Gg CO_2 eq.)						
CO_2	7192	7584	7805	7857	8127	8372
CH_4	964	961	978	960	957	955
N_2O	548	536	513	472	450	455
HFCs & SF_6	19	19	20	22	24	26
TOTAL	8722	9099	9315	9311	9558	9808

	2008	**2009**	**2010**	**2011**
Total GHG emissions including LULUCF (Gg CO_2 eq.)				
CO_2	8456	8177	7824	7579
CH_4	966	976	945	899
N_2O	444	436	452	473
HFCs & SF_6	26	40	56	127
TOTAL	9893	9629	9278	9078
Total GHG emissions excluding LULUCF (Gg CO_2 eq.)				
CO_2	8630	8352	7992	7672
CH_4	966	976	945	898
N_2O	444	436	450	458
HFCs & SF_6	26	40	56	127
TOTAL	10065	9803	9444	9154

2.2. Description and interpretation of emission trends by category

GHG emissions trends by sector for the period 1990 - 2011 are presented in Figure 2.1 and Table 2.2.

<u>Energy</u>

Emissions from Energy in 2011 (Figure 2.2) accounted for 78% of total GHG emissions (without LULUCF) and increased by 69% compared to 1990 levels.

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. This behaviour of economic growth was also reflected in the emission trends.

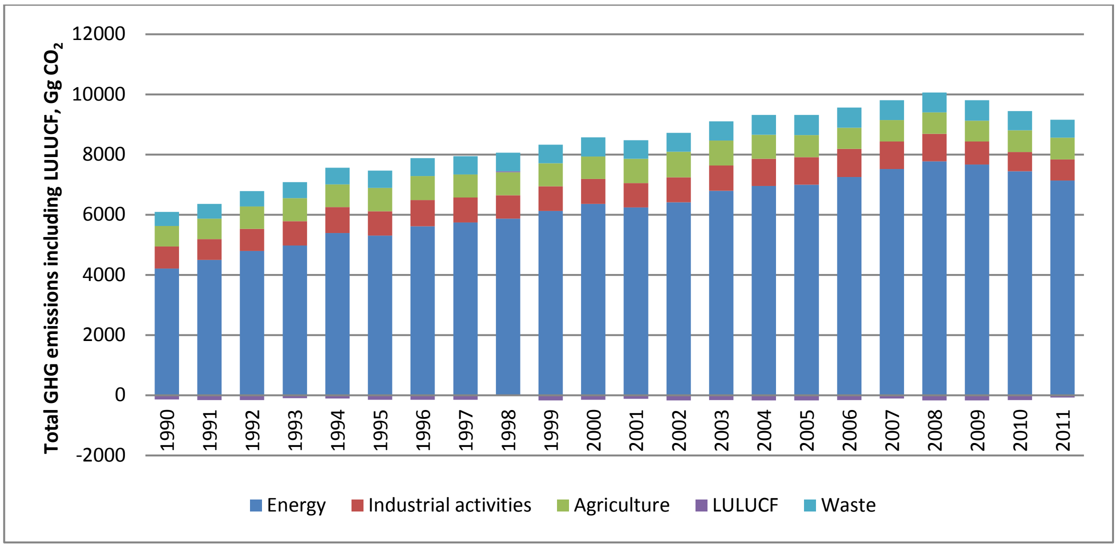

Figure 2.1. Contribution of activity sectors to total GHG emissions during the period 1990-2011 (including LULUCF)

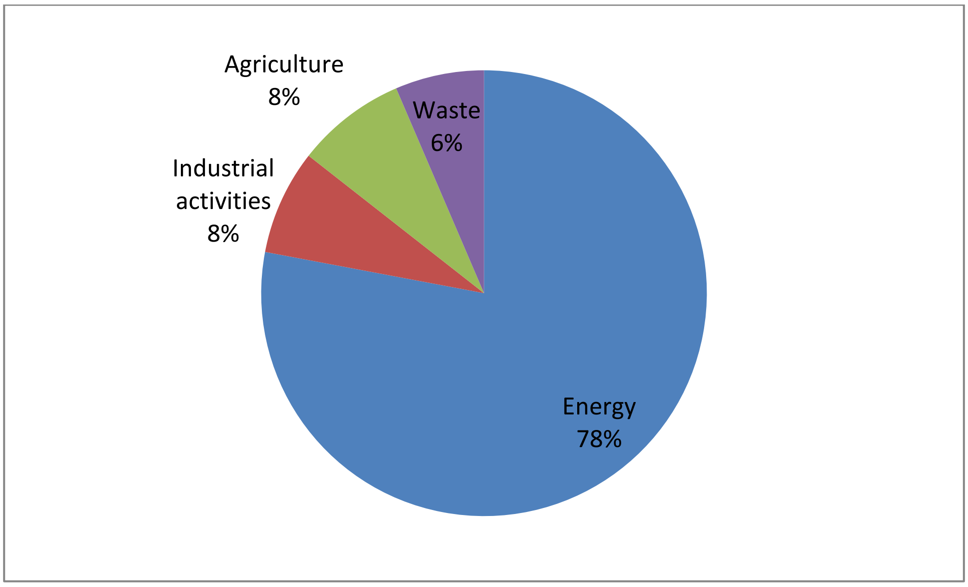

Figure 2.2. Relative contribution of activity sectors to total GHG emissions in 2011 excluding LULUCF

The majority of energy related GHG emissions (52.2%) in 2011 was derived from energy industries, while the contribution of transport, manufacturing industries and construction and other sectors is estimated at 32%, 7.2% and 8.9% respectively.

The substantial increase of GHG emissions from road transport 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.

Table 2.2 Total GHG emissions in Cyprus (in Gg CO_2 eq) by sector for the period 1990-2011

	1990	1991	1992	1993	1994	1995	1996	1997
Energy	4214	4497	4791	4981	5389	5308	5614	5738
Industry	728	687	737	808	864	805	872	830
Agriculture	679	680	742	764	758	779	799	769
Waste	470	491	512	533	553	574	592	606
Total[5]	6091	6355	6782	7086	7564	7465	7877	7942
LULUCF	-139	-157	-160	-95	-114	-149	-152	-149

	1998	1999	2000	2001	2002	2003	2004	2005
Energy	5865	6129	6361	6244	6409	6793	6952	6995
Industry	785	812	831	802	831	840	903	915
Agriculture	766	765	744	808	856	828	803	738
Waste	616	624	639	617	627	638	658	663
Total[4]	8032	8329	8574	8470	8722	9099	9315	9311
LULUCF	26	-171	-150	-122	-174	-163	-172	-174

	2006	2007	2008	2009	2010	2011		
Energy	7256	7513	7771	7665	7441	7137		
Industry	927	919	921	763	642	697		
Agriculture	712	717	708	698	722	730		
Waste	663	659	666	677	639	590		
Total[4]	9558	9808	10065	9803	9444	9154		
LULUCF	-166	-106	-173	-175	-166	-76		

Industrial Processes

Emissions from Industrial processes in 2011 accounted for 8% of the total emissions (without LULUCF) and decreased by 4% compared to 1990 levels. Between 1990 and 2008 the emissions of the sector were increasing (mainly depicted in the CO_2 emissions) and are mainly attributed to the growth of the constructions sector. However, during 2008-2010, the constructions sector experienced the same impact as all economic activities and the emissions of the sector in 2010 decreased by 24% compared to 2008. An additional cause of the increase between 1990 and 2008 is that emissions from consumption of f-gases, was mainly available for years after 2005. Total emissions of the sector in 2011 are higher than emissions of 2010 by 9% due to a better estimation of the emissions from consumption of f-gases.

Solvents and other products use

Emissions from Solvents and other products use have not been estimated due to lack of IPCC methodology.

Agriculture

Emissions from Agriculture accounted for 8% of total emissions in 2011 (without LULUCF), and increased by approximately 7% compared to 1990 levels. The peak of Agriculture emissions was in 2002 when an in increase of 26% compared to 1990 was observed. Since 2002 a reduction in emissions was observed, due to the reduction of N_2O

[5]Emissions / removals from Land Use, Land Use Change and Forestry are not included in national totals

emissions from agricultural soils, because of the reduction in the use of synthetic nitrogen fertilizers. 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 and the reduction in the animal population.

Waste

Emissions from the Waste Sector in 2011 contributed 6% of the total emissions (without LULUCF). Even though waste management of both liquid and solid wastes improved significantly since 1990, due to the increase in population and solid waste production per capita due to the changes in social conditions, the emissions of the sector increased by 26% between 1990 and 2011.

Land Use, Land Use Change and Forestry

The Land Use, Land Use Change and Forestry sector was a net sink of greenhouse gases during the period 1990 – 2011. During this period, the LULUCF sector offset about 1% of the total national emissions (without LULUCF). The magnitude of this sink decreased from approximately 139 Gg CO_2 eq in 1990, to 76 Gg CO_2 eq in 2011, i.e. a decrease of 45%. Even though during 2011 there was an increase of the area covered with forests by 211 ha, the CO_2 balance is reduced due to a large wildfire (1974 ha burnt).

2.3. Description and interpretation of emission trends by gas

2.3.1. Carbon dioxide

The trend of carbon dioxide emissions from 1990 to 2011 by source category is presented in Table 2.3. Total CO_2 emissions increased from 4922 Gg in 1990 to 7672 Gg in 2011 (without LULUCF). The increase of 56% from 1990 to 2011 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 11% from 2008 to 2011 is mainly attributed to economic crisis. Another reason for the decrease is the increasing share of renewable energy technologies.

CO_2 emissions from Energy increase from 4193 Gg in 1990 to 7102 Gg in 2011, presenting a total increase of 69% from 1990 to 2011. Carbon dioxide emissions from Industrial processes in 2011 decreased by 22% compared to 1990 (Figure 2.3).

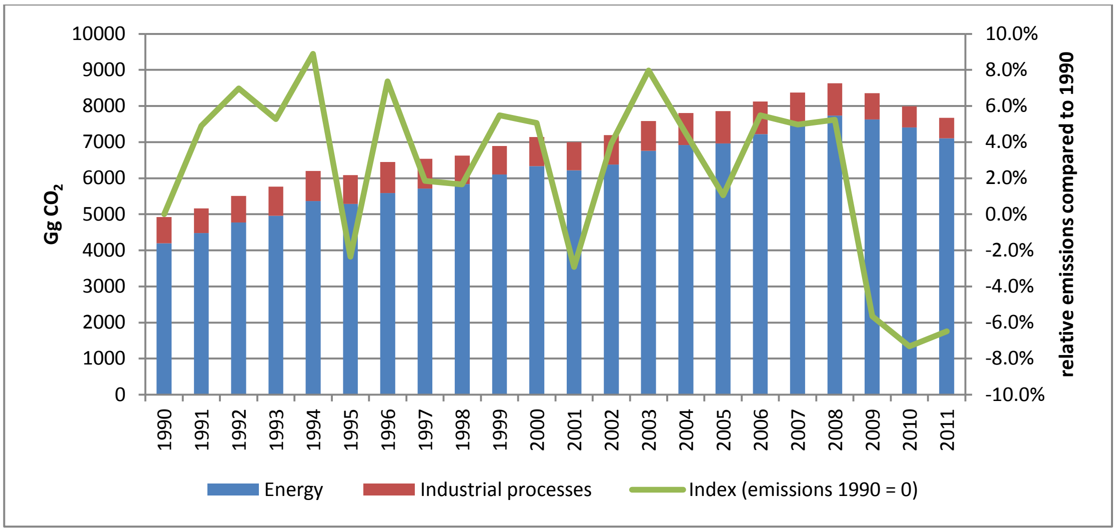

Figure 2.3 CO_2 emissions by sector (in Gg) for the years 1990 – 2011 (without LULUCF)

Table 2.3 CO_2 emissions / removals by sector for the period 1990-2011 (in Gg)

	1990	1991	1992	1993	1994	1995
Energy						
1AA1A. Public electricity and heat production	1674	1736	2030	2163	2257	2074
1AA1B. Petroleum refining	91	91	94	81	119	94
1AA2F1. Other	428	361	419	435	448	486
1AA2F2. Non-metallic minerals	649	940	699	747	956	956
1AA3B. Road transport	1168	1164	1310	1330	1383	1468
1AA4A. Commercial/ Institutional						
1AA4B. Residential	183	183	217	202	202	205
1AA4C. Agriculture/ Forestry/ Fisheries						
1AA5A. Other Stationary						
Industrial Processes						
2A1. Cement Production	668	629	686	747	784	751
2A2. Lime production	4	3	3	4	6	3
2A7.2. Ceramics Production	57	55	48	57	50	50
Total	4922	5163	5506	5766	6204	6088
LULUCF	-142	-157	-160	-106	-122	-151
Total with LULUCF	4780	5006	5346	5660	6081	5937

	1996	1997	1998	1999	2000	2001
Energy						
1AA1A. Public electricity and heat production	2195	2320	2549	2719	2849	2781
1AA1B. Petroleum refining	87	94	97	113	110	60
1AA2F1. Other	512	540	572	588	607	613
1AA2F2. Non-metallic minerals	1068	957	746	770	789	728
1AA3B. Road transport	1518	1585	1661	1704	1745	1801
1AA4A. Commercial/ Institutional						
1AA4B. Residential	208	217	215	208	233	233
1AA4C. Agriculture/ Forestry/ Fisheries						
1AA5A. Other Stationary						
Industrial Processes						
2A1. Cement Production	811	780	740	740	763	745
2A2. Lime production	4	5	3	5	4	4
2A7.2. Ceramics Production	48	45	42	48	44	34
Total	6451	6542	6624	6894	7144	7000
LULUCF	-154	-152	-8	-171	-155	-131
Total with LULUCF	6296	6390	6616	6723	6989	6868

	2002	2003	2004	2005	2006	2007
Energy						
1AA1A. Public electricity and heat production	2889	3115	3255	3472	3653	3802
1AA1B. Petroleum refining	113	113	29			
1AA2F1. Other	588	610	576	243	210	205
1AA2F2. Non-metallic minerals	747	764	828	661	652	649
1AA3B. Road transport	1784	1890	1991	2031	2019	2156
1AA4A. Commercial/ Institutional					67	63
1AA4B. Residential	258	270	242	471	522	496
1AA4C. Agriculture/ Forestry/ Fisheries				86	89	89
1AA5A. Other Stationary					13	19
Industrial Processes						
2A1. Cement Production	766	751	808	822	821	812
2A2. Lime production	4	10	9	12	10	10
2A7.2. Ceramics Production	42	60	66	60	72	71
Total	7192	7584	7805	7857	8127	8372
LULUCF	-175	-165	-173	-175	-169	-118
Total with LULUCF	7017	7419	7632	7682	7958	8254

	2008	2009	2010	2011
Energy				
1AA1A. Public electricity and heat production	3967	3992	3868	3710
1AA1B. Petroleum refining				
1AA2F1. Other	219	156	148	131
1AA2F2. Non-metallic minerals	661	585	501	378
1AA3B. Road transport	2246	2251	2298	2235
1AA4A. Commercial/ Institutional	70	67	79	70
1AA4B. Residential	449	487	424	479
1AA4C. Agriculture/ Forestry/ Fisheries	83	76	73	79
1AA5A. Other Stationary	41	16	16	19
Industrial Processes				
2A1. Cement Production	818	673	555	546
2A2. Lime production	10	8	9	7
2A7.2. Ceramics Production	66	41	21	17
Total	8630	8352	7992	7672
LULUCF	-174	-175	-168	-93
Total with LULUCF	8456	8177	7824	7579

2.3.2. Methane

The trend of methane emissions from 1990 to 2011 by source category is presented in Table 2.4 and in Figure 2.4. Waste represents the largest anthropogenic source of methane emissions in Cyprus, accounting for 63% of total methane emissions in 2011 (without LULUCF). Methane emissions from Waste in 2011 increased by 25% compared to 1990 levels. Methane emissions from Agriculture in 2011 accounted for 35% of total methane emissions and increased by 22% from 1990. Methane emissions from the Energy sector account for the remaining 8% of the total methane emissions.

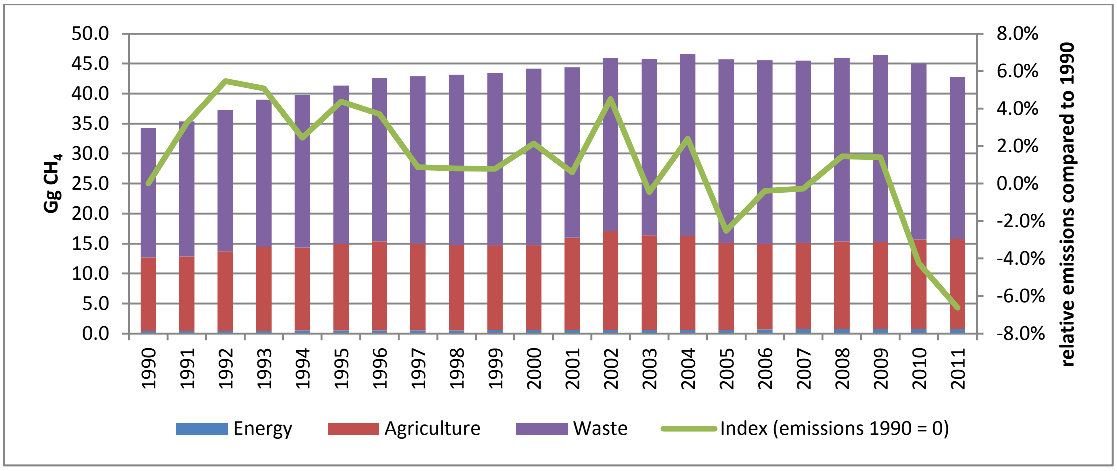

Figure 2.4 CH_4 emissions by sector (in Gg) for the years 1990 – 2011 (without LULUCF)

Table 2.4 CH_4 emissions by sector for the period 1990-2011 (in t)

	1990	1991	1992	1993	1994	1995
Energy						
1AA1A. Public electricity and heat production	66	68	80	85	88	81
1AA1B. Petroleum refining	4	4	4	3	5	4
1AA2F1. Other	18	15	17	18	18	20
1AA2F2. Non-metallic minerals	41	53	30	32	53	52
1AA3B. Road transport	192	196	207	207	218	226
1AA4A. Commercial/ Institutional						
1AA4B. Residential	29	29	34	31	31	32
1AA4C. Agriculture/ Forestry/ Fisheries						
1AA5A. Other Stationary	44	36	35	35	26	27
1B2A4. Refining / Storage	44	52	50	54	63	57
Agriculture						
4A. Enteric Fermentation	7651	7772	7814	8110	8247	8563
4B. Manure Management	4187	4346	4865	5299	5190	5446
4F. Field burning of agricultural residues	418	277	560	580	424	393
Waste						
6A. Solid waste disposal on land	20618	21606	22621	23570	24452	25409
6B. Wastewater handling	948	913	919	951	996	1000
Total	34257	35365	37236	38975	39810	41311
LULUCF	12.9	1.3	0.4	55.3	42.0	12.7
Total with LULUCF	34270	35366	37237	39030	39852	41324

	1996	1997	1998	1999	2000	2001
Energy						
1AA1A. Public electricity and heat production	86	91	100	107	112	109
1AA1B. Petroleum refining	4	4	4	5	5	3
1AA2F1. Other	21	22	23	24	25	25
1AA2F2. Non-metallic minerals	56	52	30	31	37	37
1AA3B. Road transport	231	239	247	256	260	273
1AA4A. Commercial/ Institutional						

1AA4B. Residential	32	34	33	32	36	36
1AA4C. Agriculture/ Forestry/ Fisheries						
1AA5A. Other Stationary	41	21	19	26	23	24
1B2A4. Refining / Storage	53	72	75	82	81	80
Agriculture						
4A. Enteric Fermentation	8699	8513	8195	8150	8387	9126
4B. Manure Management	5751	5810	5891	5733	5642	6098
4F. Field burning of agricultural residues	365	127	162	241	99	188
Waste						
6A. Solid waste disposal on land	26183	26819	27389	27893	28589	27474
6B. Wastewater handling	1062	1076	986	843	856	884
Total	42584	42880	43154	43422	44153	44356
LULUCF	11.7	16.3	166.8	0.2	21.3	45.2
Total with LULUCF	42595	42897	43321	43423	44174	44401

	2002	2003	2004	2005	2006	2007
Energy						
1AA1A. Public electricity and heat production	113	122	128	136	139	145
1AA1B. Petroleum refining	5	5	1	0	0	0
1AA2F1. Other	24	25	24	9	8	8
1AA2F2. Non-metallic minerals	38	43	45	38	37	38
1AA3B. Road transport	278	302	329	346	359	389
1AA4A. Commercial/ Institutional					9	13
1AA4B. Residential	39	41	37	68	97	100
1AA4C. Agriculture/ Forestry/ Fisheries				12	12	12
1AA5A. Other Stationary	22	20	18	17	2	3
1B2A4. Refining / Storage	75	67	19	0	0	0
Agriculture						
4A. Enteric Fermentation	9655	9030	9188	8594	8265	8396
4B. Manure Management	6596	6523	6338	5859	5981	5968
4F. Field burning of agricultural residues	188	187	119	69	88	39
Waste						
6A. Solid waste disposal on land	27956	28487	29319	29585	29462	29291
6B. Wastewater handling	913	895	1003	972	1115	1083
Total	45903	45748	46570	45706	45574	45484
LULUCF	2.8	12.8	5.6	3.9	10.7	57.4
Total with LULUCF	45906	45761	46575	45709	45585	45542

	2008	2009	2010	2011
Energy				
1AA1A. Public electricity and heat production	152	154	149	144
1AA1B. Petroleum refining	0	0	0	0
1AA2F1. Other	9	6	6	6
1AA2F2. Non-metallic minerals	40	35	35	22
1AA3B. Road transport	412	419	427	420
1AA4A. Commercial/ Institutional	14	14	15	42
1AA4B. Residential	102	123	87	139
1AA4C. Agriculture/ Forestry/ Fisheries	11	10	10	11
1AA5A. Other Stationary	6	2	2	5

1B2A4. Refining / Storage	0	0	0	0	
Agriculture					
4A. Enteric Fermentation	8451	8430	8837	9070	
4B. Manure Management	6122	6075	6101	5877	
4F. Field burning of agricultural residues	8	22	23	25	
Waste					
6A. Solid waste disposal on land	29573	30028	28118	25777	
6B. Wastewater handling	1086	1148	1200	1203	
Total	45985	46466	45010	42741	
LULUCF	4.9	3.2	11.3	81.2	
Total with LULUCF	45990	46469	45022	42822	

2.3.3. Nitrous oxide

The trend of nitrous oxide emissions from 1990 to 2011 by source category is presented in Table 2.5 and in Figure 2.5.

Agriculture represents the largest anthropogenic source of nitrous oxide emissions in Cyprus (93% of the total nitrous oxide emissions in 2011, without LULUCF). Emissions from this sector decreased by 1% since 1990, mainly because of new agricultural practices applied, affecting the use of synthetic nitrogen fertilizers and manure management. Nitrous oxide is also produced from the reaction between nitrogen and oxygen during fossil fuel combustion. Nitrous oxide emissions from fossil fuels combustion (accounting for 2.6% of total nitrous oxide emissions in 2011) increased by 66% from 1990. N_2O emissions from Waste in 2011 (4% of total emissions without LULUCF) decreased by 39% compared to 1990 levels.

Table 2.5 N_2O emissions by sector for the period 1990-2011 (in t)

	1990	1991	1992	1993	1994	1995
Energy						
1AA1A. Public electricity and heat production	13.1	13.6	15.9	17.0	17.7	16.3
1AA1B. Petroleum refining	0.8	0.8	0.8	0.7	1.0	0.8
1AA2F1. Other	3.5	3.0	3.4	3.6	3.7	4.0
1AA2F2. Non-metallic minerals	6.5	8.8	5.5	5.8	8.8	8.7
1AA3B. Road transport	9.8	9.8	11.0	11.2	11.6	12.3
1AA4A. Commercial/ Institutional						
1AA4B. Residential	1.7	1.7	2.0	1.9	1.9	1.9
1AA4C. Agriculture/ Forestry/ Fisheries						
1AA5A. Other Stationary	0.6	0.5	0.5	0.5	0.3	0.4
Agriculture						
4B. Manure Management	414	412	418	439	440	455
4D1. Direct Soil Emissions	493	493	566	569	565	574
4D3. Indirect emissions	426	426	481	485	482	490
4F. Field burning of agricultural residues	27.2	22.1	30.1	25.1	19.3	18.4
Waste						
6B. Wastewater handling	55	57	58	60	61	62
Total	1451	1448	1593	1618	1612	1644
LULUCF	7.5	0.8	0.2	32.2	24.5	7.4
Total with LULUCF	1459	1449	1594	1650	1637	1651

	1996	1997	1998	1999	2000	2001
Energy						

1AA1A. Public electricity and heat production	17.2	18.2	20.0	21.3	22.3	21.8
1AA1B. Petroleum refining	0.7	0.8	0.8	1.0	0.9	0.5
1AA2F1. Other	4.2	4.4	4.7	4.8	5.0	5.0
1AA2F2. Non-metallic minerals	9.5	8.6	5.5	5.8	6.5	6.3
1AA3B. Road transport	12.7	13.3	13.9	14.3	14.6	15.1
1AA4A. Commercial/ Institutional						
1AA4B. Residential	1.9	2.0	2.0	1.9	2.1	2.1
1AA4C. Agriculture/ Forestry/ Fisheries						
1AA5A. Other Stationary	0.5	0.3	0.3	0.4	0.3	0.3
Agriculture						
4B. Manure Management	472	486	483	487	507	553
4D1. Direct Soil Emissions	586	536	542	545	493	533
4D3. Indirect emissions	500	467	470	470	436	469
4F. Field burning of agricultural residues	18.1	11.6	10.9	8.2	5.1	6.5
Waste						
6B. Wastewater handling	63	64	65	66	67	68
Total	1685	1612	1618	1626	1560	1680
LULUCF	6.8	9.5	97.3	0.1	12.4	26.4
Total with LULUCF	1692	1622	1715	1626	1573	1707

	2002	**2003**	**2004**	**2005**	**2006**	**2007**
Energy						
1AA1A. Public electricity and heat production	22.6	24.4	25.5	27.2	27.8	28.9
1AA1B. Petroleum refining	1.0	1.0	0.3			
1AA2F1. Other	4.8	5.0	4.7	1.8	1.6	1.6
1AA2F2. Non-metallic minerals	6.5	7.2	7.5	6.2	6.1	6.3
1AA3B. Road transport	15.0	15.9	16.8	17.1	17.1	18.3
1AA4A. Commercial/ Institutional					0.5	0.6
1AA4B. Residential	2.4	2.5	2.2	4.1	4.8	4.7
1AA4C. Agriculture/ Forestry/ Fisheries				0.7	0.7	0.7
1AA5A. Other Stationary	0.3	0.3	0.2	0.2	0.1	0.2
Agriculture						
4B. Manure Management	582	541	530	492	450	476
4D1. Direct Soil Emissions	564	567	531	480	468	457
4D3. Indirect emissions	495	489	462	422	405	403
4F. Field burning of agricultural residues	6.2	8.3	6.3	2.9	2.9	1.7
Waste						
6B. Wastewater handling	67	67	68	69	68	69
Total	1767	1728	1654	1523	1453	1468
LULUCF	1.7	7.5	3.2	2.3	6.2	33.5
Total with LULUCF	1769	1736	1657	1526	1459	1502

	2008	**2009**	**2010**	**2011**		
Energy						
1AA1A. Public electricity and heat production	30.3	30.8	29.7	28.7		
1AA1B. Petroleum refining						
1AA2F1. Other	1.7	1.2	1.2	1.1		
1AA2F2. Non-metallic minerals	6.7	5.9	5.6	3.7		
1AA3B. Road transport	19.4	19.5	19.8	19.3		
1AA4A. Commercial/ Institutional	0.6	0.6	0.7	1.0		
1AA4B. Residential	4.4	4.9	4.0	5.1		

1AA4C. Agriculture/ Forestry/ Fisheries	0.7	0.6	0.6	0.6
1AA5A. Other Stationary	0.3	0.1	0.1	0.2
Agriculture				
4B. Manure Management	468	456	479	483
4D1. Direct Soil Emissions	436	430	442	455
4D3. Indirect emissions	392	382	394	401
4F. Field burning of agricultural residues	0.7	1.0	1.0	1.5
Waste				
6B. Wastewater handling	71	73	75	77
Total	1431	1405	1453	1477
LULUCF	2.9	1.8	6.6	47.4
Total with LULUCF	1434	1407	1459	1524

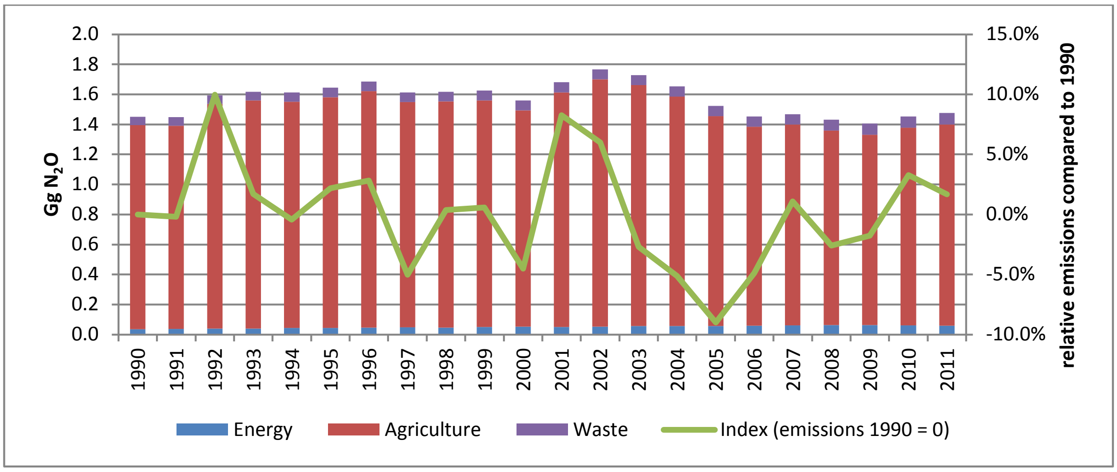

Figure 2.5 N_2O emissions by sector (in Gg) for the years 1990-2011 (without LULUCF)

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.

No actual emissions of these gases were estimated prior to 1999, due to lack of activity data. HFC emissions increased significantly since then, 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 2.6 Actual and potential F-gases emissions for the period 1999-2011 in Gg CO_2 eq.

	1999	2000	2001	2002	2003
HFCs					
2F1 Refrigeration and air conditioning	19.4	19.3	18.4	18.7	19.1
2F2 Foam blowing					

2F4 Aerosols / metered dose inhalers			0.000004	0.000004	0.000004
2F TOTAL	19.4	19.3	18.4	18.7	19.1
2FP Potential emissions from Consumption	19.8	30.0	55.2	13.5	20.2
SF6					
2F8 Electrical equipment		10.6	11.0	11.6	11.7
2FP Potential emissions from Consumption					

	2004	2005	2006	2007	2008
HFCs					
2F1 Refrigeration and air conditioning	19.6	20.3	22.1	23.7	24.9
2F2 Foam blowing		1.9	1.8	1.9	1.4
2F4 Aerosols / metered dose inhalers	0.001	0.002	0.003	0.002	0.004
2F TOTAL	19.6	22.2	23.9	25.6	26.3
2FP Potential emissions from Consumption	21.9	456.6	953.9	759.8	505.2
SF6					
2F8 Electrical equipment	68.3	72.5	76.5	80.5	85.7
2FP Potential emissions from Consumption					

	2009	2010	2011
HFCs			
2F1 Refrigeration and air conditioning	39.1	55.1	125.3
2F2 Foam blowing	1.2	1.3	1.3
2F4 Aerosols / metered dose inhalers	0.002	0.002	0.002
2F TOTAL	40.3	56.4	126.6
2FP Potential emissions from Consumption	712.4	688.9	658.9
SF6			
2F8 Electrical equipment	73.0	84.9	87.1
2FP Potential emissions from Consumption		72417	57360

2.4. Description and interpretation of emission trends for indirect greenhouse gases and SO_2

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 trends for indirect greenhouse gases and SO_2 are presented in Table 2.7.

Table 2.7 Emissions trends for indirect greenhouse gases and SO_2 (in Gg) for the period 1990-2011

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Energy												
NOx	15.23	15.35	17.19	17.60	18.72	17.49	18.04	18.30	18.66	18.95	20.07	19.28
CO	50.67	47.24	47.65	46.48	45.96	43.65	42.16	40.07	37.17	35.12	33.13	31.81
NMVOC	11.56	11.03	11.23	11.06	11.09	10.71	10.40	10.18	9.58	9.10	8.54	8.17
SO_2	29.08	30.30	35.02	37.18	39.60	36.58	38.62	40.77	44.04	46.35	45.25	42.32
Industrial processes												
NOx	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,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO
CO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NMVOC	0.05	0.06	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.07	0.06
SO_2	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,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO
Solvent and other product use												
NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NMVOC	2.65	2.30	2.42	2.43	2.65	2.31	2.30	2.49	2.36	2.37	2.54	2.41
SO_2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Agriculture												
NOx	0.98	0.80	1.09	0.91	0.70	0.67	0.65	0.42	0.39	0.30	0.19	0.23
CO	8.78	5.81	11.75	12.18	8.90	8.25	7.67	2.67	3.40	5.05	2.08	3.94
NMVOC	2.02	2.03	2.25	2.38	2.40	2.50	2.57	2.59	2.59	2.48	2.50	2.60
SO_2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Waste												
NOx	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
CO	0.0012	0.0012	0.0013	0.0013	0.0013	0.0013	0.0014	0.0014	0.0014	0.0014	0.0014	0.0014
NMVOC	0.03	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.06
SO_2	0.0006	0.0006	0.0006	0.0006	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Energy										
NOx	19.43	19.90	19.50	19.42	19.26	19.72	18.43	18.05	16.17	20.38
CO	30.95	30.13	27.37	25.11	23.76	23.25	21.30	19.13	17.92	IE,NA,NE,NO
NMVOC	7.58	7.47	6.23	5.57	4.54	4.74	4.53	4.11	3.82	3.75
SO_2	42.62	44.38	38.08	35.49	28.97	26.88	21.60	17.00	21.25	20.87
Industrial processes										
NOx	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
CO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA,NE,NO	NA,NE,NO
NMVOC	0.06	0.06	0.07	0.06	0.05	0.05	0.05	0.10	0.22	0.22
SO_2	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	NA,NE,NO	0.02	0.02
Solvent and other product use										
NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CO	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
NMVOC	3.22	3.92	4.73	5.06	5.90	5.54	4.47	4.25	4.51	2.73
SO_2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Agriculture										
NOx	0.22	0.30	0.23	0.10	0.11	0.06	0.03	0.04	0.04	0.06
CO	3.95	3.93	2.51	1.45	1.85	0.82	0.17	0.46	0.49	0.53
NMVOC	2.72	2.66	2.63	2.51	2.46	2.46	2.42	2.37	2.47	2.47
SO_2	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Waste										
NOx	0.0007	0.0002	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
CO	0.0015	0.0004	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
NMVOC	0.06	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.04	0.04
SO_2	0.0007	0.0002	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO

Chapter 3: Energy (CRF sector 1)

3.1. Overview of sector

3.1.1. Emissions trends

The energy sector relies on fossil fuel combustion for meeting the bulk of energy requirements in Cyprus. Final consumption in 2011 amounted to approximately 96 PJ. Solid fuels in 2011account for only 0.3% of the consumption and 0.4% of the energy emissions while 98.4% of the consumption and 99.5% of the emissions are from the consumption of oil products. The remaining 1.3% of the consumption and 0.05% of the emissions are from biomass (excluding CO_2). In 2011, total inland final consumption increased by 73% compared to 1990, showing a reduction of 7% compared to 2008 that was the peak. The contribution of inland consumption according to fuel for 1990 – 2011 is presented in Figure 3.1.

There is no natural gas available for use of any kind in Cyprus, including gas pipelines.

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.

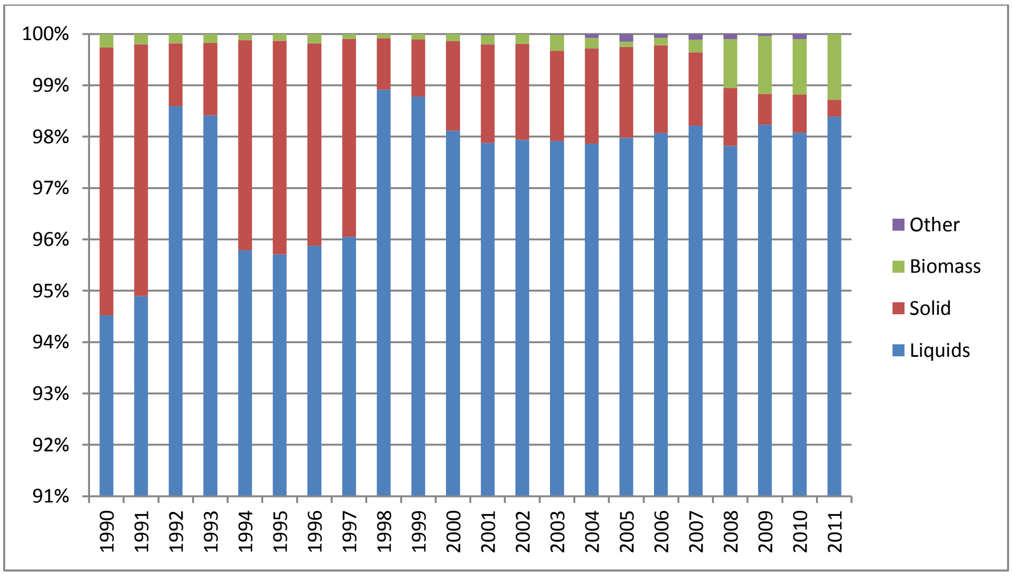

Figure 3.1 Percept contribution of inland consumption according to fuel for the period 1990 - 2011

GHG emissions from Energy in 2011 increased by 69% compared to 1990 (Figure 3.2). The majority of energy related GHG emissions (52%) in 2011 was derived from energy industries, while the contribution of transport, manufacturing industries and construction and other sectors is estimated at 32%, 7% and 9% respectively.

The substantial increase of GHG emissions from road transport (91% between 1990 and 2011) 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.

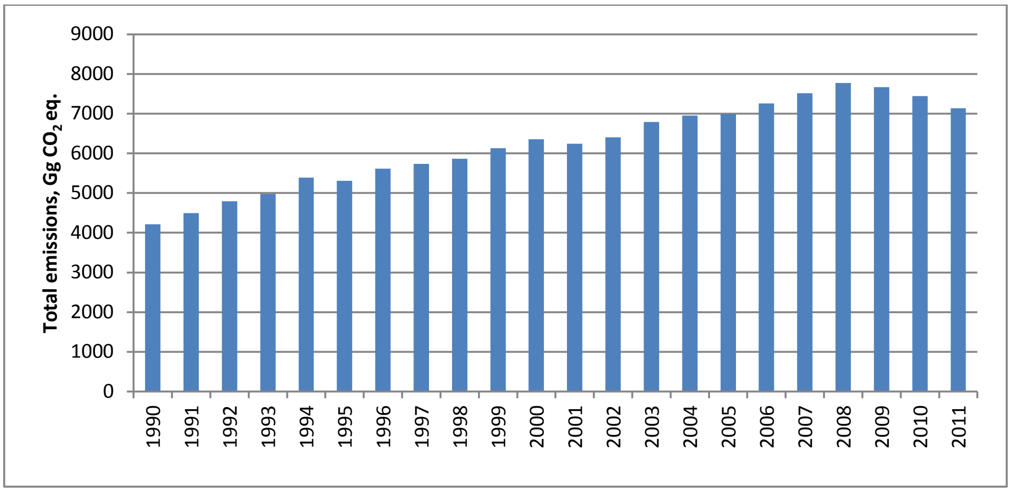

Figure 3.2 Total GHG emissions from Energy (in Gg CO_2 eq) for the period 1990 – 2011

Energy is mainly responsible for carbon dioxide emissions, while it contributes also to methane and nitrous oxide emissions. In 2011, 99.5% of the emissions from the energy sector were carbon dioxide, 0.2% methane and 0.3% nitrous oxide. Emissions from energy per greenhouse gas are presented in Table 3.1. Fugitive emissions from fuels have not been estimated since 2004 when the refining activities stopped in Cyprus. Emissions from other stationary sources for fuel other than solid biomass have not been estimated prior to 2006 due to data unavailability. The contribution of each source to the total of the sector is presented schematically in Figure 3.3.

In several sources it will be noticed that exactly the same emission values for some years. This was caused from the original activity data that was in kt of fuel consumed (with no decimals). Therefore, any further calculation gave the same emissions as a result.

Table 3.1 GHG emissions from Energy by source category and gas for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995
Energy industries						
CO_2 (Gg)	1765	1827	2124	2245	2376	2168
CH_4 (Gg)	0.07	0.07	0.08	0.09	0.09	0.09
N_2O (Gg)	0.01	0.01	0.02	0.02	0.02	0.02
Total (Gg CO_2 eq.)	1771	1833	2131	2252	2384	2175
Manufacturing						
CO_2 (Gg)	1077	1301	1118	1182	1404	1442
CH_4 (Gg)	0.06	0.07	0.05	0.05	0.07	0.07
N_2O (Gg)	0.01	0.01	0.01	0.01	0.01	0.01
Total (Gg CO_2 eq.)	1081	1306	1122	1186	1409	1448
Transport						
CO_2 (Gg)	1168	1164	1310	1330	1383	1468
CH_4 (Gg)	0.19	0.20	0.21	0.21	0.22	0.23
N_2O (Gg)	0.01	0.01	0.01	0.01	0.01	0.01
Total (Gg CO_2 eq.)	1175	1171	1318	1337	1391	1477

Other sectors						
CO_2 (Gg)	183	183	217	202	202	205
CH_4 (Gg)	0.03	0.03	0.03	0.03	0.03	0.03
N_2O (Gg)	0.002	0.002	0.002	0.002	0.002	0.002
Total (Gg CO_2 eq.)	184	184	218	203	203	206
Other stationary						
CO_2 (Gg)						
CH_4 (Gg)	0.04	0.04	0.04	0.04	0.03	0.03
N_2O (Gg)	0.00	0.00	0.00	0.00	0.00	0.00
Total (Gg CO_2 eq.)	1.09	0.90	0.89	0.88	0.64	0.69
Total						
CO_2 (Gg)	4193	4476	4770	4958	5364	5283
CH_4 (Gg)	0.39	0.40	0.41	0.41	0.44	0.44
N_2O (Gg)	0.04	0.04	0.04	0.04	0.05	0.04
Total (Gg CO_2 eq.)	4213	4496	4790	4980	5388	5306
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
Energy industries						
CO_2 (Gg)	2282	2414	2646	2832	2959	2841
CH_4 (Gg)	0.09	0.09	0.10	0.11	0.12	0.11
N_2O (Gg)	0.02	0.02	0.02	0.02	0.02	0.02
Total (Gg CO_2 eq.)	2290	2421	2655	2841	2968	2850
Manufacturing						
CO_2 (Gg)	1579	1497	1318	1357	1396	1341
CH_4 (Gg)	0.08	0.07	0.05	0.06	0.06	0.06
N_2O (Gg)	0.01	0.01	0.01	0.01	0.01	0.01
Total (Gg CO_2 eq.)	1585	1502	1322	1362	1400	1346
Transport						
CO_2 (Gg)	1518	1585	1661	1704	1745	1801
CH_4 (Gg)	0.23	0.24	0.25	0.26	0.26	0.27
N_2O (Gg)	0.01	0.01	0.01	0.01	0.01	0.02
Total (Gg CO_2 eq.)	1527	1594	1670	1714	1755	1811
Other sectors						
CO_2 (Gg)	208	217	215	208	233	233
CH_4 (Gg)	0.03	0.03	0.03	0.03	0.04	0.04
N_2O (Gg)	0.002	0.002	0.002	0.002	0.002	0.002
Total (Gg CO_2 eq.)	209	219	216	210	234	234
Other stationary						
CO_2 (Gg)						
CH_4 (Gg)	0.04	0.02	0.02	0.03	0.02	0.02
N_2O (Gg)	0.00	0.00	0.00	0.00	0.00	0.00
Total (Gg CO_2 eq.)	1.03	0.53	0.48	0.66	0.59	0.60
Total						
CO_2 (Gg)	5588	5712	5839	6102	6332	6216
CH_4 (Gg)	0.47	0.46	0.46	0.48	0.50	0.51
N_2O (Gg)	0.05	0.05	0.05	0.05	0.05	0.05
Total (Gg CO_2 eq.)	5612	5737	5863	6127	6359	6243
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
Energy industries						
CO_2 (Gg)	3002	3229	3284	3472	3653	3802
CH_4 (Gg)	0.12	0.13	0.13	0.14	0.14	0.14
N_2O (Gg)	0.02	0.03	0.03	0.03	0.03	0.03
Total (Gg CO_2 eq.)	3012	3239	3294	3483	3665	3814
Manufacturing						
CO_2 (Gg)	1335	1374	1404	904	862	854
CH_4 (Gg)	0.06	0.07	0.07	0.05	0.05	0.05

N_2O (Gg)	0.01	0.01	0.01	0.01	0.01	0.01
Total (Gg CO_2 eq.)	1340	1379	1409	908	865	858
Transport						
CO_2 (Gg)	1784	1890	1991	2031	2019	2156
CH_4 (Gg)	0.28	0.30	0.33	0.35	0.36	0.39
N_2O (Gg)	0.01	0.02	0.02	0.02	0.02	0.02
Total (Gg CO_2 eq.)	1795	1901	2004	2043	2032	2170
Other sectors						
CO_2 (Gg)	258	270	242	557	677	648
CH_4 (Gg)	0.04	0.04	0.04	0.08	0.12	0.13
N_2O (Gg)	0.002	0.002	0.002	0.005	0.01	0.01
Total (Gg CO_2 eq.)	260	272	243	560	682	653
Other stationary						
CO_2 (Gg)					12.71	19.06
CH_4 (Gg)	0.02	0.02	0.02	0.02	0.00	0.00
N_2O (Gg)	0.00	0.00	0.00	0.00	0.00	0.00
Total (Gg CO_2 eq.)	0.56	0.51	0.46	0.44	12.78	19.17
Total						
CO_2 (Gg)	6380	6763	6921	6964	7224	7479
CH_4 (Gg)	0.52	0.56	0.58	0.63	0.66	0.71
N_2O (Gg)	0.05	0.06	0.06	0.06	0.06	0.06
Total (Gg CO_2 eq.)	6407	6792	6951	6995	7256	7513
	2008	**2009**	**2010**	**2011**		
Energy industries						
CO_2 (Gg)	3967	3992	3868	3710		
CH_4 (Gg)	0.15	0.15	0.15	0.14		
N_2O (Gg)	0.03	0.03	0.03	0.03		
Total (Gg CO_2 eq.)	3980	4005	3880	3722		
Manufacturing						
CO_2 (Gg)	880	741	648	509		
CH_4 (Gg)	0.05	0.04	0.04	0.03		
N_2O (Gg)	0.01	0.01	0.01	0.00		
Total (Gg CO_2 eq.)	884	744	651	511		
Transport						
CO_2 (Gg)	2246	2251	2298	2235		
CH_4 (Gg)	0.41	0.42	0.43	0.42		
N_2O (Gg)	0.02	0.02	0.02	0.02		
Total (Gg CO_2 eq.)	2260	2266	2313	2250		
Other sectors						
CO_2 (Gg)	601	629	576	629		
CH_4 (Gg)	0.13	0.15	0.11	0.19		
N_2O (Gg)	0.01	0.01	0.01	0.01		
Total (Gg CO_2 eq.)	606	634	580	635		
Other stationary						
CO_2 (Gg)	41.30	15.89	15.89	19.06		
CH_4 (Gg)	0.01	0.00	0.00	0.01		
N_2O (Gg)	0.00	0.00	0.00	0.00		
Total (Gg CO_2 eq.)	41.53	15.97	15.97	19.23		
Total						
CO_2 (Gg)	7736	7630	7406	7102		
CH_4 (Gg)	0.75	0.76	0.73	0.79		
N_2O (Gg)	0.06	0.06	0.06	0.06		
Total (Gg CO_2 eq.)	7771	7665	7441	7137		

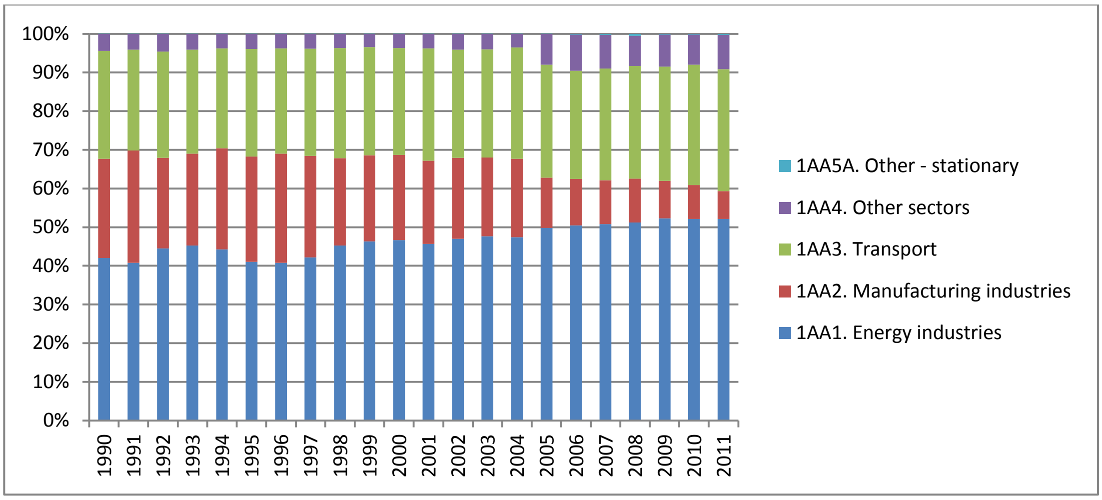

Figure 3.3 Contribution of energy emission source to the sector total for the period 1990 – 2011

3.1.2. Methodology

The calculation of GHG emissions from energy is based on the revised IPCC 1996 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 methodology applied for the calculation of emissions by source category is presented in Table 3.2.

Key categories

The key categories identified in the energy sector are presented in Section 1.5.

Uncertainty

The results of the uncertainty analysis are presented in Section 1.7, while the detail calculations are presented in Annex II.

Table 3.2 Methodology for the estimation of emissions from energy

	CO_2		CH_4		N_2O	
	Method	**EF**	**Method**	**EF**	**Method**	**EF**
FUEL COMBUSTION						
1. Energy industries						
A. Public electricity	D	D,CS[1]	D	D	D	D
B. Petroleum refining	D	D	D	D	D	D
2. Manufacturing Industries						
F. Other						
- Non-metallic Minerals	D	D,CS[1]	D	D	D	D
- Other	D	D,CS[1]	D	D	D	D
3. Transport						
B. Road Transportation	T1	D	T1	D	T1	D
4. Other Sectors						
A. Commercial/ Institutional	T1	D	T1	D	T1	D
B. Residential	T1	D	T1	D	T1	D
C. Agriculture/ Forestry/ Fisheries	T1	D	T1	D	T1	D
5. Other						
A. Stationary						

- Other	T1	D	T1	D	T1	D
B. FUGITIVE EMISSIONS FROM FUELS						
2. Oil and Natural Gas						
A. Oil			D	D		
C. MEMO ITEMS						
1. International bunkers						
A. Aviation	D	D	D	D	D	D
B. Marine	D	D	D	D	D	D
3. CO_2 emissions from biomass	D	D	D	D	D	D

[1] D for 1990-2004, CS for 2005-2010

T1: IPCC methodology Tier 1

D: IPCC default methodology and emission factor

CS: Country specific emission factor

PS: Plant specific emission factor

3.1.3. Completeness

Table 3.3 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 energy sector.

Table 3.3 Energy – Completeness of emissions inventory (2011)

	CO_2	CH_4	N_2O
FUEL COMBUSTION			
1. Energy industries			
A. Public electricity	✓	✓	✓
B. Petroleum refining*	NO	NO	NO
C. Manufacture of solid fuels	NO	NO	NO
2. Manufacturing Industries			
A. Iron and Steel	NE2	NE2	NE2
B. Non-Ferrous Metals	NE2	NE2	NE2
C. Chemicals	NE2	NE2	NE2
D. Pulp, Paper and Print	NE2	NE2	NE2
E. Food Processing, Beverages and Tobacco	IE	IE	IE
F. Other			
- Non-metallic Minerals	✓	✓	✓
- Other	✓	✓	✓
3. Transport			
A. Civil Aviation	NE2	NE2	NE2
B. Road Transportation	✓	✓	✓
C. Railways	NO	NO	NO
D. Navigation	NE2	NE2	NE2
E. Other Transportation	NO	NO	NO
4. Other Sectors			
A. Commercial/ Institutional	✓	✓	✓
B. Residential	✓	✓	✓
C. Agriculture/ Forestry/ Fisheries	✓	✓	✓
5. Other			
A. Stationary			
- Other	✓	✓	✓
B. Mobile	NA	NA	NA
B. FUGITIVE EMISSIONS FROM FUELS			
1. Solid Fuels	**NO**	**NO**	**NO**
2. Oil and Natural Gas			
A. Oil	NO	NO	NO

B. Natural Gas	NO	NO	NO
C. Venting and Flaring			
- Venting	NE1	NE1	
- Flaring	NO	NO	NO
D. Other	NO	NO	NO
C. MEMO ITEMS			
1. International bunkers			
A. Aviation	✓	✓	✓
B. Marine	✓	✓	✓
2. Multilateral operations	NO	NO	NO
3. CO_2 emissions from biomass	✓	✓	✓

NO: Not occurring
NE1: Not estimated due to lack of method
NE2: Not estimated due to lack of activity data
IE: included elsewhere
* the petroleum refinery ceased its operations in 2004. Petroleum refining has not been occurring in Cyprus after 2004.

3.2. Fuel combustion (CRF source category 1A)

3.2.1. Comparison of the sectoral approach with the reference approach

According to the IPCC Guidelines, carbon dioxide emissions from the energy sector should be calculated using both the reference and the sectoral approach. The reference approach is based on detailed data on primary energy consumption, which lead to the calculation of apparent consumption and to the consequent calculation of CO_2 emissions, while the sectoral approach is based on a detailed disaggregation of energy consumption by sector, fuel and technology for the calculation of CO_2 emissions.

The application of the reference approach can be considered as a quality control procedure, as the deviation of estimations should not be significant (deviations in the order of ±2%) or else explanations should be provided.

The estimation of carbon dioxide emissions according to the two methodologies is presented in Table 3.4. Detailed activity data used for the reference approach and comparison to the sectoral approach are presented in Annex IV.

Table 3.4 CO_2 emissions (in Gg) according to the reference and the sectoral approach for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995	1996	1997
Reference	4334	4485	4883	5245	6182	5377	5962	5845
Sectoral	4193	4476	4770	4958	5364	5283	5588	5712
Deviation	3.3%	0.2%	2.4%	5.8%	15.2%	1.8%	6.7%	2.3%

	1998	1999	2000	2001	2002	2003	2004	2005
Reference	6015	6020	6494	6433	6535	7149	6613	6671
Sectoral	5839	6102	6332	6216	6380	6763	6921	6964
Deviation	3.0%	-1.3%	2.6%	3.5%	2.4%	5.7%	-4.4%	-4.2%

	2006	2007	2008	2009	2010	2011
Reference	6967	7332	7694	7540	7189	6919
Sectoral	7224	7479	7736	7630	7406	7102
Deviation	-3.6%	-2.0%	-0.5%	-1.2%	-2.9%	-2.6%

As shown in the table above, the estimated deviation ranges from –4% to 15%.The deviation that exists is mainly caused by:

(a) Statistical differences in fuel consumption. The sectoral approach uses the actual consumption of the different fuels, while the reference approach uses their apparent consumption. Theoretically, both consumption estimates should be equal, but there is usually a difference between them (statistical differences) due to the collection of information from different sources. The reference approach does not provide for the calculation of these differences. The deviation in the calculation of the consumption of fuels (Table 3.5) is mainly attributed to the statistical differences.

NOTE: due to the statistical difference that exists in the statistical data of the national statistical service for jet fuel, there was apparent fuel consumption for several years. However, there is no data to support data for consumption in the sectoral approach, so there is a substantial difference between the reference and the sectoral approach.

(b) Emission factors. In the reference approach, CO_2 emissions from liquid fuel consumption are mainly estimated assuming "combustion" of crude oil. On the contrary, the sectoral approach calculates emissions using the actual consumption per liquid fuel and appropriate emission factors.

(c) ETS data: where activity data is available from the ETS annual reports these were used in the sectoral approach, resulting to a difference with the apparent consumption from the reference approach.

Table 3.5 Deviations for energy consumption (reference and sectoral) for the period 1990 – 2011 in PJ

	1990	1991	1992	1993	1994	1995	1996	1997
Reference	58.3	59.2	66.6	71.2	83.7	72.3	80.3	78.7
Sectoral	55.3	58.9	63.5	65.6	70.6	69.4	73.2	74.9
Deviation	5.4%	0.5%	4.9%	8.6%	18.6%	4.1%	9.6%	5.0%

	1998	1999	2000	2001	2002	2003	2004	2005
Reference	81.9	82.4	88.8	87.9	89.2	97.0	90.4	91.5
Sectoral	77.1	80.6	83.7	82.3	84.4	89.6	91.5	92.1
Deviation	6.1%	2.2%	6.1%	6.9%	5.7%	8.3%	-1.2%	-0.6%

	2006	2007	2008	2009	2010	2011
Reference	95.1	99.9	105.1	103.0	99.4	95.6
Sectoral	94.5	98.2	101.6	100.9	97.9	94.7
Deviation	0.6%	1.7%	3.5%	2.1%	1.5%	1.0%

3.2.2. International bunker fuels

GHG emissions from international aviation and marine bunkers are calculated with the same methodologies as for internal aviation and navigation. No data is available on the allocation of fuel consumption between domestic and international transportation. It is therefore considered that all fuel consumed for aviation and maritime activities is for international travelling and not domestic. The emissions from international bunkers (Table 3.6) increased by about 67% between 1990 and 2011: aviation increased by 25% and maritime activities by 242%.

Table 3.6 GHG emissions in the International bunkers (1C1) per category for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995
1C1A. Aviation						
CO_2 (Gg)	745	884	859	729	748	821
CH_4 (Gg)	0.005	0.006	0.006	0.005	0.005	0.006
N_2O (Gg)	0.021	0.025	0.024	0.021	0.021	0.023
Total (Gg CO_2 eq.)	752	892	866	736	755	828
1C1B. Maritime						
CO_2 (Gg)	181	174	184	155	192	214
CH_4 (Gg)	0.012	0.012	0.012	0.010	0.013	0.014
N_2O (Gg)	0.001	0.001	0.001	0.001	0.002	0.002
Total (Gg CO_2 eq.)	182	175	184	156	193	215
Total						
CO_2 (Gg)	926	1058	1042	884	940	1035
CH_4 (Gg)	0.017	0.018	0.018	0.015	0.018	0.020
N_2O (Gg)	0.022	0.026	0.026	0.022	0.023	0.025
Total (Gg CO_2 eq.)	933	1067	1051	891	947	1043
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
1C1A. Aviation						
CO_2 (Gg)	786	773	814	833	846	991
CH_4 (Gg)	0.006	0.005	0.006	0.006	0.006	0.007
N_2O (Gg)	0.022	0.022	0.023	0.024	0.024	0.028
Total (Gg CO_2 eq.)	793	780	822	841	853	1000
1C1B. Maritime						
CO_2 (Gg)	282	307	308	482	602	599
CH_4 (Gg)	0.019	0.020	0.020	0.032	0.040	0.040
N_2O (Gg)	0.002	0.002	0.002	0.004	0.005	0.005
Total (Gg CO_2 eq.)	284	308	309	483	604	601
Total						
CO_2 (Gg)	1068	1081	1122	1315	1448	1590
CH_4 (Gg)	0.024	0.026	0.026	0.038	0.046	0.047
N_2O (Gg)	0.024	0.024	0.025	0.027	0.029	0.033
Total (Gg CO_2 eq.)	1076	1089	1131	1324	1458	1601
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
1C1A. Aviation						
CO_2 (Gg)	953	1019	931	918	947	906
CH_4 (Gg)	0.007	0.007	0.007	0.006	0.007	0.006
N_2O (Gg)	0.027	0.029	0.026	0.026	0.027	0.026
Total (Gg CO_2 eq.)	962	1029	939	927	955	914
1C1B. Maritime						
CO_2 (Gg)	431	388	172	908	925	860
CH_4 (Gg)	0.028	0.026	0.011	0.060	0.061	0.057
N_2O (Gg)	0.003	0.003	0.001	0.007	0.007	0.007
Total (Gg CO_2 eq.)	433	390	172	912	928	863
Total						
CO_2 (Gg)	1384	1408	1103	1827	1871	1766
CH_4 (Gg)	0.035	0.033	0.018	0.066	0.068	0.063
N_2O (Gg)	0.030	0.032	0.028	0.033	0.034	0.032
Total (Gg CO_2 eq.)	1394	1418	1112	1839	1883	1777
	2008	**2009**	**2010**	**2011**		
1C1A. Aviation						
CO_2 (Gg)	903	836	852	928		

CH_4 (Gg)	0.006	0.006	0.006	0.007	
N_2O (Gg)	0.026	0.024	0.024	0.026	
Total (Gg CO_2 eq.)	911	844	860	936	
1C1B. Maritime					
CO_2 (Gg)	790	681	581	618	
CH_4 (Gg)	0.052	0.045	0.038	0.041	
N_2O (Gg)	0.006	0.005	0.005	0.005	
Total (Gg CO_2 eq.)	793	684	583	621	
Total					
CO_2 (Gg)	1693	1518	1433	1546	
CH_4 (Gg)	0.059	0.051	0.044	0.047	
N_2O (Gg)	0.032	0.029	0.029	0.031	
Total (Gg CO_2 eq.)	1704	1528	1443	1557	

3.2.3. Feedstocks and non-energy use of fuels

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 oxidized 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 during production processes (e.g. ammonia production) should be reported under the sector of industrial processes (as it was implemented in this submission for the first time), while emissions from burning of products should be reported under the waste sector or energy sector (as long as energy exploitation takes place).

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.

The calculation of carbon dioxide emissions from non-energy use of fuels is based on the relevant consumption by fuel type (Table 3.7) and the fraction of the carbon stored by fuel type (100% for both fuels), according to the following equation:

$$E = \sum_{f} FC_f \cdot CC_f \cdot (1 - CS_f) \qquad [1]$$

where, E represents carbon emissions, f is the index of fuel type, FC_f is non-energy consumption of fuel f, CC_f is the carbon content of fuel f and CS_f is the fraction of carbon stored from the non-energy use of fuel f.

Non-energy fuel use, carbon dioxide emissions and the amount of carbon stored in the final products are presented in Table 3.7.

Table 3.7 Non-energy fuel use (in TJ), carbon dioxide emissions and the amount of carbon stored for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995
1AD2. Lubricants						
Consumption (TJ)				241.1	442.1	442.1

Carbon stored (Gg)				4.8	8.8	8.8
CO_2 not emitted (Gg)				17.7	32.4	32.4
1AD3. Bitumen						
Consumption (TJ)			1045	1005	924	563
Carbon stored (Gg)			23.0	22.1	20.3	12.4
CO_2 not emitted (Gg)			84.3	81.0	74.6	45.4
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
1AD2. Lubricants						
Consumption (TJ)	482.3	442.1	160.8	201.0	281.3	361.7
Carbon stored (Gg)	9.6	8.8	3.2	4.0	5.6	7.2
CO_2 not emitted (Gg)	35.4	32.4	11.8	14.7	20.6	26.5
1AD3. Bitumen						
Consumption (TJ)	1005	924	1527	1969	1969	1567
Carbon stored (Gg)	22.1	20.3	33.6	43.3	43.3	34.5
CO_2 not emitted (Gg)	81.0	74.6	123.2	158.9	158.9	126.4
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
1AD2. Lubricants						
Consumption (TJ)	321.5	321.5	442.1	401.9	442.1	401.9
Carbon stored (Gg)	6.4	6.4	8.8	8.0	8.8	8.0
CO_2 not emitted (Gg)	23.6	23.6	32.4	29.5	32.4	29.5
1AD3. Bitumen						
Consumption (TJ)	1849	1567	2291	2853	2612	2411
Carbon stored (Gg)	40.7	34.5	50.4	62.8	57.5	53.1
CO_2 not emitted (Gg)	149.1	126.4	184.8	230.2	210.7	194.5
	2008	**2009**	**2010**	**2011**		
1AD2. Lubricants						
Consumption (TJ)	401.9	401.9	442.1	401.9		
Carbon stored (Gg)	8.0	8.0	8.8	8.0		
CO_2 not emitted (Gg)	29.5	29.5	32.4	29.5		
1AD3. Bitumen						
Consumption (TJ)	2773	2291	2974	2572		
Carbon stored (Gg)	61.0	50.4	65.4	56.6		
CO_2 not emitted (Gg)	223.7	184.8	239.9	207.5		

3.2.4. CO_2 capture from flue gases and subsequent CO_2 storage

Not applicable.

3.2.5. Country-specific issues

Not applicable.

3.2.6. Energy industries (CRF 1A1)

3.2.6.1 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. Moreover, a petroleum refinery (1A1B) was in operation until 2004. No refining activities have been taking place in Cyprus since 2004.

The consumption of fossil fuels in 2011 (47867 TJ) increased by 107% compared to 1990 (23165 TJ). Between 2010 and 2011 the consumption reduced by 3%. *Since 2005, the emissions from energy industries are entirely caused by the production of electricity (1A1A).*

The total GHG emissions of the sector in 2011 (3722 Gg CO_2 eq) increased by 119% compared to 1990 (1771 Gg CO_2 eq). The trend in the emissions from the energy industries is presented in Figure 3.4. The last three years, a decreasing trend of emissions is observed. This decreasing trend is attributed to the penetration of renewable energy technologies to the energy mix, but also, especially for the year 2010 and 2011, to the economic recession that the country is facing.

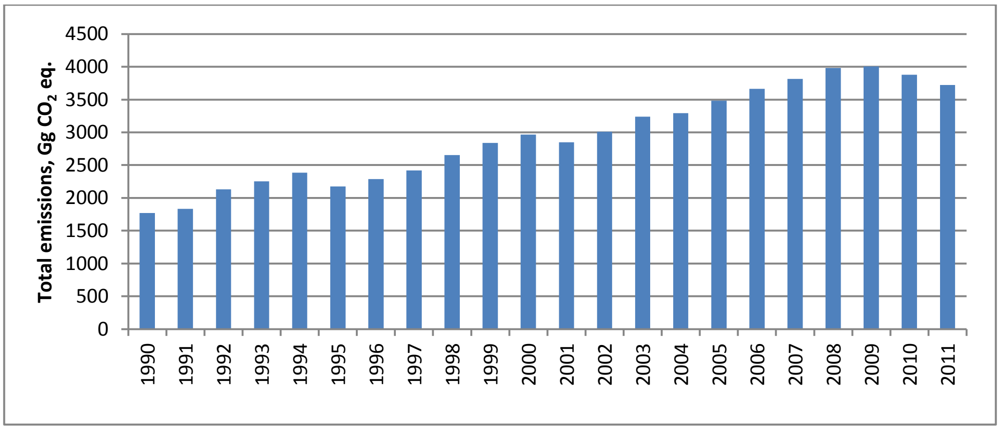

Figure 3.4 GHG emissions from energy industries for 1990-2011 in Gg CO_2 eq.

Emissions from energy industries account for 37% of total national emissions (without LULUCF) for 2011, while in 1990 the contribution was 21%. Emissions from energy industries are presented in Table 3.8 for the period 1990-2011 by source and gas. CO_2 emissions from energy industries in 2010 increased by 110% compared to 1990 and are 99.7% of the emissions. N_2O emissions in 2011 account for 0.2% of emissions from energy industries and CH_4 emissions account for the rest 0.1% of total emissions.

Table 3.8 Emissions from energy industries by source and gas in for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995
1AA1A. Public electricity and heat production						
CO_2 (Gg)	1674	1736	2030	2163	2257	2074
CH_4 (Gg)	0.07	0.07	0.08	0.08	0.09	0.08
N_2O (Gg)	0.01	0.01	0.02	0.02	0.02	0.02
Total (Gg CO_2 eq.)	1679	1742	2037	2170	2264	2081
1AA1B. Petroleum refining						
CO_2 (Gg)	91.1	91.0	94.1	81.4	119.4	93.7
CH_4 (Gg)	0.004	0.004	0.004	0.003	0.005	0.004
N_2O (Gg)	0.001	0.001	0.001	0.001	0.001	0.001
Total (Gg CO_2 eq.)	91.4	91.3	94.4	81.7	119.9	94.0
Total						
CO_2 (Gg)	1765	1827	2124	2245	2376	2168
CH_4 (Gg)	0.07	0.07	0.08	0.09	0.09	0.09
N_2O (Gg)	0.01	0.01	0.02	0.02	0.02	0.02
Total (Gg CO_2 eq.)	1771	1833	2131	2252	2384	2175
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
1AA1A. Public electricity and heat production						
CO_2 (Gg)	2195	2320	2549	2719	2849	2781
CH_4 (Gg)	0.09	0.09	0.10	0.11	0.11	0.11

N_2O (Gg)	0.02	0.02	0.02	0.02	0.02	0.02
Total (Gg CO_2 eq.)	2202	2327	2557	2728	2858	2790
1AA1B. Petroleum refining						
CO_2 (Gg)	87.4	94.0	97.1	112.9	109.7	60.4
CH_4 (Gg)	0.004	0.004	0.004	0.005	0.005	0.003
N_2O (Gg)	0.001	0.001	0.001	0.001	0.001	0.001
Total (Gg CO_2 eq.)	87.7	94.3	97.4	113.3	110.1	60.7
Total						
CO_2 (Gg)	2282	2414	2646	2832	2959	2841
CH_4 (Gg)	0.09	0.09	0.10	0.11	0.12	0.11
N_2O (Gg)	0.02	0.02	0.02	0.02	0.02	0.02
Total (Gg CO_2 eq.)	2290	2421	2655	2841	2968	2850
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
1AA1A. Public electricity and heat production						
CO_2 (Gg)	2889	3115	3255	3472	3653	3802
CH_4 (Gg)	0.11	0.12	0.13	0.14	0.14	0.14
N_2O (Gg)	0.02	0.02	0.03	0.03	0.03	0.03
Total (Gg CO_2 eq.)	2898	3125	3266	3483	3665	3814
1AA1B. Petroleum refining						
CO_2 (Gg)	113.5	113.5	28.6			
CH_4 (Gg)	0.005	0.005	0.001			
N_2O (Gg)	0.001	0.001	0.000			
Total (Gg CO_2 eq.)	113.9	113.9	28.7			
Total						
CO_2 (Gg)	3002	3229	3284	3472	3653	3802
CH_4 (Gg)	0.12	0.13	0.13	0.14	0.14	0.14
N_2O (Gg)	0.02	0.03	0.03	0.03	0.03	0.03
Total (Gg CO_2 eq.)	3012	3239	3294	3483	3665	3814
	2008	**2009**	**2010**	**2011**		
1AA1A. Public electricity and heat production						
CO_2 (Gg)	3967	3992	3868	3710		
CH_4 (Gg)	0.15	0.15	0.15	0.14		
N_2O (Gg)	0.03	0.03	0.03	0.03		
Total (Gg CO_2 eq.)	3980	4005	3880	3722		
1AA1B. Petroleum refining						
CO_2 (Gg)						
CH_4 (Gg)						
N_2O (Gg)						
Total (Gg CO_2 eq.)						
Total						
CO_2 (Gg)	3967	3992	3868	3710		
CH_4 (Gg)	0.15	0.15	0.15	0.14		
N_2O (Gg)	0.03	0.03	0.03	0.03		
Total (Gg CO_2 eq.)	3980	4005	3880	3722		

3.2.6.2 Methodological issues

For all gases and all sources, the revised IPCC1996 guidelines were applied with the exception of CO_2 from public electricity for the years 2005-2011. CO_2 from public electricity for the years 2005-2011 is according to the information submitted by the one electricity provider in its annual verified report for the EU ETS.

The fuel consumption used for the estimation of GHG emissions is presented in Table 3.9. Data for fuel consumption for electricity production for 1990-2004 was obtained from the Department of Labour Inspection, which has been maintaining consumption data for each installation. Activity data for the period 2005-2011 is from the ETS annual reports. Data for petroleum refining was obtained from the Statistical Service for 1990 until 2004 when the operation of the refinery stopped. All data is available in units of mass.

For the production of electricity, the majority of fuel consumed is HFO. The consumption of diesel is gradually increasing during the recent years, due to the further utilisation of the new installations compared to the older units consuming only HFO that should be phased out within the next years. No fuels other than liquid are consumed for energy industries.

Table 3.9 Fuel consumption (in Gg) in energy industries (1A1) for the period of 1990-2011

	1990	1991	1992	1993	1994	1995
1AA1A. Public electricity and heat production						
HFO (Gg)	540	560	645	695	726	661
Diesel (Gg)	0	0	11	3	2	8
1AA1B. Petroleum refining						
RFO (Gg)	11	12	13	13	14	17
Other products (Gg)	0	0	0	0	0	0
Refinery gas (Gg)	18	17	17	13	24	13
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
1AA1A. Public electricity and heat production						
HFO (Gg)	702	743	811	856	900	894
Diesel (Gg)	6	6	12	21	19	4
1AA1B. Petroleum refining						
RFO (Gg)	16	14	15	16	16	0
Other products (Gg)	0	0	0	0	0	0
Refinery gas (Gg)	12	16	16	20	19	19
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
1AA1A. Public electricity and heat production						
HFO (Gg)	931	1000	1042	1103	1137	1175
Diesel (Gg)	2	5	8	16	7	16
1AA1B. Petroleum refining						
RFO (Gg)	0	0	0			
Other products (Gg)	16	16	0			
Refinery gas (Gg)	21	21	9			
	2008	**2009**	**2010**	**2011**		
1AA1A. Public electricity and heat production						
HFO (Gg)	1219	1163	1053	1058		
Diesel (Gg)	23	92	158	112		
1AA1B. Petroleum refining						
RFO (Gg)						
Other products (Gg)						
Refinery gas (Gg)						

Carbon content and oxidation factor of the fuels are according to the revised IPCC 1996 guidelines, with the exception of HFO and diesel for electricity production for 2005-2011 which is according to the ETS annual reports. The net calorific value of the HFO and diesel for electricity production for 1990-2004 is the weighted average of the values reported in the ETS reports of 2005. Methane and nitrous oxide emission factors are according to the revised IPCC 1996 guidelines. Carbon content, oxidation factor, emission factors and other parameters used for the estimation of emissions from energy industries are presented in Table 3.10.

The equation applied for the estimation of CO_2 emissions for 1990-2004 is the following:

$CO2 = FC_x \times CV_x \times C_x \times OF_x \times 44/12$ [2]

where *CO2* is the CO_2 emissions in t, FC_x is the fuel consumption of fuel x in t, CV_x is the calorific value of fuel x, C_x is the carbon content in fuel x and OF_x is the oxidation factor of fuel x.

For the years 2005 – 2011, the equation applied for the estimation of CO_2 emissions is the following:

$CO2 = FC_x \times CV_x \times EF \times OF_x$ [3]

where *CO2* is the CO_2 emissions in t, FC_x is the fuel consumption of fuel x in t, CV_x is the calorific value of fuel x, *EF* is the implied CO_2 emission factor of fuel x in t/TJ and OF_x is the oxidation factor of fuel x.

The weighted average implied CO_2 emission factor and net calorific values according to the ETS reports are presented in Table 3.11 and have been reported as *country specific* data. Oxidation factor is assumed 1.

Methane and nitrous oxide emission factor are according to the revised IPCC 1996 guidelines for energy industries: 3 kg CH_4/ TJ (reference manual, pg. 1.35, oil, energy industries) and 0.6 kg N_2O/TJ (reference manual, pg. 1.36, energy industries). The emissions are estimated by the multiplication of the energy consumption in TJ by the emission factor of each gas.

Table 3.10 Carbon content, oxidation factor and net calorific value used for the estimation of emissions from energy industries, 1990-2004

Parameter	Carbon content (*C*), tC/TJ	Oxidation factor (*OF*)	Net calorific value (*CV*), GJ/t
Public electricity			
HFO	21.1 [a]	99%[a]	40.446[b]
Diesel	20.2 [a]	99%[a]	42.700[b]
Petroleum refinery			
HFO	21.1 [a]	99%[a]	40.19[a]
Other products	20.2 [a]	99%[a]	40.19[a]
Refinery gas	18.2 [a]	99%[a]	48.15[a]

[a] Revised IPCC1996 guidelines, pg. 1.6 workbook
[b] CS = Weighted average of ETS installations for 2005

Table 3.11 Implied CO_2 emission factor and net calorific values for public electricity, according to ETS reports (2005-2011)

Parameter	2005	2006	2007	2008	2009	2010	2011
Implied CO_2 emission factor (*EF*), tCO_2/TJ							
HFO	76.672	78.935	78.938	78.582	78.141	78.919	78.274
Diesel	72.431	72.421	72.444	72.798	72.640	72.532	70.572
Net calorific value (*CV*), GJ/t							
HFO	40.446	40.460	40.463	40.690	40.795	40.641	40.741
Diesel	42.700	42.700	42.700	42.563	42.653	42.942	42.701

3.2.6.3 Uncertainties and time-series consistency

All activity data other than the data available from the ETS reports was obtained from one source, the statistical service, to maximise the time-series consistency.

Specific issues related to energy industries that cause uncertainty are the following:

(a) The assumption that the net calorific value is the same as the first of ETS was made due to the difference that exists between the values obtained from the ETS and the default in the revised IPCC 1996 guidelines.
(b) No information is available on the characteristics of the *other products* activity data available only for 2002 and 2003. The inventory team is of the impression that the *other products* should be HFO as the rest of the period but no data is available to support that opinion.

The results of the uncertainty analysis are presented in Section 1.7, while the detail calculations are presented in Annex II.

3.2.6.4 Source-specific QA / QC and verification

Activity data for fuel consumption was compared between four sources:

(a) The annual ETS reports (2005-2011) and the data submitted during the preparation of the national allocation plan for the period 2005-2007 by the EAC (1990-2004).
(b) The annual reports submitted to the Department of Labour Inspection for the NEC directive.
(c) The energy balance prepared by the Energy Service.
(d) The energy balance prepared by the statistical service (data submitted to EUROSTAT).

Activity data, methodology and any information used for electricity production after 2005 have been obtained from the reported submitted for the ETS directive and are therefore verified according to the ETS monitoring regulations.

3.2.6.5 Source-specific recalculations

No recalculations.

3.2.6.6 Source-specific planned improvements

No source-specific planned improvements.

3.2.7. Manufacturing industries and construction (CRF 1A2)

3.2.7.1 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 blow 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 industrial sector in 2011 registered a negative growth rate in real terms for a third year in a row, after the positive growth rates recorded in the two previous years. 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. However, only the total fuel consumption is available for industrial activity from the energy balance of the country. No data is available on the consumption of fuels by specific industrial activities other than the activities included in the EU ETS (cement and ceramics production). Therefore, all emissions are reported under other (1A2F).

The GHG emissions caused by energy consumption in manufacturing industries and construction (Figure 3.5) in 2011 were 511 Gg CO_2 eq. of which the majority (99.6%) is CO_2 compared to 1081 Gg CO_2 in 1990. Between 1990 and 2011, emissions decreased by 53%, while the corresponding decrease in fuel consumption was 52%.

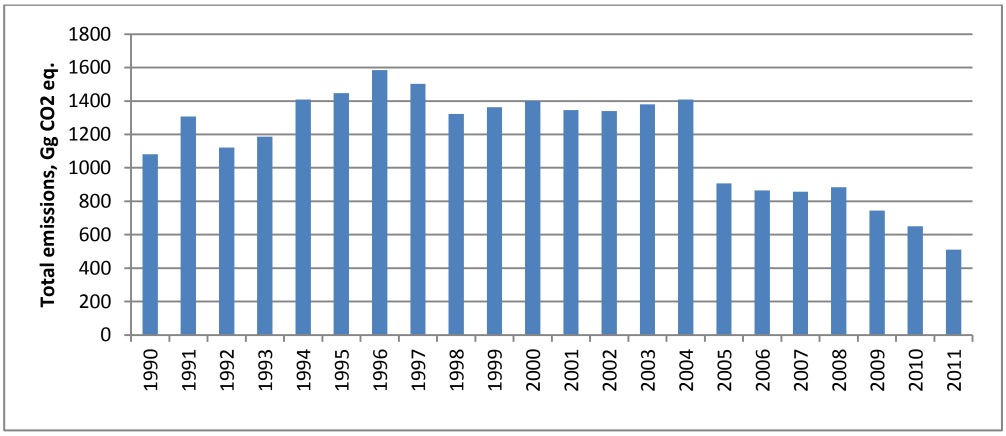

Figure 3.5 GHG emissions from manufacturing industries and construction for 1990-2011 in Gg CO_2 eq.

Emissions from manufacturing industries and construction are presented in Table 3.12 for the period 1990-2011 by source and gas. The emissions from energy consumption by manufacturing industries and construction contribute 5% to the national total (2011), compared to 13% in 199. Between 2004 and 2005 there is a sudden decrease in the energy consumption which is confirmed from all sources of activity data, which is mainly caused by the reduction in the consumption of RFO. No information has been found on the reason that caused the decrease. Hopefully more information will be available by the next submission.

Table 3.12 Emissions from manufacturing industries and constructionby source and gas for the period 1990 – 2011 (recalculations indicated with red)

	1990	1991	1992	1993	1994	1995
Other						
CO_2 (Gg)	428	361	419	435	448	486
CH_4 (Gg)	0.018	0.015	0.017	0.018	0.018	0.020
N_2O (Gg)	0.004	0.003	0.003	0.004	0.004	0.004
Total (Gg CO_2 eq.)	430	362	421	437	450	488
Non-metallic minerals						
CO_2 (Gg)	649	940	699	747	956	956

CH_4 (Gg)	0.041	0.053	0.030	0.032	0.053	0.052
N_2O (Gg)	0.007	0.009	0.006	0.006	0.009	0.009
Total (Gg CO_2 eq.)	652	944	701	750	960	960
Total 1AA2F						
CO_2 (Gg)	1077	1301	1118	1182	1404	1442
CH_4 (Gg)	0.059	0.067	0.047	0.050	0.071	0.072
N_2O (Gg)	0.010	0.012	0.009	0.009	0.012	0.013
Total (Gg CO_2 eq.)	1081	1306	1122	1186	1409	1448
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
Other						
CO_2 (Gg)	512	540	572	588	607	613
CH_4 (Gg)	0.021	0.022	0.023	0.024	0.025	0.025
N_2O (Gg)	0.004	0.004	0.005	0.005	0.005	0.005
Total (Gg CO_2 eq.)	513	542	574	590	609	615
Non-metallic minerals						
CO_2 (Gg)	1068	957	746	770	789	728
CH_4 (Gg)	0.056	0.052	0.030	0.031	0.037	0.037
N_2O (Gg)	0.009	0.009	0.006	0.006	0.007	0.006
Total (Gg CO_2 eq.)	1072	961	748	772	791	731
Total 1AA2F						
CO_2 (Gg)	1579	1497	1318	1357	1396	1341
CH_4 (Gg)	0.077	0.074	0.053	0.056	0.062	0.062
N_2O (Gg)	0.014	0.013	0.010	0.011	0.011	0.011
Total (Gg CO_2 eq.)	1585	1502	1322	1362	1400	1346
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
Other						
CO_2 (Gg)	588	610	576	243	210	205
CH_4 (Gg)	0.024	0.025	0.024	0.009	0.008	0.008
N_2O (Gg)	0.005	0.005	0.005	0.002	0.002	0.002
Total (Gg CO_2 eq.)	590	612	578	244	210	206
Non-metallic minerals						
CO_2 (Gg)	747	764	828	661	652	649
CH_4 (Gg)	0.038	0.043	0.045	0.038	0.037	0.038
N_2O (Gg)	0.006	0.007	0.008	0.006	0.006	0.006
Total (Gg CO_2 eq.)	750	768	831	664	655	652
Total 1AA2F						
CO_2 (Gg)	1335	1374	1404	904	862	854
CH_4 (Gg)	0.062	0.068	0.068	0.047	0.045	0.046
N_2O (Gg)	0.011	0.012	0.012	0.008	0.008	0.008
Total (Gg CO_2 eq.)	1340	1379	1409	908	865	858
	2008	**2009**	**2010**	**2011**		
Other						
CO_2 (Gg)	219	156	148	131		
CH_4 (Gg)	0.009	0.006	0.006	0.006		
N_2O (Gg)	0.002	0.001	0.001	0.001		
Total (Gg CO_2 eq.)	219	156	148	131		
Non-metallic minerals						
CO_2 (Gg)	661	585	501	378		
CH_4 (Gg)	0.040	0.035	0.035	0.022		
N_2O (Gg)	0.007	0.006	0.006	0.004		
Total (Gg CO_2 eq.)	664	587	503	380		
Total 1AA2F						
CO_2 (Gg)	880	741	648	509		
CH_4 (Gg)	0.049	0.041	0.041	0.027		
N_2O (Gg)	0.008	0.007	0.007	0.005		

Total (Gg CO_2 eq.)	884	744	651	511		

3.2.7.2. Methodological issues

For all gases and all sources, the revised IPCC1996 guidelines were applied with the exception of CO_2 from cement and ceramics production (in non-metallic minerals and other respectively) for the years 2005-2010. CO_2 from the two sources for the years 2005-2010 is according to the information submitted by the installations in their annual verified report for the EU ETS.

An exception is the consumption of Pet-coke for 1990: national statistics show that there was no consumption of Pet-coke in 1990 while the data from the installations show that there are 85 kt pet-coke consumed. Therefore, the consumption of pet-coke for 1990 is according to the installation data collected by the department of labour inspection and not according to the statistical service.

The fuel consumption used for the estimation of GHG emissions is presented in Table 3.13. The data for the years 1990-2004 was obtained from the Statistical Service and for 2005-2011 from the ETS annual reports. The majority of fuel consumed is HFO, while cement industry is the only user of solid fuel in Cyprus. The fuel that is reported under *other* is the fuel consumed by ceramics industry and remaining from the energy balance of the statistical service, which is not consumed for production of ceramics.

Table 3.13 Fuel consumption in manufacturing industries and construction (1A2) for the period of 1990-2011

	1990	1991	1992	1993	1994	1995
Other						
Diesel (kt)	98	109	132	137	141	153
RFO (kt)	0	0	0	0	0	0
Other oil (kt)	40	5	0	0	0	0
Non-metallic Minerals						
Pet-coke (kt)	85	93	85	114	112	125
RFO (kt)	37	124	118	100	110	97
Other bit. coal (kt)	97	97	26	31	97	97
Solid biomass (TJ)	0	0	0	0	0	0
Other waste (TJ)	0	0	0	0	0	0
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
Other						
Diesel (kt)	161	169	180	185	191	193
RFO (kt)	0	0	0	0	0	0
Other oil (kt)	0	1	0	0	0	0
Non-metallic Minerals						
Pet-coke (kt)	147	152	150	154	141	133
RFO (kt)	111	70	68	68	70	54
Other bit. coal (kt)	97	97	26	30	49	53
Solid biomass (TJ)	0	0	0	0	41	70
Other waste (TJ)	0	0	0	0	0	18
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
Other						
Diesel (kt)	185	190	171	47	24	21
RFO (kt)	0	2	5	52	44	36
Other oil (kt)	0	0	6	0	0	0
Non-metallic Minerals						
Pet-coke (kt)	139	137	146	142	146	143

RFO (kt)	55	62	68	23	23	31
Other bit. coal (kt)	53	53	57	55	54	49
Solid biomass (TJ)	90	211	127	39	61	100
Other waste (TJ)	0	15	71	138	73	114
	2008	**2009**	**2010**	**2011**		
Other						
Diesel (kt)	18	18	14	16		
RFO (kt)	41	26	28	26		
Other oil (kt)	0	0	0	0		
Non-metallic Minerals						
Pet-coke (kt)	152	147	118	100		
RFO (kt)	30	26	21	7		
Other bit. coal (kt)	45	23	27	12		
Solid biomass (TJ)	249	346	358	235		
Other waste (TJ)	104	38	99	0		

The carbon content and oxidation factor of the fuels is according to the revised IPCC 1996 guidelines, with the exception of Pet-coke, HFO, Diesel, LFO and LPG consumed for cement production during 2005-2011 which is according to the ETS annual report of the cement installations. Methane and nitrous oxide emission factors are according to the revised IPCC 1996 guidelines. The net calorific value for the other bituminous coal consumed is according to the ETS report of 2005 of the installation that consumes the fuel. Carbon content, oxidation factor, emission factors and other parameters used for the estimation of emissions from energy industries are presented in Table 3.14.

The equation applied for the estimation of CO_2 emissions for 1990-2004 is the following:

$$CO2 = FC_x \text{ x } CV_x \text{ x } C_x \text{ x } OF_x \text{ x } 44/12 \qquad [4]$$

where *CO2* is the CO_2 emissions in t, FC_x is the fuel consumption of fuel x in t, CV_x is the calorific value of fuel x, C_x is the carbon content in fuel x and OF_x is the oxidation factor of fuel x.

For the years 2005 – 2010, the equation applied for the estimation of CO_2 emissions is the following:

$$CO2 = FC_x \text{ x } CV_x \text{ x } EF \text{ x } OF_x \qquad [5]$$

where *CO2* is the CO_2 emissions in t, FC_x is the fuel consumption of fuel x in t, CV_x is the calorific value of fuel x, *EF* is the implied CO_2 emission factor of fuel x in t/TJ and OF_x is the oxidation factor of fuel x.

The weighted average implied CO_2 emission factor and net calorific values according to the ETS reports are presented in Table 3.15 and have been reported as *plant specific* data. Oxidation factor is assumed 1 for the ETS period (2005-2011) and 0.99 for 1990-2004.

Methane and nitrous oxide emission factor are according to the revised IPCC 1996 guidelines for the whole period: 2 kg CH_4/ TJ and 0.6 kg N_2O/TJ for liquid fuels, 10 kg CH_4/ TJ and 1.4 kg N_2O/TJ for solid fuels and 30 kg CH_4/ TJ and 4 kg N_2O/TJ for solid biomass and other fuels. The emissions are estimated by the multiplication of the energy consumption in TJ by the emission factor of each gas.

Note: In 2011, the two cement producing installations operating in Cyprus merged into one company. During the last 2 months of 2011, a third new cement producing installation operated. The aim is to phase out the operation of the two older cement producing installations and cover the production with the new installation. Therefore, in 2011 there were 3 cement producing installations in operation.

Table 3.14 Carbon content and net calorific value used for the estimation of emissions from manufacturing industries, 1990-2004

Fuel	Carbon content (*C*), tC/TJ	Net calorific value (*CV*), GJ/t
HFO	21.1 [a]	40.19 [a]
Diesel	20.2 [a]	43.33 [a]
Pet-coke	27.5[a]	31.00[a]
Other bituminous coal	25.8[a]	29.824[b]
Sewage sludge	29.9[a]	18 [b]
Bone meal	29.9[a]	16 [b]
Olive seeds	29.9[a]	13 [b]
Tyres	29.9[a]	25 [b]

[a] Revised IPCC1996 guidelines, pg. 1.6 workbook

[b]PS = as reported by the cement installation for ETS for 2005

Table 3.15 Implied CO_2 emission factor and net calorific values for cement production, according to ETS reports (2005-2011)

	2005	2006	2007	2008	2009	2010	2011
Implied CO_2 emission factor (EF), tCO_2/TJ							
Pet-coke	95.560	92.578	92.676	92.768	93.285	94.178	94.522
RFO	76.384	77.289	77.311	77.395	78.817	78.686	77.813
Other bit. Coal	92.600	92.239	83.654	94.555	94.089	94.580	93.939
Solid biomass	103.322	110.012	95.635	103.721	82.570	106.949	90.986
Other waste	81.596	84.997	85.001	85.000	85.003	84.995	
Net calorific value (CV), GJ/t							
Pet-coke							
Installation 1	31.080	31.080	31.700	31.470	31.950	31.920	31.968
Installation 2			34.780	31.220	32.240	31.600	31.470
New installation							31.920
HFO							
Installation 1	40.100	40.100	40.850	40.620	40.320	40.440	40.190
Installation 2	40.910	40.910	40.870	40.200	40.600	40.428	40.430
New installation							40.440
LFO							
Installation 2	40.850	40.850	40.850	41.200	41.200	41.200	41.200
New installation							40.190
Other bit. Coal							
Installation 2	29.824	29.824	28.360	25.950	26.080	26.819	25.600
New installation							24.402
Solid biomass							
Installation 1							
Sewage sludge	18.000	18.000	18.000	11.710	13.170	18.000	13.817
RDF					18.960		
Bone meal	16.000	16.000	16.000	16.000	16.000	16.000	18.376
Animal fat			33.000				
Wheat dust			13.000				
Olive seeds	13.000	13.000	13.000	13.000	13.000	13.000	
Other waste	25.000	25.000	25.000	25.000	25.000	24.000	
Installation 1	95.560	92.578	92.676	92.768	93.285	94.178	94.522
Tires	76.384	77.289	77.311	77.395	78.817	78.686	77.813

3.2.7.3 Uncertainties and time-series consistency

The results of the uncertainty analysis are presented in Section 1.7, while the detail calculations are presented in Annex II.

3.2.7.4 Source-specific QA / QC and verification

Activity data for fuel consumption was compared between four sources:

(a) The annual ETS reports (2005-2011).
(b) The annual reports submitted to the Department of Labour Inspection for the NEC directive.
(c) The energy balance prepared by the Energy Service.
(d) The energy balance prepared by the statistical service (data submitted to EUROSTAT).

Activity data, methodology and any information used for electricity production after 2005 have been obtained from the reported submitted for the ETS directive and are therefore verified according to the ETS monitoring regulations.

3.2.7.5 Source-specific recalculations

(a) A mistake was identified for the CO_2 emissions from RFO consumption for cement production to the data transferred from the ETS database for 2010 resulting to a very high implied emission factor. This was corrected and the implied emission factor is comparable to the rest of the time series.
(b) The emissions from diesel consumed by other (1AA2f4) were recalculated for the years 2005-2010.

The resulting changes in the emissions estimated for 2005 - 2010 for the current submission, compared to the previous submission are presented in Table 3.16.

Table 3.16 Changes in the emissions caused by recalculations

(Gg CO_2 eq.)	2005	2006	2007	2008	2009	2010
NIR 2012						
Non-metallic elements	664	655	652	664	587	831
Other industries	247	214	211	224	162	183
TOTAL	911	869	863	889	749	1409
NIR 2013						
Non-metallic elements	664	655	652	664	587	503
Other industries	244	210	206	219	156	148
TOTAL	908	865	858	884	744	651
% deviation of total	*-0.3%*	*-0.4%*	*-0.6%*	*-0.6%*	*-0.7%*	*-53.8%*

3.2.7.6. Source-specific planned improvements

The possibility of obtaining fuel consumption data according to industry is under examination. This will allow estimates for emissions for other sources to be calculated.

3.2.8. Transport (CRF 1A3)

3.2.8.1 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. In Cyprus, the only source of emissions reported in Transport is road transport (1A3B) because:

(a) Civil aviation (1A3A): the majority of civil aviation activity in Cyprus is for educational purposes and the domestic flights are limited. As a result no data is currently available for consumption of fuel for domestic aviation. All energy consumption is reported under international aviation.
(b) Railways (1A3C): no railways operate in Cyprus.
(c) Navigation (1A3D): similarly to civil aviation, the majority of navigation activity in Cyprus is for recreational and educational. As a result no data is currently available for consumption of fuel for navigation. All energy consumption is reported under road transport or marine bunkers.

In total, GHG emissions from transport (Table 3.17) in 2011 increased by 91%compared to 1990 emissions (from 1175Gg CO_2 eq in 1990 to 2250 GgCO_2eq in 2011). Transport in 2011 consumed 34% of total energy consumption compared to 30% in 1990.

In terms of GHG emissions, transport contributed 23% to the total emissions of the country and 32% to the total energy emissions in 2011 compared to 14% and 28% respectively in 1990. The majority of emissions areCO_2 (99.3% in 2011).

The number of registered vehicles in the country during 1990-2011 increased by 147%, compared to 91% increase in emissions. The relation between the emissions and the registered cars for 1990-2011 is shown in Figure 3.6.

Table 3.17 GHG emissions from transport for the period 1990-2011

	1990	1991	1992	1993	1994	1995
CO_2 (Gg)	1168	1164	1310	1330	1383	1468
CH_4 (Gg)	0.19	0.20	0.21	0.21	0.22	0.23
N_2O (Gg)	0.01	0.01	0.01	0.01	0.01	0.01
Total (Gg CO_2 eq.)	1175	1171	1318	1337	1391	1477
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
CO_2 (Gg)	1518	1585	1661	1704	1745	1801
CH_4 (Gg)	0.23	0.24	0.25	0.26	0.26	0.27
N_2O (Gg)	0.01	0.01	0.01	0.01	0.01	0.02
Total (Gg CO_2 eq.)	1527	1594	1670	1714	1755	1811
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
CO_2 (Gg)	1784	1890	1991	2031	2019	2156
CH_4 (Gg)	0.28	0.30	0.33	0.35	0.36	0.39
N_2O (Gg)	0.01	0.02	0.02	0.02	0.02	0.02
Total (Gg CO_2 eq.)	1795	1901	2004	2043	2032	2170
	2008	**2009**	**2010**	**2011**		
CO_2 (Gg)	2246	2251	2298	2235		
CH_4 (Gg)	0.41	0.42	0.43	0.42		
N_2O (Gg)	0.02	0.02	0.02	0.02		
Total (Gg CO_2 eq.)	2260	2266	2313	2250		

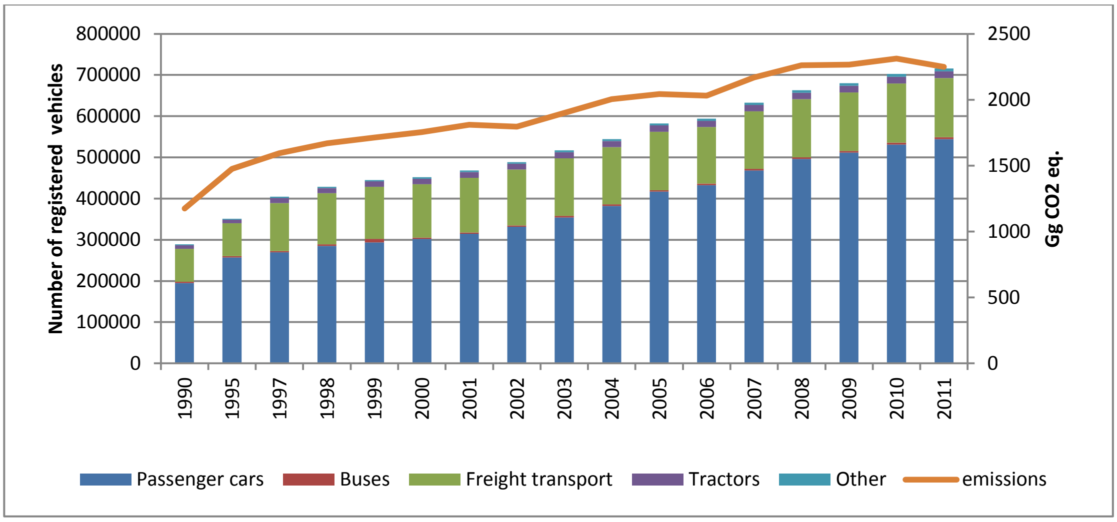

Figure 3.6 Registered vehicles and GHG emissions from road transport 1990-2011

3.2.8.2 Methodological issues

GHG emissions from road transport were estimated according to the revised IPCC1996 guidelines.

The carbon content and oxidation factor of diesel, gasoline and biodiesel used is according to the revised IPCC 1996 guidelines. Methane and nitrous oxide emission factors are according to the revised IPCC 1996 guidelines. Carbon content, calorific values and emission factors for the estimation of emissions from road transport are presented in Table 3.18. Oxidation factor is according to the revised IPCC 1996 guidelines and is assumed 0.99for all fuels. The activity data used for the estimation of emissions is presented in Table 3.19.

The activity data for biofuels was obtained in tons, converted to toe using 0.86 toe/t (Eurostat) and to TJ using 41.868 TJ/ktoe. The implied net calorific value for biofuels is therefore 36.00 TJ/t. Methane and nitrous oxide emissions have not been estimated for biofuels, due to unavailability of emission factor.

Table 3.18 Carbon content, net calorific value and emission factors used for the estimation of emissions from road transport

Fuel	Carbon content (*C*), tC/TJ	CH_4 Emission factor (*EF*), kg/TJ	N_2O Emission factor (*EF*), kg/TJ	Net calorific value (*CV*), GJ/t
Diesel	20.2	5	0.6	43.33
Gasoline	18.9	20	0.6	44.8
Biofuels	20	NA	NA	36.00*

* Implied calorific value: The activity data for biofuels was obtained in tons, converted to toe using 0.86 toe/t (Eurostat) and to TJ using 41.868 TJ/ktoe. The implied net calorific value for biofuels is therefore 36.00 TJ/t

The equation applied for the estimation of CO_2 emissions is the following:

$CO2 = FC_x \text{ x } CV_x \text{ x } C_x \text{ x } OF_x \text{ x } 44/12$ [6]

where *CO2* is the CO_2 emissions in t, FC_x is the fuel consumption of fuel x in t, CV_x is the calorific value of fuel x, C_x is the carbon content in fuel x and OF_x is the oxidation factor of fuel x.

The equation applied for the estimation of CH_4 and N_2O emissions is the following:

$$GHG = FC_x \text{ x } CV_x \text{ x } (EF_x)_{GHG} \quad [7]$$

where *CO2* is the CO_2 emissions in t, FC_x is the fuel consumption of fuel x in t, CV_x is the calorific value of fuel x, and $(EF_x)_{GHG}$ is the emission factor of fuel x for gas GHG.

Table 3.19 Fuel consumption (kt) for road transport for 1990-2011

	1990	1991	1992	1993	1994	1995	1996	1997
Diesel (kt)	210	202	246	255	261	285	298	314
Gasoline (kt)	163	170	172	169	180	183	186	191
Biofuels (kt)								

	1998	1999	2000	2001	2002	2003	2004	2005
Diesel (kt)	334	340	350	355	341	351	354	346
Gasoline (kt)	195	203	206	219	228	252	282	303
Biofuels (kt)								

	2006	2007	2008	2009	2010	2011
Diesel (kt)	323	338	346	338	346	331
Gasoline (kt)	323	352	373	383	390	385
Biofuels (kt)		0.8	16.3	17.2	17.1	18.0

3.2.8.3 Uncertainties and time-series consistency

All activity data was obtained from one source (statistical service) to maximise the time-series consistency. The results of the uncertainty analysis are presented in Section 1.7, while the detail calculations are presented in Annex II.

3.2.8.4 Source-specific QA / QC and verification

The estimates were compared to the results of COPERT IV, to provide a comparison.

3.2.8.5 Source-specific recalculations

No recalculations

3.2.8.6 Source-specific planned improvements

The possibility of (a) applying a more detailed methodology for the estimation of GHG emissions from road transport and (b) obtaining data for domestic flights and maritime activity, are under examination.

3.2.9. Other sectors (CRF 1A4)

Emissions from other sectors (1A4) include the emissions caused by the sectors commercial/ institutional (1A4A), residential (1A4B) and agriculture/ forestry/ fisheries (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 rural areas).

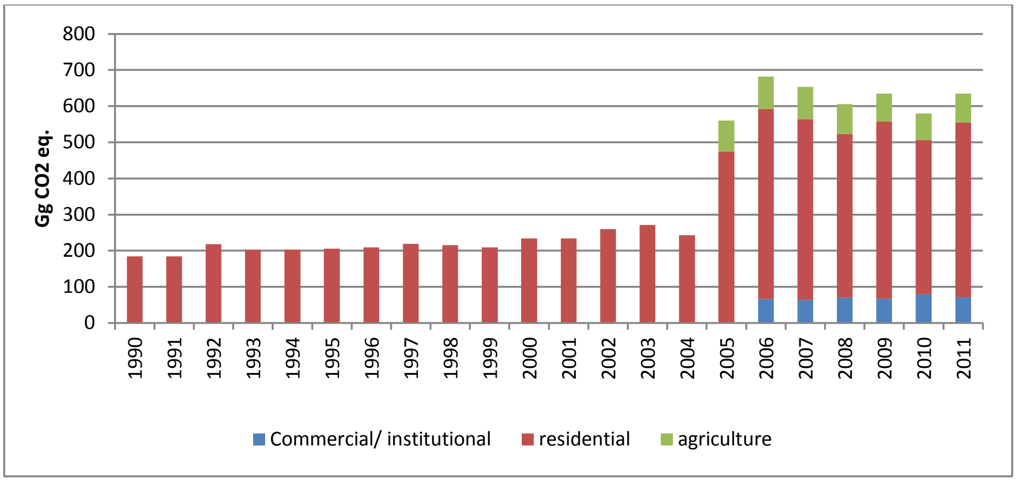

Figure 3.7 GHG emissions from other sectors by source, for the period 1990-2011

In total, GHG emissions from other sectors (Table 3.20) in 2011 increased by 245%compared to 1990 emissions (from 184Gg CO_2 eq in 1990 to 635Gg CO_2 eq in 2011). The total energy consumed by the sector in 2011was 9343 TJ which corresponds 10% of total energy consumption compared to 5% in 1990. In terms of GHG emissions, the sector contributed 6% to the total emissions of the country in 2010 compared to 2% in 1990. The majority of emissions are CO_2 (99% in 2010).

The sudden increase in emissions between 2004 and 2005 of more than 100% (Figure 3.7) is caused by data availability. For 1990-2004, this energy consumption was allocated to other (1A5).

Table 3.20 GHG emissions from other sectors, by activity and gas for the period 1990-2011

	1990	1991	1992	1993	1994	1995
1AA4A. Commercial / Institutional						
CO_2 (Gg)						
CH_4 (Gg)						
N_2O (Gg)						
Total (Gg CO_2 eq.)						
1AA4B. Residential						
CO_2 (Gg)	183	183	217	202	202	205
CH_4 (Gg)	0.03	0.03	0.03	0.03	0.03	0.03
N_2O (Gg)	0.002	0.002	0.002	0.002	0.002	0.002
Total (Gg CO_2 eq.)	184	184	218	203	203	206
1AA4C. Agriculture						
CO_2 (Gg)						
CH_4 (Gg)						
N_2O (Gg)						
Total (Gg CO_2 eq.)						
1AA4. Other sectors						
CO_2 (Gg)	183	183	217	202	202	205
CH_4 (Gg)	0.03	0.03	0.03	0.03	0.03	0.03
N_2O (Gg)	0.002	0.002	0.002	0.002	0.002	0.002
Total (Gg CO_2 eq.)	184	184	218	203	203	206
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
1AA4A. Commercial / Institutional						
CO_2 (Gg)						
CH_4 (Gg)						

N_2O (Gg)						
Total (Gg CO_2 eq.)						
1AA4B. Residential						
CO_2 (Gg)	208	217	215	208	233	233
CH_4 (Gg)	0.03	0.03	0.03	0.03	0.04	0.04
N_2O (Gg)	0.002	0.002	0.002	0.002	0.002	0.002
Total (Gg CO_2 eq.)	209	219	216	210	234	234
1AA4C. Agriculture						
CO_2 (Gg)						
CH_4 (Gg)						
N_2O (Gg)						
Total (Gg CO_2 eq.)						
1AA4. Other sectors						
CO_2 (Gg)	208	217	215	208	233	233
CH_4 (Gg)	0.03	0.03	0.03	0.03	0.04	0.04
N_2O (Gg)	0.002	0.002	0.002	0.002	0.002	0.002
Total (Gg CO_2 eq.)	209	219	216	210	234	234
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
1AA4A. Commercial / Institutional						
CO_2 (Gg)					66.5	63.3
CH_4 (Gg)					0.01	0.01
N_2O (Gg)					0.001	0.001
Total (Gg CO_2 eq.)					66.9	63.8
1AA4B. Residential						
CO_2 (Gg)	258	270	242	471	522	496
CH_4 (Gg)	0.04	0.04	0.04	0.07	0.10	0.10
N_2O (Gg)	0.002	0.002	0.002	0.004	0.005	0.005
Total (Gg CO_2 eq.)	260	272	243	474	525	500
1AA4C. Agriculture						
CO_2 (Gg)				85.8	89.0	89.0
CH_4 (Gg)				0.01	0.01	0.01
N_2O (Gg)				0.001	0.001	0.001
Total (Gg CO_2 eq.)				86.2	89.4	89.4
1AA4. Other sectors						
CO_2 (Gg)	258	270	242	557	677	648
CH_4 (Gg)	0.04	0.04	0.04	0.08	0.12	0.13
N_2O (Gg)	0.002	0.002	0.002	0.005	0.006	0.006
Total (Gg CO_2 eq.)	260	272	243	560	682	653
	2008	**2009**	**2010**	**2011**		
1AA4A. Commercial / Institutional						
CO_2 (Gg)	69.7	66.5	79.2	69.7		
CH_4 (Gg)	0.01	0.01	0.02	0.04		
N_2O (Gg)	0.001	0.001	0.001	0.001		
Total (Gg CO_2 eq.)	70.2	67.0	79.8	70.9		
1AA4B. Residential						
CO_2 (Gg)	449	487	424	479		
CH_4 (Gg)	0.10	0.12	0.09	0.14		
N_2O (Gg)	0.004	0.005	0.004	0.005		
Total (Gg CO_2 eq.)	452	491	427	484		
1AA4C. Agriculture						
CO_2 (Gg)	82.6	76.3	73.1	79.4		
CH_4 (Gg)	0.01	0.01	0.01	0.01		
N_2O (Gg)	0.001	0.001	0.001	0.001		
Total (Gg CO_2 eq.)	83.1	76.7	73.5	79.9		
1AA4. Other sectors						

CO_2 (Gg)	601	629	576	629
CH_4 (Gg)	0.13	0.15	0.11	0.19
N_2O (Gg)	0.006	0.006	0.005	0.007
Total (Gg CO_2 eq.)	606	634	580	635

3.2.9.2 Methodological issues

GHG emissions from other sectors were estimated according to the revised IPCC1996 guidelines.

The carbon content and oxidation factor of fuels used is according to the revised IPCC 1996 guidelines. Methane and nitrous oxide emission factors are also according to the revised IPCC 1996 guidelines. Carbon content, calorific values and emission factors for the estimation of emissions from road transport are presented in Table 3.21. Oxidation factor is according to the revised IPCC 1996 guidelines and is assumed 0.99for all fuels. The activity data used for the estimation of emissions is available in kt (Table 3.22). The fuel consumption from kt to TJ was made using the net calorific value proposed by the revised IPCC 1996 guidelines (Table 3.21). Activity data for biomass was available in TJ, therefore no conversion was required.

Table 3.21 Carbon content, net calorific value and emission factors used for the estimation of emissions from other sectors

Fuel (x)	Net calorific value (*NCV*), TJ/kt	Carbon content (*C*), tC/TJ	CH_4 Emission factor (*EF*), kg/TJ	N_2O Emission factor (*EF*), kg/TJ
Diesel	43.33	20.2	10	0.6
Kerosene	44.75	19.6	10	0.6
LPG	47	17.2	10	0.6
RFO	40	21.1	10	0.6
Biomass		29.9	300	4

The equation applied for the estimation of CO_2 emissions is the following:

$$CO2 = FC_x \times C_x \times NCV_x \times OF_x \times 44/12 \quad [8]$$

where*CO2* is the CO_2 emissions in t, FC_x is the fuel consumption of fuel x in kt, NCV_x is the net calorific value of fuel x, C_x is the carbon content in fuel x and OF_x is the oxidation factor of fuel x.

The equation applied for the estimation of CH_4 and N_2O emissions is the following:

$$GHG = FC_x \times NCV_x \times (EF_x)_{GHG} \quad [9]$$

where *CO2* is the CO_2 emissions in t, FC_x is the fuel consumption of fuel x in kt, NCV_x is the net calorific value of fuel x in TJ/kt, and $(EF_x)_{GHG}$ is the emission factor of fuel x for gas GHG.

Note: the biomass data for 2011 was according to the information provided by the Energy Service and not the Statistical Service – therefore there is a large inconsistency compared to previous years.

Table 3.22 Fuel consumption for other sectors for 1990-2011

	1990	1991	1992	1993	1994	1995
1AA4.a. Commercial/Institutional						
Diesel (kt)						
RFO (kt)						
Solid biomass (TJ)						
1AA4.b. Residential						
Other kerosene (kt)	12	12	17	16	17	17
Diesel/gas oil (kt)						
LPG (kt)	49	49	55	51	50	51
Solid Biomass (TJ)						
1AA4.c. Agriculture/Forestry/Fisheries						
Diesel/gas oil (kt)						
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
1AA4.a. Commercial/Institutional						
Diesel (kt)						
RFO (kt)						
Solid biomass (TJ)						
1AA4.b. Residential						
Other kerosene (kt)	18	20	21	20	24	24
Diesel/gas oil (kt)						
LPG (kt)	51	52	50	49	53	53
Solid Biomass (TJ)						
1AA4.c. Agriculture/Forestry/Fisheries						
Diesel/gas oil (kt)						
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
1AA4.a. Commercial/Institutional						
Diesel (kt)					19	18
RFO (kt)					2	2
Solid biomass (TJ)						14
1AA4.b. Residential						
Other kerosene (kt)	31	31	24	16	16	16
Diesel/gas oil (kt)				83	98	89
LPG (kt)	54	58	56	53	54	55
Solid Biomass (TJ)					74	95
1AA4.c. Agriculture/Forestry/Fisheries						
Diesel/gas oil (kt)				27	28	28
	2008	**2009**	**2010**	**2011**		
1AA4.a. Commercial/Institutional						
Diesel (kt)	20	19	23	20		
RFO (kt)	2	2	2	2		
Solid biomass (TJ)	15	15	15	109		
1AA4.b. Residential						
Other kerosene (kt)	14	19	14	16		
Diesel/gas oil (kt)	78	83	70	80		
LPG (kt)	53	55	53	59		
Solid Biomass (TJ)	123	174	84	2300		
1AA4.c. Agriculture/Forestry/Fisheries						
Diesel/gas oil (kt)	26	24	23	25		

3.2.9.3 Uncertainties and time-series consistency

All activity data was obtained from one source to maximise the time-series consistency. The results of the uncertainty analysis are presented in Section 1.7, while the detail calculations are presented in Annex II.

3.2.9.4 Source-specific QA / QC and verification

Activity data for fuel consumption was compared between two sources: (a) The energy balance prepared by the Energy Service, and (b) The energy balance prepared by the statistical service (data submitted to EUROSTAT). An exception was biomass consumption for which no data was available by the Statistical Service, and the data from the Energy Service was used.

3.2.9.5 Source-specific recalculations

No recalculations.

3.2.9.6 Source-specific planned improvements

The possibility of obtaining more detailed data on the allocation of fuel consumption according to sector, are under examination.

3.2.10. Other – not elsewhere specified (CRF 1A5)

Fuel consumption not elsewhere specified, has been allocated to an additional category CRF 1A5. Data other than solid biomass is available only after 2006. GHG emissions in 2011 were 19 Gg CO_2 eq. The total energy consumed by the sector in 2011 was 269 TJ. The emissions are presented in Figure 3.8.

Table 3.23 GHG emissions from other for the period 2006-2011

	1990	1991	1992	1993	1994	1995
Gg CO_2						
Gg CH_4	0.044	0.036	0.035	0.035	0.026	0.027
Gg N_2O	0.0006	0.0005	0.0005	0.0005	0.0003	0.0004
Total (Gg CO_2 eq.)	1.1	0.9	0.9	0.9	0.6	0.7

	1996	1997	1998	1999	2000	2001
Gg CO_2						
Gg CH_4	0.041	0.021	0.019	0.026	0.023	0.024
Gg N_2O	0.0005	0.0003	0.0003	0.0004	0.0003	0.0003
Total (Gg CO_2 eq.)	1.0	0.5	0.5	0.7	0.6	0.6

	2002	2003	2004	2005	2006	2007
Gg CO_2					12.7	19.1
Gg CH_4	0.022	0.020	0.018	0.017	0.002	0.003
Gg N_2O	0.0003	0.0003	0.00024	0.00023	0.0001	0.00016
Total (Gg CO_2 eq.)	0.6	0.5	0.5	0.4	12.8	19.2

	2008	2009	2010	2011		
Gg CO_2	41.3	15.9	15.9	19.1		
Gg CH_4	0.006	0.002	0.002	0.005		
Gg N_2O	0.00034	0.00013	0.00013	0.00019		
Total (Gg CO_2 eq.)	41.5	16.0	16.0	19.2		

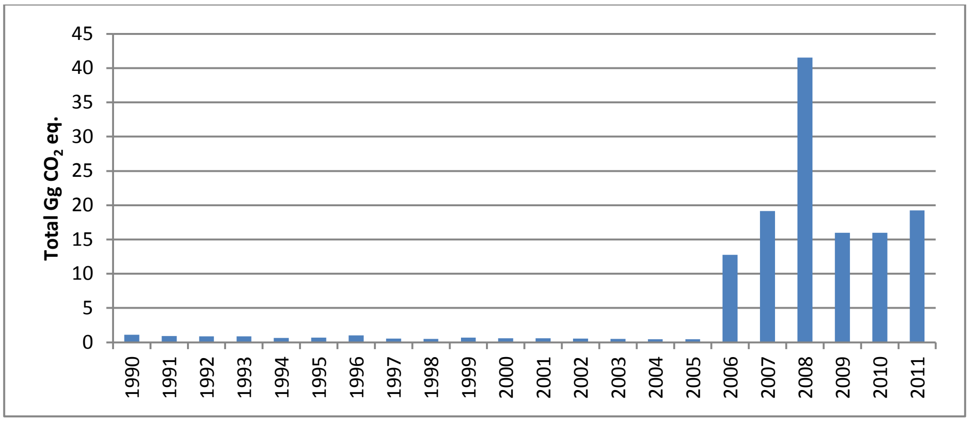

Figure 3.8 GHG emissions from others, for 1990-2011

3.2.10.2 Methodological issues

GHG emissions from other were estimated according to the revised IPCC1996 guidelines.

The carbon content and oxidation factor of fuels used is according to the revised IPCC 1996 guidelines. Methane and nitrous oxide emission factors are also according to the revised IPCC 1996 guidelines. Carbon content, calorific values and emission factors for the estimation of emissions from other are presented in Table 3.24. Oxidation factor is according to the revised IPCC 1996 guidelines and is assumed 0.99for both fuels. The activity data used for the estimation of emissions is available in t (Table 3.25). The fuel consumption from kt to TJ was made using the default net calorific value proposed by the IPCC1996 guidelines. Data for biomass was available in TJ and no conversion was necessary.

The equation applied for the estimation of CO_2 emissions is the following:

$$CO2 = FC_x \text{ x } NCV_x \text{ x } C_x \text{ x } OF_x \text{ x } 44/12 \quad [10]$$

where *CO2* is the CO_2 emissions in t, NCV_x is the net calorific value of fuel x in TJ/kt, FC_x is the fuel consumption of fuel x in kt, C_x is the carbon content in fuel x and OF_x is the oxidation factor of fuel x.

The equation applied for the estimation of CH_4 and N_2O emissions is the following:

$$GHG = FC_x \text{ x } NCV_x \text{ x } (EF_x)_{GHG} \quad [11]$$

where *CO2* is the CO_2 emissions in t, NCV_x is the net calorific value of fuel x in TJ/kt, FC_x is the fuel consumption of fuel x in ktoe, and $(EF_x)_{GHG}$ is the emission factor of fuel x for gas GHG.

Table 3.24 Carbon content, net calorific value and emission factors used for the estimation of emissions from other sectors

Fuel	Net calorific value (*NCV*), TJ/kt	Carbon content (*C*), tC/TJ	CH_4 Emission factor (*EF*), kg/TJ	N_2O Emission factor (*EF*), kg/TJ
Diesel	43.33	20.2	10	0.6
Biomass		29.9	300	4

Table 3.25 Fuel consumption for other sectors for 1990-2011

	1990	1991	1992	1993	1994	1995	1996	1997
Diesel (kt)	0	0	0	0	0	0	0	0
Biomass (TJ)	145	120	118	117	85	91	136	70

	1998	1999	2000	2001	2002	2003	2004	2005
Diesel (kt)	0	0	0	0	0	0	0	0
Biomass (TJ)	64	88	78	80	74	67	61	58

	2006	2007	2008	2009	2010	2011
Diesel (kt)	4	6	13	5	5	6
Biomass (TJ)	0	0	0	0	0	9

3.2.10.3 Uncertainties and time-series consistency

All activity data was obtained from one source to maximise the time-series consistency. The results of the uncertainty analysis are presented in Section 1.7, while the detail calculations are presented in Annex II.

3.2.10.4 Source-specific QA / QC and verification

Activity data for fuel consumption was compared between two sources: The energy balance prepared by the Energy Service and the energy balance prepared by the statistical service (data submitted to EUROSTAT). Biomass consumption in 2011 is an exception – no data was available from the Statistical Service and the consumption available from the Energy Service was used.

3.2.10.5 Source-specific recalculations

No recalculations.

3.2.10.6 Source-specific planned improvements

The possibility of obtaining more detailed data on the allocation of fuel consumption according to sector sunder examination.

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

3.3.1. Solid fuels (CRF 1B1)

Not occurring.

3.3.2. Oil and natural gas (CRF 1B2)

3.3.2.1 Source category description

Activities related to primary production (extraction), processing, storage and transmission/ distribution of crude oil, petroleum products and natural gas 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.

No refining currently takes place in Cyprus. There was however one refinery in operation until 2004. 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, transport and distribution of oil products. For the distribution of oil products no emissions are reported since no method is proposed by IPCC (NE). For refining, no emissions are reported after 2004 when the refinery stop operating (NO).Emissions from transportation and refining according to the revised IPCC 1996 guidelines are associated to refining activities; therefore no emissions are reported after 2004.Table 3.27 presents the emissions of the source. All emissions are methane emissions and are from refining activities (1B2A.4).

Table 3.27 CH_4 fugitive emissions from oil during 1990-2004, in tons

CH_4, t	1990	1991	1992	1993	1994	1995	1996	1997
Transportation	20.0	24.0	22.9	24.6	28.5	26.0	23.9	32.8
Refining	20.0	24.0	22.9	24.6	28.5	26.0	23.9	32.8
Storage	3.6	4.3	4.1	4.4	5.2	4.7	4.3	5.9

CH_4, t	1998	1999	2000	2001	2002	2003	2004
Transportation	34.0	37.1	36.9	36.3	34.1	30.5	8.8
Refining	34.0	37.1	36.9	36.3	34.1	30.5	8.8
Storage	6.2	6.7	6.7	6.6	6.2	5.5	1.6

3.3.2.2 Methodological issues

GHG emissions from oil until 2004 when the refinery was operating are estimated according to the Tier 1 methodology described in the revised IPCC 1996 guidelines. The activity data used in presented in Table 3.28.

Table 3.28 Oil refined during 1990-2004, kt

	1990	1991	1992	1993	1994	1995	1996	1997
Oil refined, kt	636	763	727	781	906	828	760	1,043

	1998	1999	2000	2001	2002	2003	2004
Oil refined, kt	1,082	1,180	1,173	1,156	1,086	971	279

The activity data is from the energy balance of the National Statistical Service. The data was converted from tons to TJ using the conversion factors of 1.008 ktoe/t and 41.868 TJ/ktoe. The emission factors are according to the revised IPCC 1996 guidelines, i.e. 745 g CH_4/TJ oil transported, 745 g CH_4/TJ oil refined (average of 90 and 1400 g CH_4/TJ oil refined which is proposed for all regions according to Table 1-6 of workbook, pg. 1.30) and 135 gCH_4/TJ oil stored (average of 20 and 250 g CH_4/TJ oil stored which is proposed for all regions according to Table 1-6 of workbook, pg. 1.30).

3.3.2.3 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.

3.3.2.4 Source-specific QA / QC and verification

No source specific QA / QC are applied.

3.3.2.5 Source-specific recalculations

No recalculations.

3.3.2.6 Source-specific planned improvements

No source specific improvements are planned.

3.4. Memo Items (CRF 1.C)

3.4.1. International bunkers (CRF 1C1)

3.4.1.1 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. The definitions of national and international movements for ships and aircraft are covered under the "Definition of Source Categories" (Energy) in Volume 1, Reporting Instructions, in the revised IPCC 1996 guidelines.

No data is available on the allocation of fuel consumption between domestic and international transportation. It is therefore considered that all fuel consumed for aviation and maritime activities are for international travelling and not domestic.

The emissions from international bunkers (already presented in Table 3.6) increased by 67% between 1990 and 2011: aviation increased by 25% and maritime activities by 242%. The total emissions are presented in Figure 3.9.

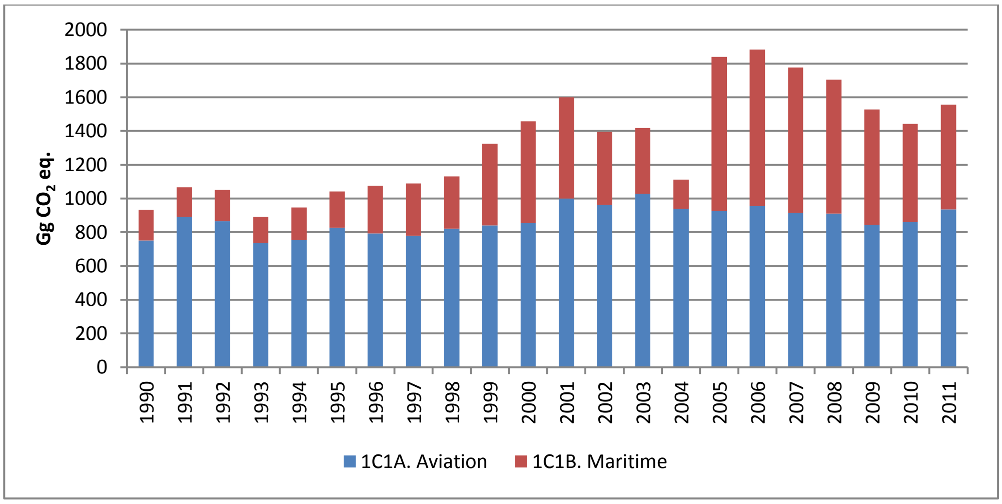

Figure 3.9 Total emissions of bunkers, Gg CO_2 eq.

3.4.1.2 Methodological issues

Activity data used for the estimation of emissions from bunkers is presented in Table 3.30.Data was obtained from the energy balance of the national statistical service in kt of fuel consumed. The conversion to TJ was made according to the conversion factors presented in Table 3.31 and 41.868 TJ/ktoe. Emission factors are according to revised IPCC 1996 guidelines and are presented in Table 3.32. Oxidation also according to revised IPCC 1996 guidelines (0.99).

Table 3.30 Fuel consumption for international aviation and maritime activities for 1990-2011 in kt

	1990	1991	1992	1993	1994	1995	1996	1997
Aviation								
Jet kerosene	236	280	272	231	237	260	249	245
Marine								
Gas / diesel oil	24	20	21	14	12	15	25	27
RFO	34	36	38	36	50	54	65	71

	1998	1999	2000	2001	2002	2003	2004	2005
Aviation								
Jet kerosene	258	264	268	314	302	323	295	291
Marine								
Gas / diesel oil	35	46	50	47	33	36	27	67
RFO	63	108	143	145	105	88	27	225

	2006	2007	2008	2009	2010	2011
Aviation						
Jet kerosene	300	287	286	266	271	296
Marine						
Gas / diesel oil	106	104	88	73	53	58
RFO	190	171	165	146	134	141

Table 3.31 Conversion and emission factors used for the estimation of emissions from international bunkers

	Jet kerosene	Gas / diesel oil	RFO
Carbon emission factor, tC/ TJ	19.5	20.2	21.1
kg CH_4/TJ fuel consumed	0.5	5	5
kg N_2O/TJ fuel consumed	2	0.6	0.6
ktoe/kt	1.027	1.017	0.955

3.4.1.3 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.

3.4.1.4 Source-specific QA / QC and verification

No source specific QA / QC are applied.

3.4.1.5 Source-specific recalculations

Recalculations were made for 2009 and 2010 because of revised activity data for 2009 and 2010.

3.4.1.6 Source-specific planned improvements

At the moment, no data is available on the allocation of fuel consumption between domestic and international transportation. It is therefore considered that all fuel consumed for aviation and maritime activities are for international travelling and not domestic. The options for improving the accuracy in fuel consumption are currently examined.

3.4.2. Multilateral operations (CRF 1C2)

Not occurring.

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), Food and drink production (2D2) and Consumption of halocarbons and SF6 (2F).

Activity data for food and drink production is not available therefore emissions for source 2D2 have not been estimated.

4.1.1. Emissions trends

In 2011, GHG emissions from Industrial processes account for 7.6% of total emissions (excluding LULUCF) and have decreased by 4.3% compared to the emissions of 1990 (Figure 4.1), after following an increasing trend until 2006 when the emissions were 27% above 1990 emissions.

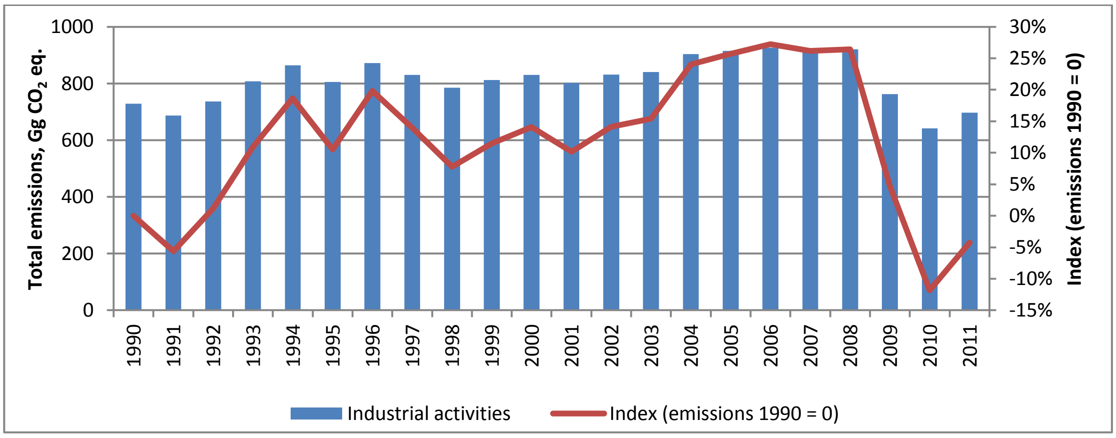

Figure 4.1 Total GHG emissions (in Gg CO_2 eq) from Industrial Processes for the period 1990 - 2011

The sector of industrial processes is responsible for emissions of carbon dioxide from mineral products and F-gases. Emissions per gas from industrial processes are presented in Table 4.1.Carbon dioxide represents the only greenhouse gas from industrial processes until data was available to estimate emissions of f-gases. Overall, CO_2 emissions in 2011 decreased by 21.7% compared to 1990.

The contribution of F-gases consumption to total emissions from industrial processes is also significant and in 2011 it contributed 18% to the industrial emissions. Activity data for the estimation of f-gases emissions for all years and sectors is not yet available and only estimations for 2009 and 2010 are the most complete.

Table 4.1 GHG emissions (in Gg CO_2 eq) per gas from industrial processes for the period 1990-2011 (recalculated emissions are indicated with red)

	1990	1991	1992	1993	1994	1995	1996	1997
CO_2	728	687	737	808	839	805	863	830
HFCs	0	0	0	0	*24.7**	*0*	*9.7**	0
TOTAL	728	687	737	808	864	805	872	830

	1998	1999	2000	2001	2002	2003	2004	2005
CO_2	785	792	811	784	812	821	884	893
HFCs	0	19	19.3	18.4	18.7	19.1	19.6	22.2
TOTAL	785	812	831	802	831	840	903	915

	2006	2007	2008	2009	2010	2011
CO_2	903	893	894	722	586	570
HFCs	23.9	25.6	26.3	40.3	56.4	126.6
TOTAL	927	919	921	763	642	697

* Potential emissions

Throughout the inventory years, the sources of emissions from Industrial processes are mineral products and consumption of halocarbons (Figure 4.2). Emissions show an overall increasing trend until 2006-2008. The peak is due both to higher emissions of CO_2 from mineral production and to the better estimation of HFCs' emissions. The significant reduction after 2008, which takes place regardless the increase in HFC emissions, is caused by the reduced production levels of mineral products.

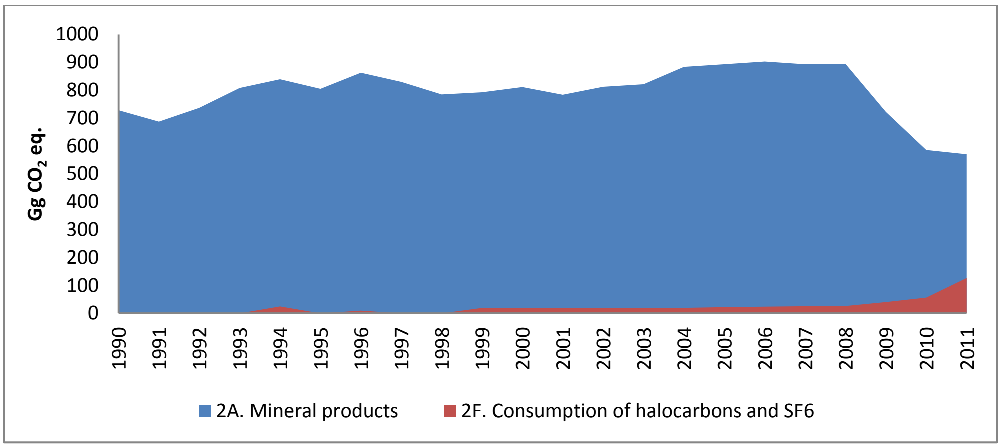

Figure 4.2 GHG emissions (in Gg CO_2 eq) from Industrial processes per main source category for the period 1990 – 2011

4.1.2. Methodology

The calculation of GHG emissions from Industrial Processes is based on the methodologies described in Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, the 2000 IPCC Good Practice Guidance and the EMEP/CORINAIR Emission Inventory Guidebook 2007. The methodology applied for the calculation of emissions per source category is presented in Table 4.2, while a detailed description is given in the corresponding section of the source category. For the years 2005-2011 detailed data is available via the verified EU ETS reports of the plants. The reports were prepared according to Annexes I & II of monitoring and reporting regulation (2007/589/EC).

Table 4.2 Methodology for the estimation of emissions from industrial processes

	CO_2		HFC	
	Method	EF	Method	EF
2A. Mineral production	D, T1	CS, D, PS		
2F. Consumption of F-gases			T2, CS	D

T1, T2: IPCC methodology Tier 1 and 2 respectively
D: IPCC default methodology and emission factor
CS: Country specific
PS: Plant specific

Key categories

The key categories identified are presented in Section 1.5.

Uncertainty

The results of the uncertainty analysis are presented in Section 1.7, while the detail calculations are presented in Annex II.

4.1.3. Completeness

An overview of the completeness of the inventory is presented in Table 4.3.Completeness has overall improved in the current inventory for industrial processes. The main improvements include the following subcategories:

- HFC and SF6 emissions from consumption of halocarbons and SF6 have been estimated for more sources additional to refrigeration and air-conditioning (2F1).

Table 4.3 Industrial Processes – completeness (new estimations are indicated with red)

	CO_2	CH_4	N_2O	HFC	PFC	SF_6
2A. Metallic minerals						
1. Cement production	✓					
2. Lime production	✓					
3. Limestone & dolomite use	NE2					
4. Soda ash production & use	NO					
5. Asphalt roofing	NE1					
6. Road paving with asphalt	NE1					
7. Other						
(a) Glass production	NO					
(b) Ceramics production	✓					
2B. Chemical industry	NO					
2C. Metal production	NO					
2D. Other production						
1. Pulp and paper	NO					
2. Food and drink	NE2					
2E. Production of halocarbons & SF_6	NO					
2F. Consumption of halocarbons & SF_6						
1. Refrigeration & air conditioning				✓	NO	NO
2. Foam blowing				✓	NE2	NO
3. Fire extinguishers				NE2	NE2	NO
4. Aerosols / metered dose inhalers				✓	NE2	NO
5. Solvents				NE2	NE2	NO

6. Other applications using ODS substitutes		NO	NO	NO
7. Semiconductor manufacture		NO	NO	NO
8. Electrical equipment		NO	NO	✓

NO: Not occurring
NE1: Not estimated due to lack of method
NE2: Not estimated due to lack of activity data

4.2. Cement Production (CRF source category 2A1)

4.2.1. Source category description

Cement production (CO_2 emissions) is a key category by level assessment. CO_2 emissions from cement production in 2011 (Table 4.5) accounted for 78% of total GHG emissions from industrial processes and for 5% of total national emissions excluding LULUCF.

Table 4.4 Clinker production (in Gg) and CO_2 emissions from cement production (in Gg), for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995
Clinker production (Gg)	1249	1176	1282	1397	1466	1405
CO_2 emissions (Gg)	668	629	686	747	784	751

	1996	1997	1998	1999	2000	2001
Clinker production (Gg)	1516	1459	1382	1382	1428	1394
CO_2 emissions (Gg)	811	780	740	740	763	745

	2002	2003	2004	2005	2006	2007
Clinker production (Gg)	1432	1405	1509	1503	1541	1515
CO_2 emissions (Gg)	766	751	808	822	821	812

	2008	2009	2010	2011		
Clinker production (Gg)	1526	1264	1043	1037		
CO_2 emissions (Gg)	818	673	555	546		

4.2.2. Methodological issues

For the years 2005-2011 detailed data is available via the verified EU-ETS reports of the plants. The reports were prepared according to Annexes I & II of monitoring and reporting regulation (2007/589/EC).

Cement producing plants also report on emissions from non-carbonate carbon (organic carbon). The average percentage of organic carbon to the raw material for 2010 was 6.1% and the respective emissions constitute the 3% of total emissions from cement production.

For the period 1997-2004, the data submitted by the installations for the preparation of the National Allocation Plan 2005-2007 was used, whereas for the period 1990-1996, the emissions were estimated using the EF of 1997. For years after 2005, data submitted in the annual reports of the installations for the EU-ETS are used.

4.2.3. Uncertainties and time-series consistency

The uncertainty of the current category’s estimations is quite low (2% for EF and AD), since the emissions are plant-specific and the reports of the emissions are being verified by accredited verifiers. Both cement plants in Cyprus are above the EU ETS benchmarks for inclusion.

It is quite clear from Figure 4.3 that the cement production is experiencing intense reduction in 2009 and 2010, which is attributed to the economic recession that had a considerable impact on the construction sector. During the years 1990-2005, emissions show some level of fluctuation (Figure 4.3). In general, annual variations of clinker production and, as a result, of CO_2 emissions are rather low, since a decrease in the domestic demand is counterbalanced by increased exports.

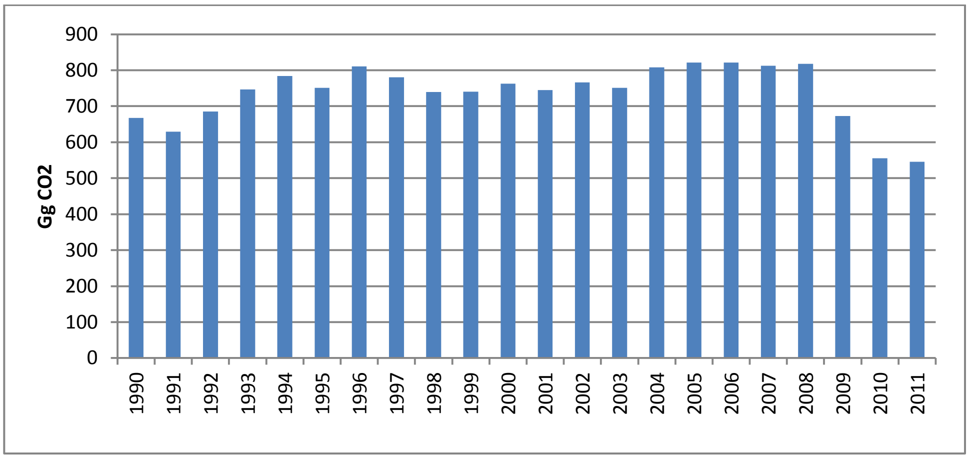

Figure 4.3 CO_2 emissions (in Gg) from Cement Production for the period 1990 –2011

The implied emission factor of 2011 is the lowest since 1990 (Table 4.5). This could be attributed to the operation of a new cement producing installation, which replaced the production of the two that already existed.

Table 4.5 Country specific CO_2implied emission factor (in t / t) for clinker (cement) production for the period 1990 – 2011

Year	1990	-	1997	1998	1999	2000
Implied CO_2 emission factor (tCO_2/t clinker)		0.5347		0.5351	0.5357	0.5342

	2001	2002	2003	2004	2005	2006
Implied CO_2 emission factor (tCO_2/t clinker)	0.5345	0.5350	0.5344	0.5352	0.5468	0.5326

	2007	2008	2009	2010	2011
Implied CO_2 emission factor (tCO_2/t clinker)	0.5362	0.5361	0.5326	0.5322	0.5264

4.2.4. Source-specific QA / QC and verification

In order to perform quality assurance activities, the total clinker produced reported by the plants is also checked with the value provided by the National Statistical Service and the data submitted to the Department of Labour Inspection for the purposes of NEC Directive[6]. The three sources agree, especially in the recent years that the data submitted is verified.

[6]Directive 2001/81/EC of the European Parliament and the Council on National Emission Ceilings for certain pollutants

Because of the great decrease in emissions in 2010, additional information for the sector was collection from National Statistical Service. Indeed, the Production Index in Construction shows important decrease in 2010, with an average change of -9.5% between 2009 and 2010 and -23.1% during 2008 and 2009.

4.2.5. Source-specific recalculations

No recalculations.

4.2.6. Source-specific planned improvements

No improvements are planned for the emissions from cement production (2A1).

4.3. Lime Production (CRF source category 2A2)

4.3.1. Source category description

Lime production leads to carbon dioxide emissions because of the calcination of limestone ($CaCO_3$) or dolomite ($CaCO_3.MgCO_3$) to produce lime or dolomitic lime. Lime production in Cyprus is mainly based on limestone.

CO_2 emissions from lime production in 2011 (Figure 4.4) account for 1% of total GHG emissions from Industrial processes and for 0.1% of total national emissions (excluding LULUCF). Emissions from lime production increased by 89% compared to 1990 and decreased by 24% between 2010 and 2011. The large increase that takes place between 2002 and 2003 is caused by the operation of a new lime producing installation.

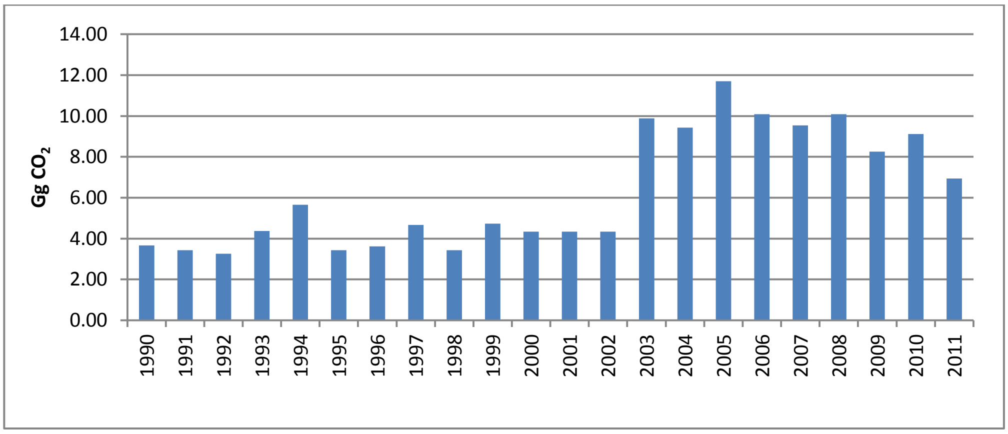

Figure 4.4 CO_2 emissions (in Gg) from Lime Production for the period 1990 –2011

4.3.2. Methodological issues

The CO_2 emissions from lime production were estimated using the default emission factor proposed by the revised IPCC 1996 guidelines (0.79 t CO_2/ t lime) and the activity data obtained from the data collected by installations by the Department of Labour Inspection. Both the activity data used and the resulting CO_2 emissions are presented in Table 4.6.

Table 4.6 Lime production (in Gg) and respective CO_2 emissions (in Gg), for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995
Lime production (Gg)	4.64	4.35	4.13	5.54	7.17	4.34
CO_2 emissions (Gg)	3.66	3.44	3.27	4.37	5.66	3.43
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
Lime production (Gg)	4.59	5.92	4.35	5.98	5.50	5.50
CO_2 emissions (Gg)	3.63	4.67	3.43	4.72	4.35	4.35
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
Lime production (Gg)	5.50	12.51	11.94	14.82	12.78	12.08
CO_2 emissions (Gg)	4.35	9.88	9.43	11.71	10.09	9.55
	2008	**2009**	**2010**	**2011**		
Lime production (Gg)	12.78	10.46	11.55	8.78		
CO_2 emissions (Gg)	10.10	8.26	9.12	6.93		

4.3.3. Uncertainties and time-series consistency

The results of uncertainty analysis are presented in Table 1.7. The detailed calculations of uncertainty are presented in Annex II.

4.3.4. Source-specific QA / QC and verification

Quality control and source-specific quality control is carried out based on the principles of inventory Quality Assurance / Quality Control (QA/QC) plan (section 1.6).

4.3.5. Source-specific recalculations

No recalculations.

4.3.6. Source-specific planned improvements

No improvements are planned for the emissions from lime production (2A2).

4.4. Ceramics Production (CRF source category 2A7.2)

4.4.1. Source category description

Emissions of CO_2 occur during the production of ceramics. CO_2 emissions are attributed to the calcination of limestone (mainly $CaCO_3$), to produce lime (CaO) and carbon dioxide as a by-product. In Cyprus, there are 8 ETS and 1 non-ETS ceramics installations in operation. Ceramics production (CO_2 emissions) is not a key category in 2011.Ceramics production accounted for 2.5% of total GHG emissions from industrial processes and for 0.2% of total national emissions excluding LULUCF. The CO_2 emissions from ceramics production are presented in Figure 4.5.

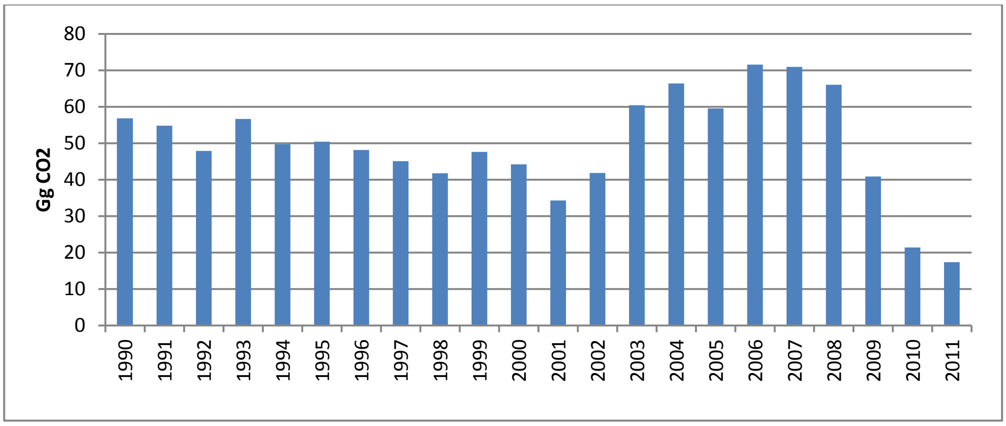

Figure 4.5 CO_2 emissions (in Gg) from Ceramics Production for the period 1990 –2011

4.4.2. Methodological issues

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

(a) The activity data 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 2001-2011. For 2001-2004 was data obtained during the preparation of the first national allocation plan of Cyprus and for 2005-2011 the data was obtained from the verified emissions reports submitted annually according to the ETS legislation.

(b) Diving the total CO_2 process emissions of the ETS installations by the total production, the annual implied emission factor was estimated for the years 2005-2011.

(c) The activity data for the non-ETS installation for the years 2001-2011 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 2001-2011 were estimated by multiplying the implied emission factor estimated in (b) 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 activity data, implied CO_2 process emission factor and resulting emissions are presented in Table 4.7.

Table 4.7 ETS and non-ETS ceramics production (in Gg), implied emission factor used and CO_2 emissions (in Gg), for the period 1990 – 2011 (revised activity data causing recalculations indicated with red)

	1990	1991	1992	1993	1994	1995
Total production (Gg)	355	343	300	354	311	315
ETS production (Gg)						
Non-ETS production (Gg)						
ETS IEF ($GgCO_2$/Gg product)						
Total CO_2 emissions (Gg)	57	55	48	57	50	50

	1996	1997	1998	1999	2000	2001
Total production (Gg)	301	282	261	298	276	278

ETS production (Gg)						271
Non-ETS production (Gg)						6.3
ETS IEF ($GgCO_2$/Gg product)						0.1233
Total CO_2 emissions (Gg)	48	45	42	48	44	34

	2002	**2003**	**2004**	**2005**	**2006**	**2007**
Total production (Gg)	332	378	484	504	491	512
ETS production (Gg)	314	364	470	493	484	500
Non-ETS production (Gg)	17.9	13.7	13.6	10.8	7.8	12.0
ETS IEF ($GgCO_2$/Gg product)	0.1259	0.1599	0.1372	0.1181	0.1456	0.1384
Total CO_2 emissions (Gg)	42	60	66	60	72	71

	2008	**2009**	**2010**	**2011**
Total production (Gg)	546	356	291	223
ETS production (Gg)	533	338	282	211
Non-ETS production (Gg)	13.0	17.8	9.3	11.5
ETS IEF ($GgCO_2$/Gg product)	0.1209	0.1148	0.0733	0.0779
Total CO_2 emissions (Gg)	66	41	21	17

4.4.3. Uncertainties and time-series consistency

The uncertainty of the current category's estimations is quite low (2% for EF and AD), since the emissions are plant-specific and the reports of the emissions are being verified by accredited verifiers.

4.4.4. Source-specific QA / QC and verification

Quality control and source-specific quality control is carried out based on the principles of inventory Quality Assurance / Quality Control (QA/QC) plan (section 1.6). Verified emissions are available for the majority of the emissions of the source, since 8 of the 9 installations operating are participating in the EU-ETS.

4.4.5. Source-specific recalculations

Recalculations have been caused by revised activity data which included the production from the non-ETS installation (see section 4.4.2). The changes in the activity data and the emissions were for the years 2001, 2004, 2005, 2009 and 2010. The emissions and difference caused to the emissions submitted in NIR2012 is presented in Table 4.8.

Table 4.8 Recalculations of emissions from ceramics production for the years 2001, 2004, 2005, 2009 and 2010

	2011	**2004**	**2005**	**2009**	**2010**
NIR 2012 (Gg CO_2 eq.)	29.8	63.2	55.2	40.8	20.7
NIR 2013 (Gg CO_2 eq.)	34.2	66.4	59.5	40.9	21.4
% difference	*15.1%*	*5.1%*	*7.9%*	*0.3%*	*3.3%*

4.4.6. Source-specific planned improvements

No improvements are planned for the emissions from ceramics production (2F7.2).

4.5. Consumption of Halocarbons and SF_6 (CRF source category 2F)

4.5.1. Source category description

According to the IPCC Good Practice Guidance there are five categories accounting for emissions from the use of ozone depleting substances (ODS) substitutes. 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, in some cases the estimations presented hereafter involve the application of country specific methodologies.

Table 4.9 shows the contribution from each subcategory to the total emissions from ODS substitutes. Emissions in 2011 (Table 4.10) accounted for 18% of total GHG emissions from Industrial processes and for 1.2% of total national emissions (without LULUCF). Emissions of each gas are presented in Table 4.11.This is the first time an attempt is made to estimate emissions from other sources than refrigeration and air-conditioning. Further details will be provided in the sections that follow. The large increase that occurs between 2011 and the previous years of the inventory are predominately caused by (a) availability of additional activity data (b) estimates of sources that have not been previously made.

Table 4.9 The contribution of halocarbons and SF6 consumption sources in 2011

Source	% contribution
2F1. Refrigeration and air-conditioning equipment	98.92%
2F2. Foam blowing	1.01%
2F4. Aerosols/ metered dose inhalers	0.002%
2F8. Electrical equipment	0.07%

Table 4.10 Actual F-gases emissions from consumption of halocarbons and SF6 (2F) for the period 1999-2011 (t CO_2 eq.)

	1999	2000	2001	2002	2003
2F1. Refrigeration and air-conditioning equipment	19356	19328	18405	18697	19085
2F2. Foam blowing					
2F3. Fire extinguishers					
2F4. Aerosols/ metered dose inhalers			0.0039	0.0038	0.0036
2F8. Electrical equipment		10.58	10.97	11.58	11.69

	2004	2005	2006	2007	2008
2F1. Refrigeration and air-conditioning equipment	19638	20265	22140	23728	24857
2F2. Foam blowing		1895	1769	1885	1422
2F3. Fire extinguishers		19.10	11.37	1.40	1.40
2F4. Aerosols/ metered dose inhalers	1.21	1.97	2.91	2.50	3.90
2F8. Electrical equipment	68.27	72.46	76.54	80.50	85.69

	2009	2010	2011
2F1. Refrigeration and air-conditioning equipment	39133	55144	125347
2F2. Foam blowing	1211	1251	1284
2F3. Fire extinguishers			
2F4. Aerosols/ metered dose inhalers	1.92	1.90	1.95

2F8. Electrical equipment	73.01	84.87	87.11

Table 4.11 Actual F-gases emissions by gas from 2F1 during the period 1999-2011

	1999	2000	2001	2002	2003
HFC-32 (kg)		13	41	85	143
HFC-125 (kg)	196	26	83	169	286
HFC-134a (kg)	14466	14805	13959	13976	13994
HFC-143a (kg)					
HFC-227ea (kg)			0.00012	0.00012	0.00011
HFC-245ca (kg)					
Unspecified mix of HFCs (Gg CO_2 eq.)					
SF6 (kg)		0.0004	0.0005	0.0005	0.0005
Total (Gg CO_2 eq.)	19.4	19.3	18.4	18.7	19.1

	2004	2005	2006	2007	2008
HFC-32 (kg)	216	306	586	826	985
HFC-125 (kg)	433	612	1172	1652	1970
HFC-134a (kg)	14067	14120	14217	14284	14389
HFC-143a (kg)					
HFC-227ea (kg)	0.03781	6.720	4.079	0.632	0.659
HFC-245ca (kg)		3.751	3.502	3.732	2.816
Unspecified mix of HFCs (Gg CO_2 eq.)		1.890	1.765	1.881	1.419
SF6 (kg)	0.0029	0.0030	0.0032	0.0034	0.0036
Total (Gg CO_2 eq.)	19.6	22.2	23.9	25.6	26.3

	2009	2010	2011
HFC-32 (kg)	1671	2345	8977
HFC-125 (kg)	4536	7092	20060
HFC-134a (kg)	15370	17678	23800
HFC-143a (kg)	1412	2838	8528
HFC-227ea (kg)	0.106	0.107	0.110
HFC-245ca (kg)	2.398	2.476	2.541
Unspecified mix of HFCs (Gg CO_2 eq.)	1.209	1.248	1.281
SF6 (kg)	0.0031	0.0036	0.0036
Total (Gg CO_2 eq.)	40.3	56.4	126.6

4.5.2. Methodological issues

The methodologies followed for the estimation of the presented emissions are distinguished into two types, (i) the methodology followed for Refrigeration and air-conditioning equipment (2F1) and (ii) the methodology followed for Foam blowing (2F2), Aerosols/ metered dose inhalers (2F4) and Electrical equipment (2F8).

4.5.2.1 Refrigeration and air-conditioning equipment (2F1)

F-gases emissions from Refrigeration and air-conditioning equipment (2F1) were estimated according to the Tier 2a methodology described in the IPCC Good practice Guidance. This is a bottom-up approach based on detailed equipment data and emission factors representing various types of leakage per equipment category.

No product manufacturing of refrigeration or air-conditioning equipment takes place in Cyprus therefore the assembly emissions are considered 0. Similarly, no equipment is exported, thus export emissions are also considered 0. Actual emissions in the case of Cyprus include operation emissions that include annual leakage from equipment stock in use (regardless of where they were manufactured) as well as servicing emissions.

Some data is available on the disposal of units containing f-gases; however it is associated with very high uncertainty and was not used for the estimation of Disposal emissions.

The equation applied for the estimation of emissions during operation is the following:

$$E_0 = \left(\sum_{t_0}^{\tau}(IMP)_t \times CH\right) \times x \qquad [13]$$

where E_0 is emissions during operation, CH is the initial charge, t_0 is the year of F-gases introduction in the market, τ is the current year, IMP is imports and x is the leakage rate during operation.

Assembly emissions are related to the number of units produced in the country (domestic production) that use F-gases as refrigerants, the amount of refrigerant used per unit and the losses during assembly. Assembly emissions are not applicable to Cyprus. Operation emissions are related to the total number of equipment with F-gases as refrigerant (imports) and the leakage rate per equipment type. Disposal emissions depend on the available amount of refrigerant in the equipment, as well as on the existence of disposal practices. Some data is available on the disposal of units containing f-gases; however it is associated with very high uncertainty and was not used for the estimation of Disposal emissions.

According to information from the inspectors implementing the EU regulations, there are several large systems in operation in Cyprus, of which the exact number and capacity are not known. These large systems are assembled in Cyprus. However, no information is currently available to allow the inclusion of these systems in the current submission.

According to information received from technicians installing refrigerators, the "machines for food" there were included in previous submissions, do not take and f-gas charge, since they are part of a bigger installation. Therefore, they have been removed from the inventory. This change has caused a reduction in the estimated emissions compared to previous submissions.

The sources of emissions included in the category refrigeration and air conditioning equipment, are presented in Table 4.12.

Table 4.12 Equipment included in the category refrigeration and air-conditioning equipment (2F1)

Domestic Refrigeration	A1 Household refrigeration
	A2 Refrigerators/freezers
Commercial refrigeration	B1 Freezers chest type
	B2 Venting machines
Transport refrigeration	C1 Refrigerated Transport (Land)
Industrial refrigeration	D1 Industrial Refrigeration
Stationary air conditioning	E1 Large Stationary AC
	E2 Residential and Commercial A/C (split units)
Mobile air conditioning	F1 Passenger cars/tractors/trailers
	F2 Buses/public transport

Domestic Refrigeration

Household refrigeration: Import of household refrigerators used for 2005 – 2011 have been obtained by the import statistics (National Statistical Service). For 2000, it was assumed that each household had a refrigerator. Number of households were also obtained from the National Statistical Service. For 2001-2004 it was assumed that each household had two refrigerators, to also account for refrigerators in offices, shops, hotel rooms and holiday apartments and the resulting annual difference in number of units was assumed as imports.

Refrigerators/ freezers: Import of refrigerators/freezers used for 2005 – 2011 have been obtained by the import statistics (National Statistical Service). For 2000-2004, it was assumed that each household had a refrigerator/ freezer. The resulting annual difference in number of units was assumed as imports.

Commercial refrigeration

Freezers chest type: Imports of freezers chest type used for 2005 – 2011 have been obtained by the import statistics (National Statistical Service). For 2000-2004 the trend of imports for 2005-2011 was used to estimate the imports of the respective years.

Vending machines: Imports of vending machines used for 2005 – 2011 have been obtained by the import statistics (National Statistical Service). No trend in imports was apparent to use the trend for 2000-2004 estimation of imports, therefore no data available before 2005.

Transport refrigeration

Refrigerated Transport (Land): no data available on refrigerated land transport, other than the model developed for a European Commission contract "ICF International approach for developing an Excel-based inventory model of ozone depleting substances (ODS) and certain fluorinated greenhouse gases (F-gases) banked in products and equipment in the EU-27"[7] (from now on the ICF model) which provided an estimation on equipment in operation for 2009 to 2011.

Industrial Refrigeration

Industrial Refrigeration: no data available on industrial refrigeration, other than the ICF model which provided an estimation on equipment in operation for 2009 - 2011.

Stationary air conditioning

Large Stationary AC: data available on industrial refrigeration, other than the ICF model which provided an estimation on equipment in operation for 2009 - 2011.

Residential and Commercial A/C (split units):Imports of split units used for 2005 – 2011 have been obtained by the import statistics (National Statistical Service). For 2000-2004 the trend of imports for 2005-2010 was used to estimate the imports of the respective years.

Mobile air conditioning

Passenger cars/ tractors/ trailers: Imports of vehicles used for 2005 – 2011 have been obtained by the import statistics (National Statistical Service). For 1999 – 2004 the transport statistics were used to obtain annual numbers on registered vehicles. The annual number of registered vehicles was assumed to be the total units in operation.

[7] European Commission contract No. 070307/2008/59717/MAR/C4

Buses/public transport: Imports of vehicles used for 2005 – 2011 have been obtained by the import statistics (National Statistical Service). For 1999 – 2004 the transport statistics were used to obtain annual numbers on registered vehicles. The annual number of registered vehicles was assumed to be the total units in operation.

The total number of units in operation of each type of equipment is presented in Table 4.13. It should be noted again, that neither domestic production nor exports take place in Cyprus. Where data is available from national statistics and ICF model (e.g. mobile air conditioning), it has been noticed that the data from the model has a large difference from the national actual data. However, due to lack of data from national statistics, the ICF model data was used to provide an estimation of emissions.

Table 4.13 Refrigeration and air conditioning equipment in operation for the years 2000-2011 (Total units)

	2000	2001	2002	2003
Domestic Refrigeration				
A1 Household refrigeration	448600	458000	466000	477600
A2 Refrigerators/freezers	224300	229000	233000	238800
Commercial refrigeration				
B1 Freezers chest type	4181	9133	14857	21352
B2 Venting machines				
Transport refrigeration				
C1 Refrigerated Transport (Land)				
Industrial refrigeration				
D1 Industrial Refrigeration				
Stationary air conditioning				
E1 Large Stationary AC				
E2 Residential & Commercial A/C	21830	68790	140880	238100
Mobile air conditioning				
F1 Passenger cars/tractors/trailers	290116	298242	310801	327730
F2 Buses/public transport	8060	3171	3213	3243

	2004	2005	2006	2007
Domestic Refrigeration				
A1 Household refrigeration	495400	525400	597400	669400
A2 Refrigerators/freezers	247700	298876	344876	347876
Commercial refrigeration				
B1 Freezers chest type	28619	37893	47893	54893
B2 Venting machines		405	1504	2147
Transport refrigeration				
C1 Refrigerated Transport (Land)				
Industrial refrigeration				
D1 Industrial Refrigeration				
Stationary air conditioning				
E1 Large Stationary AC				
E2 Residential & Commercial A/C	360450	510072	976739	1376739
Mobile air conditioning				
F1 Passenger cars/tractors/trailers	351210	393710	463710	561710
F2 Buses/public transport	3556	3551	3691	3841

	2008	2009	2010	2011
Domestic Refrigeration				
A1 Household refrigeration	731400	783400	818900	842690
A2 Refrigerators/freezers	389876	429876	450676	473876
Commercial refrigeration				
B1 Freezers chest type	63393	74893	88393	94636
B2 Venting machines	5347	7818	8618	9233
Transport refrigeration				
C1 Refrigerated Transport (Land)		1070	2203	3478
Industrial refrigeration				
D1 Industrial Refrigeration		27	54	171
Stationary air conditioning				
E1 Large Stationary AC		195	402	620
E2 Residential & Commercial A/C	1641850	1828739	1938961	2043985
Mobile air conditioning				
F1 Passenger cars/tractors/trailers	616710	653710	690710	717940
F2 Buses/public transport	4011	4061	4361	4439

The assumptions applied for the estimation of actual emissions from Refrigeration and air conditioning equipment are presented in Table 4.14.

For the current submission new data was also available from the Union of refrigeration technicians on the charge and type of gases used for each type of equipment. The charge was changed for estimations of 1999-2010, while the gases used were changed only for 2011, since it is strongly related to the regulations that are applied in each year.

Table 4.14 Assumptions used for the estimation of HFC emissions

Equipment	Charge (g)	Annual leakage rate	lifetime (yrs.)
A1 Household refrigeration	150 [a]	1%	15
A2 Refrigerators/freezers	150 [a]	1%	15
B1 freezers chest type	150 [a]	1%	15
B2 Vending machines	500 [a]	1%	15
C1 Refrigerated Transport (Land)	4500 [b]	12.50%	12
D1 Industrial Refrigeration	850000 [b]	10%	15
E1 Large Stationary AC	210000 [b]	10%	10
E2 Residential and Commercial A/C (split units)	1000 [a]	1%	15
F1 Passenger cars/tractors/trailers	450 [a]	10%	11
F2 Buses/public transport	1750 [a]	10%	15

[a] according to information provided by the Union of refrigeration technicians
[b] according to assumption used in ICF model

Equipment	2000 – 2010			2011			
	R134a	R404	R407	R134a	R404	R407	R410
A1 Household refrigeration	30%			30%	10%		
A2 Refrigerators/freezers	40%			40%	40%		
B1 freezers chest type	40%			30%	60%		
B2 Vending machines	100%			50%			
C1 Refrigerated Transport (Land)	30%	70%		30%	70%		
D1 Industrial Refrigeration		100%			100%		
E1 Large Stationary AC	30%		70%	30%		70%	

E2 Residential and Commercial A/C (split units)		30%		50%	50%
F1 Passenger cars/tractors/trailers	100%		100%		
F2 Buses/public transport	100%		100%		

The results obtained for the emissions from Refrigeration and air-conditioning equipment (2F1) are presented in Table 4.15.

4.5.2.2 Foam blowing (2F2), Aerosols/ metered dose inhalers (2F4) and Electrical equipment (2F8)

The current submission is the first time for which emissions from the sources of Foam blowing (2F2), Aerosols/ metered dose inhalers (2F4) and Electrical equipment (2F8) have been estimated. The estimation was made following the methodology presented below:

(a) The average EU emissions from the source of Foam blowing (2F2) and the average emissions of Malta and Greece were estimated for Aerosols/ metered dose inhalers (2F4) and Electrical equipment (2F8) for the years for which data was available.
(b) The average emissions were divided by the population of the country to provide emissions per 100 000 inhabitants for the given source, and multiplied by the population of Cyprus to estimate the total emissions for the source for the given year.
(c) The total emissions were broken down into specific mixtures used according to the information provided by the national expert[8].
(d) The emissions were converted from Gg CO2 eq. to kg using the GWPs in Table 1.3.

For foam blowing the EU average emissions are used for the estimation since the process does not change between climates (and therefore MS). The other sources are considered to be affected by the economic activities and the climatic conditions of the countries, therefore the Malta – Greece average was preferred. Since the NIR2012 estimations were used, 2011 emissions were based on 2010 emissions.

The assumptions used for gases used for 2F2 and 2F4 are presented in Table 4.15, while Table 4.16 presents the emissions per 100000 inhabitants used, the population of Cyprus, the total emissions per year for the source and the resulting emissions per gas.

Table 4.15 Assumptions used for breakdown of the total emissions to gases according to the national expert

2F2	2F4
10% x 40% 227ea	30% 227ea
90% x 40% *unspecified mix of HFCs*	70% R134a
40% R134a	
20% R245ca	

4.5.3. Uncertainties and time-series consistency

The uncertainty related to emissions from ODS substitutes is characterized by high values. This issue to the fact that both activity data and the emission factor estimates are quite uncertain.

Moreover, where data is available from national statistics and ICF model (e.g. mobile air conditioning), it has been noticed that the data from the model has a large difference from

[8]Mr. Pavlos Pavlou

the national actual data. However, due to lack of data from national statistics, the ICF model data was used to provide an estimation of emissions.

Additional large sources of uncertainty are the assumptions used for (a) charge, (b) lifetime and (c) leakage rate (e.g. cars and buses assumed to have the same charge, lifetime and leakage).

Furthermore, there are many imports during the recent years that have replaced by equipment using R-600. However, there is no information on the actual imports of this equipment and our estimations are relied on personal experience of experts.

As regards to time-series consistency, the methodology used is the same for the whole time series for which data was available or was possible to estimate. Even though an increasing trend is realistic, due to the improvement of the social conditions, the observed trend is not pragmatic, due to the large deficiencies in data.

Table 4.16 Emissions per 100000 inhabitants used, the population of Cyprus, the total emissions per year for the source and the resulting emissions per gas, 2000-2011

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Cyprus population	690.4	705.5	713.7	722.9	733.0	744.0	757.9	776.4	796.9	819.1	839.8	862.0
2F2 Emissions												
Emissions /100 000 inhabitants, 2F2 - EU average (Gg CO_2 eq)						0.71	0.65	0.67	0.49	0.41	0.41	
Cyprus using EU average (Gg CO_2 eq)						5.251	4.903	5.225	3.942	3.357	3.466	3.558
R227ea emissions, kg						0.072	0.068	0.072	0.054	0.046	0.048	0.049
R134a emissions, kg						1.454	1.358	1.447	1.092	0.930	0.960	0.985
R245ca emissions, kg						3.751	3.502	3.732	2.816	2.398	2.476	2.541
Unspecified mix of HFCs, Gg CO_2 eq.						1.89	1.77	1.88	1.42	1.21	1.25	1.28
2F4 Emissions												
Emissions /100 000 inhabitants, 2F2 - GR-MT average (Gg CO_2 eq)		0.001	0.001	0.001	0.374	0.601	0.873	0.732	1.112	0.532	0.515	
Cyprus using GR-MT average (Gg CO_2 eq)		0.009	0.009	0.008	2.741	4.471	6.620	5.682	8.864	4.356	4.325	4.439
R227ea emissions, kg		0.0001	0.0001	0.0001	0.0378	0.062	0.091	0.078	0.122	0.060	0.060	0.061
R134a emissions, kg		0.0027	0.0027	0.0025	0.8434	1.376	2.037	1.748	2.727	1.340	1.331	1.366
2F8 Emissions												
Emissions /100 000 inhabitants, 2F2 - GR-MT average (Gg CO_2 eq)	0.002	0.002	0.002	0.002	0.009	0.010	0.010	0.010	0.011	0.009	0.010	
Cyprus using GR-ML average (Gg CO_2 eq)	0.011	0.011	0.012	0.012	0.068	0.072	0.077	0.081	0.086	0.073	0.085	0.087
SF6, kg	0.0004	0.0005	0.0005	0.0005	0.0029	0.0030	0.0032	0.0034	0.0036	0.0031	0.0036	0.0036

4.5.4. Source-specific QA / QC and verification

Data quality assessment was performed using the data available from the ICF model. Additional statistical data was available for vehicle registrations, which was chosen instead of imports or data from the model.

4.5.5. Source-specific recalculations

Recalculations have been caused by:

(a) Change of charge and gases used according to new country specific data (Table 4.14)
(b) Estimation of emissions by sources other than refrigeration and air-conditioning (2F1) equipment that was the only sector for which emissions were estimated in previous submissions.
(c) Revision of split units imports data
(d) Machines for food excluded from the equipment for which emissions were estimated.

The results of the above changes are presented in Table 4.17.

Table 4.17 Recalculations of emissions from consumption of halocarbons and SF6 for 2000-2010

	2000	2001	2002	2003	2004	2005
NIR 2012 (Gg CO_2 eq.)	20.1	21.8	24.2	27.6	31.6	36.9
NIR 2013 (Gg CO_2 eq.)	18.4	18.7	19.1	19.6	22.2	23.9
% difference	-8.4%	-14.2%	-21.2%	-28.7%	-29.8%	-35.1%

	2006	2007	2008	2009	2010
NIR 2012 (Gg CO_2 eq.)	44.3	54.0	65.1	152.2	233.6
NIR 2013 (Gg CO_2 eq.)	25.6	26.3	40.3	56.4	126.6
% difference	-42.2%	-51.3%	-38.0%	-63.0%	-45.8%

4.5.6. Source-specific planned improvements

In order to resolve completeness issues, and given the fact that there has not been any opposite indication for the use of the PFCs in Fire Extinguishers and f-gases in foams and Solvent Uses up to now, information from inventories of neighbouring countries will be used as source for activity data assumptions. To this end, the inventory of Malta will be used, on the grounds that the climatic and socio-economic conditions between Malta and Cyprus are quite similar. Moreover, the time series activity data for the refrigeration and air conditioning equipment that have already been estimated should be improved.

4.6. Consumption of Halocarbons and SF_6 Potential emissions (CRF source category 2FP)

4.6.1. Source category description

Emissions from Consumption of Halocarbons and SF_6 can be estimated in two ways; as potential emissions, Tier 1 (a and b), and as actual emissions, Tier 2. In the previous section the calculations for actual emissions were described. Here the potential emissions are assessed.

Bulk imports of gases estimated for 1994-2011 are presented in Table 4.18. Bulk import of gases in products estimated for 2005 to 2011 are presented in Table 4.19.

Table 4.18 Imports of bulk HFC mixtures (t), 1994-2011

Tons	HFC-32	HFC-125	HFC-134a	HFC-143a	HFC-227ea	SF6
1994			19.00			
1995						
1996			7.46			
1997						
1998						
1999			13.32			
2000			21.19			
2001			40.75			
2002	0.33	0.94	4.83	0.65		
2003	0.33	0.93	12.04	0.65		
2004	0.30	0.86	14.29	0.60		
2005	0.58	1.67	122.39	1.16		
2006	0.22	0.64	68.88	0.44		
2007	0.09	0.26	0.05	0.18		
2008			1.18			
2009	6.50	49.20	24.99	47.94		
2010	21.44	65.04	72.93	41.61	1.95	3.03
2011	22.48	69.36	71.56	38.93	1.62	2.40

Table 4.19 Bulk import of HFC gases in products (t), 2005-2011

Tons	2005	2006	2007	2008	2009	2010	2011
HFC-32	61.35	191.33	164.00	108.70	76.62	45.19	43.06
HFC-125	70.32	219.33	188.00	124.60	87.84	51.80	49.36
HFC-134a	42.77	95.32	96.87	64.72	46.13	46.05	29.41

4.6.2. Methodological issues

Potential emissions of a certain chemical are equal to the amount of virgin chemical consumed in the country minus the amount of chemical recovered for destruction or exported in the year under consideration. All chemicals consumed will eventually be emitted to the atmosphere over time if not destroyed, and in the long term (e.g., 50 yr.), potential emissions will equal actual emissions.

The calculation formula for the basic method (Tier 1) is as follows:

Potential Emissions = Production + Imports - Exports - Destruction [14]

There are two versions of Tier 1 (a and b) depending upon whether HFCs/PFCs in products are taken into account. The Tier 1b methodology is preferred since the relevant data are available, which includes both the HFCs imported in bulk and in products. No production or exports of HFC/PFC in bulk or products take place in Cyprus therefore the production and export parameters are assumed 0. The resulting calculation is the following:

Imports = Imported chemical in bulk + quantity of chemical imported in HFC/PFC containing products

<u>Bulk imports</u>

Data for 1994 to 2008 was obtained from imports statistics for codes 2903 30 80, 3824 90 99 and 3824 71 00 (Table 4.20).Import statistics in the EU can only be certain for imports from third countries (non-EU members), since there is no obligation of reporting transport of goods between EU member states. Therefore at the moment, there is a large uncertainty associated with the transport of equipment or gases from other EU member states. The breakdown of import codes to compound mixtures were based on estimations from the association of refrigeration. Any data provided by the association of refrigeration, is provided voluntarily and there is no way to verify the completeness or accuracy of the data. It was assumed that all 2903 30 80 is R134a, 3824 90 99 imports consist of 59.8% R404, 14.7% of R407 and 25.5% of R410. 3824 71 00 it was assumed to be in total R408.

In 2009 bulk imports were 0 in imports statistics but data was available from the association of refrigeration. Therefore for 2009 - 2011 data provided voluntarily from the association of refrigeration was used and not the import statistics (Table 4.21).

The composition of mixtures used to estimate the emission of each gas is presented in Table 4.22.

Table 4.20 Imports of bulk HFC mixtures (t), 1994-2008 (Statistical Service)

	Bulk imports (t) of HFC mixtures		
Year	**2903 30 80**	**3824 90 99**	**3824 71 00**
1994	19.00		
1995			
1996			13.56
1997			
1998			
1999	13.32		
2000	21.19		
2001	40.68		0.12
2002	4.66	2.09	1.86
2003	11.87	2.08	1.85
2004	14.13	1.92	33.86
2005	122.09	3.72	52.61
2006	68.76	1.43	17.35
2007		0.57	
2008			2.14

Table 4.21 Imports of bulk HFC mixtures (t), 2009-2010 (importers)

Mixtures	**2009 (t)**	**2010 (t)**	**2011 (t)**
R134a	18.1	60.3	56.98
R227ea		1.95	1.62
R404	92.2	77.8	72.93
R407	5	19.1	11.22
R408		0.01	
R409		0.14	0.029
R410	11	33.2	38.67
R413	0.12		
R417	0.12		
R422d	0.12	1.75	7.33
R424a		1.75	7.9
R434a		6.4	5.6
R507	2	1	2.3
SF6		3.03	2.4

Table 4.22 Composition of f-gas containing mixtures

Mixture	HFC-32	HFC-125	HFC-134a	HFC-143a	HFC-227ea	Other
R134a			100%			
R227ea					100%	
R404		44%	4%	52%		
R407	20%	40%	40%			
R408			55%			+45% R22
R410	50%	50%				
R413			88%			
R417		46.6%	50%			+9% R218, +3% R600
R422d		65.1%	31.5%			+3.4% R600
R424a		50.5%	47%			+3.4% isobutane
R434a	16%	63%		18%		+2.5% other gas
R507		50%	50%			+2.8% isobutane

<u>Bulk imports in products</u>

The imports of products used for the estimation of potential emissions from bulk imports of gases in products are presented in Table 4.23. Data that was considered accurate was only available for 2005 to 2011. Assumptions on charge are the same as Table 4.14.

Table 4.23 Product imports containing f-gases

Product imports	2005	2006	2007	2008	2009	2010	2011
Tractors/trailers	734	947	760	975	671	800	3387
Public transport (buses)	104	140	150	170	50	300	78
Cars[1]	42500	70000	98000	55000	37000	37000	27230
Refrigerators-freezers	51176	46000	3000	42000	40000	20800	23200
Household refrigerators	30000	72000	72000	62000	52000	35500	23790
Freezers (chest type)	9274	10000	7000	8500	11500	13500	6243
Air-conditions (units)	149622	466667	400000	265111	186889	110222	105024
Beverage/Vending machines	405	1099	643	3200	2471	800	615

[1] assumed that all are passenger cars

4.6.3. Uncertainties and time-series consistency

Import statistics in the EU can only be certain for imports from third countries (non-EU members), since there is no obligation of reporting transport of goods between EU member states. Therefore at the moment, there is a large uncertainty associated with the transport of equipment or gases from other EU member states. The breakdown of import codes to compound mixtures were based on estimations from the association of refrigeration. Any data provided by the association of refrigeration, is provided <u>voluntarily</u> and there is no way to verify the completeness or accuracy of the data.

4.6.4. Source-specific QA / QC and verification

Import statistics in the EU can only be certain for imports from third countries (non-EU members), since there is no obligation of reporting transport of goods between EU member states. Therefore at the moment, there is a large uncertainty associated with the transport of equipment or gases from other EU member states. The breakdown of import codes to compound mixtures were based on estimations from the association of refrigeration. Any data provided by the association of refrigeration, is provided voluntarily and there is no way to verify the completeness or accuracy of the data.

4.6.5. Source-specific recalculations

Recalculations were made due to the new charge provided by the union of refrigeration technicians. Moreover, the machines for food were removed from the equipment that is considered to be charged with halocarbons. The resulting changes are presented in Table 4.24.

Table 4.24 Recalculations of emissions from 2FP HFCs for 2005-2010

	2005	2006	2007	2008	2009	2010
NIR 2012 (Gg CO_2 eq.)	219	145	131	84	415	510
NIR 2013 (Gg CO_2 eq.)	457	954	760	505	712	689
% difference	*109%*	*557%*	*480%*	*499%*	*72%*	*35%*

4.6.6. Source-specific planned improvements

Different sources of data will be investigated to increase data availability for bulk imports of f-gases and therefore the estimation of the potential emissions.

Chapter 5: Solvent and other product use (CRF sector 3)

Most solvents are part of a final product, e.g. paint, and will sooner or later evaporate to the atmosphere. This evaporation of solvent and other products containing volatile organic compounds represents a major source of NMVOC emissions that, once released into the atmosphere, will react with reactive molecules (mainly HO-radicals) or high energetic light to finally form CO_2. This sector also includes evaporative emissions of greenhouse gases arising from other types of product use (e.g. N_2O emissions from medical use).

According to the IPCC Guidelines, the following source categories are included in this sector:

- Paint application
- Degreasing and Dry Cleaning
- Chemical products, manufacture and processing
- Other, including use of other products as well as uses of solvents not listed above.

This category pertains mainly to NMVOC emissions resulting from the use of solvents and other products containing volatile compounds.

According to the Revised IPCC 1996 guidelines, “no methods for the calculation of greenhouse gases from solvent and other product use are included in the phase I version of the workbook”.

Therefore all data submitted in previous reports under this sector with the exception of NMVOCs has been changed to NE, due to lack of method.

Chapter 6: Agriculture (CRF sector 4)

6.1. 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 (4A)
- Manure management (4B)
- Rice cultivation (4C)
- Agricultural soils (4D)
- Prescribed burning of savannahs (4E)
- Field burning of agricultural residues (4F)

In Cyprus, activities 4C (rice cultivation) and 4E (prescribed burning of savannahs) do not take place and are therefore reported as NO.

6.1.1. Emission trends

Emissions from Agriculture accounted for 8% of total emissions in 2011 (without LULUCF), and increased by approximately 7.5% compared to 1990 levels (Figure 6.1). The peak of Agriculture emissions was in 2002 when an in increase of 26% 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 fertilizers. 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. GHG emissions estimated from Agriculture in the current submission have been recalculated after the recommendations of 2012 TERT review[9]. Agriculture is responsible for methane and nitrous oxide emissions. Emissions per gas from agriculture in Cyprus are presented in Table 6.1.

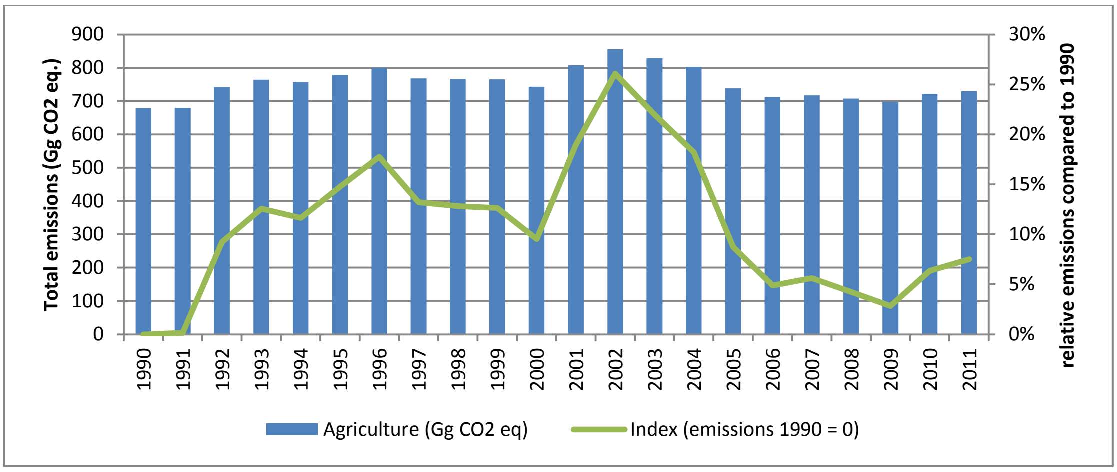

Figure 6.1. Total GHG emissions (in Gg CO_2 eq) from Agriculture for the period 1990 – 2011

[9] Umweltbundesamt GmbH, Final report of the 2012 technical review of the greenhouse gas emission inventory of Cyprus to support the determination of annual emission allocation under Decision 406/2009/EC, version 3, 17 August 2012

Table 6.1 GHG emissions (in Gg CO_2 eq) per gas from Agriculture, for the period 1990 – 2011

Gg CO_2 eq.	1990	1991	1992	1993	1994	1995
CH_4	257	260	278	294	291	302
N_2O	422	420	464	471	467	477
Total	679	680	742	764	758	779

Gg CO_2 eq.	1996	1997	1998	1999	2000	2001
CH_4	311	303	299	297	297	324
N_2O	488	465	467	468	447	484
Total	799	769	766	765	744	808

Gg CO_2 eq.	2002	2003	2004	2005	2006	2007
CH_4	345	331	329	305	301	302
N_2O	511	498	474	433	411	415
Total	856	828	803	738	712	717

Gg CO_2 eq.	2008	2009	2010	2011
CH_4	306	305	314	314
N_2O	402	393	408	416
Total	708	698	722	730

The contribution of each source to the total emissions of agriculture is presented in Figure 6.2. Nitrous oxide represents the main GHG from Agriculture, with a contribution ranging from 56% to 63%. Nitrous oxide emissions in 2011 decreased by 1.4% compared to 1990 levels. The source with most emissions is agricultural soils (4D), which contributed 36% in 2011 compared to 42% in 1990.

Manure management in 2011 contributed 38% to the emissions of the sector and enteric fermentation 26%. The changes between 1990 and 2011 are presented in Figure 6.2.

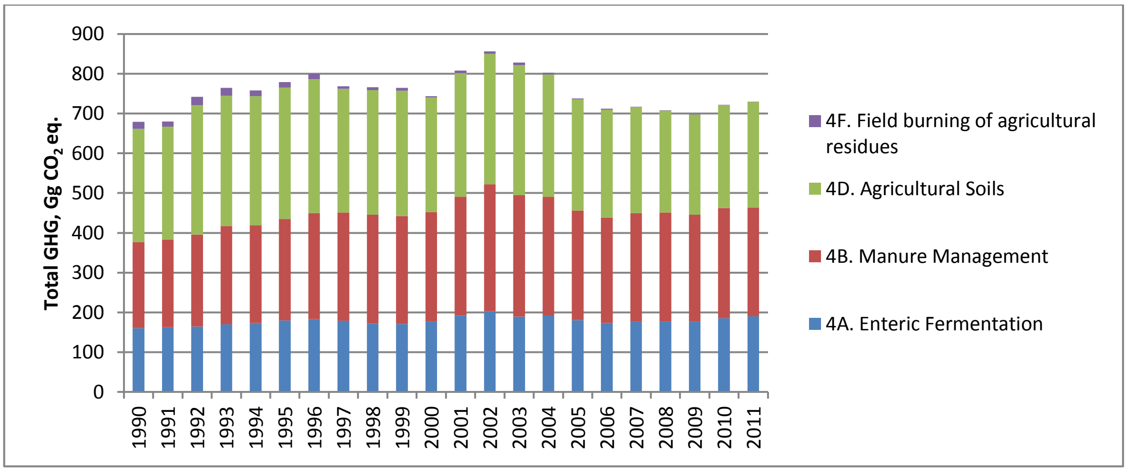

Figure 6.2. GHG emissions (in Gg CO_2 eq) from Agriculture per source category, for the period 1990-2011

6.1.2. Methodology

The calculation of GHG emissions from Agriculture is based on the methodologies and emission factors suggested by the IPCC Guidelines and the IPCC Good Practice Guidance. Data used for the estimation on emissions was obtained from the National Statistical Service. Tier 1 method with default revised IPCC 1996 emission factors are used for all calculations.

Key categories

The key categories identified are presented in Section 1.5.

Uncertainty

The results of the uncertainty analysis undertaken for the Cypriot GHG emissions inventory are presented in Section 1.7, while the detailed calculations are presented in Annex II.

6.1.3. Completeness

Table 6.2 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 6.2 Agriculture – Inventory completeness

Source category	CO_2	CH_4	N_2O
4A. Enteric fermentation		✓	
4B. Manure management		✓	✓
4C. Rice cultivation		NO	
4D. Agricultural soils		NE	✓
4E. Prescribed burning of savannahs		NO	NO
4F. Field burning of agricultural residues		✓	✓

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

6.2. Enteric Fermentation (CRF source category 4A)

6.2.1. 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 methodology. 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.

Methane emissions from enteric fermentation in 2011 account for 26% of total GHG emissions from Agriculture, 2.1% of total national emissions excluding LULUCF and 21% of the total methane emissions excluding LULUCF. Methane emissions from enteric fermentation are presented in Table 6.3 in both Gg of methane and Gg CO_2 eq.

Table 6.3 CH_4 emissions from enteric fermentation (Gg) for 1990 – 2011

CH_4 emissions	1990	1991	1992	1993	1994	1995	1996	1997
Gg CH_4	7.651	7.772	7.814	8.110	8.247	8.563	8.699	8.513
Gg CO_2 eq.	161	163	164	170	173	180	183	179

CH_4 emissions	1998	1999	2000	2001	2002	2003	2004	2005
Gg CH_4	8.195	8.150	8.387	9.126	9.655	9.030	9.188	8.594
Gg CO_2 eq.	172	171	176	192	203	190	193	180

CH_4 emissions	2006	2007	2008	2009	2010	2011
Gg CH_4	8.265	8.396	8.451	8.430	8.837	9.070
Gg CO_2 eq.	174	176	177	177	186	190

6.2.2. Methodological issues

Methane emissions from the enteric fermentation have been estimated according to the Tier 1 IPCC methodology. 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 number of animals used for the calculation of methane emissions is the annual average and it is presented in Table 6.4.The methane emission factors used for enteric fermentation were according to the Revised IPCC 1996 guidelines (Reference Manual pg. 4.10 - 4.11, Tables 4-3 and 4-4) and are presented in Table 6.5. Particularly difficult was the choice of emission factor for cattle: the average annual milk production per cow for 2010 was 6440 kg/head/yr.[10] which is similar to the average milk production for North America (6700kg/head/yr.), whereas the description of the sector is more similar to Western Europe.

The animal population used for the estimation of the emissions is presented in Table 6.4. The 2010 animal populations that are in red, have been revised compared to the NIR2012. No animal population is available for mules and asses therefore no emissions associated with the particular animal species have been estimated.

Table 6.4 Animal population in 1000s for 1990 – 2011

Specie	1990	1991	1992	1993	1994	1995	1996	1997
Dairy cattle	22.4	23.1	23.9	25.6	27.6	29.5	27.3	25.5
Non-dairy cattle	32.3	31.9	31.9	35.5	36.8	38.6	42.8	36.9
Sheep	290.0	295.0	285.0	275.0	255.0	250.0	252.0	245.0
Goats	205.0	205.0	200.0	198.0	210.0	220.0	240.0	302.0
Horses	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Swine	277.9	296.2	341.9	369.4	356.2	374.1	399.5	414.8
Poultry	3694	3403	3838	4551	4313	4460	4749	4816

Specie	1998	1999	2000	2001	2002	2003	2004	2005
Dairy cattle	23.8	23.8	23.5	24.4	26.2	24.6	26.1	24.6
Non-dairy cattle	32.0	30.2	30.7	29.2	32.1	33.0	34.5	33.2
Sheep	240.0	233.0	246.0	296.6	294.0	264.6	279.0	268.9
Goats	322.0	346.0	378.6	427.1	459.5	407.9	378.0	329.3
Horses	5.5	5.5	5.0	5.5	6.0	5.5	5.5	5.5
Swine	431.3	418.5	408.4	451.3	491.4	488.1	470.5	429.7
Poultry	4894	4823	4830	4873	5037	5015	4547	4419

[10] Department of Agriculture, 2011, Cattle breeding overview 2010 (Επισκόπηση αγελαδοτροφίας 2010), Ministry of Agriculture, Natural Resources and Environment

Specie	2006	2007	2008	2009	2010	2011
Dairy cattle	23.9	23.5	23.6	23.2	23.4	24.1
Non-dairy cattle	32.4	31.4	32.7	31.7	32.1	33.7
Sheep	272.2	259.4	267.3	300.2	328.9	355.9
Goats	272.2	339.0	318.4	280.8	307.4	290.2
Horses	5.5	5.0	5.0	5.0	5.0	5.0
Swine	452.6	450.3	464.9	463.4	463.7	438.9
Poultry	3775	3978	3892	3793	3793	3678

Table 6.5 Methane emission factor applied for enteric fermentation, according to animal specie

	Dairy cattle	Non-dairy cattle	Sheep	Goats	Horses	Swine	Poultry
Emission factor (kg CH_4/head)	100	48	8	5	18	1.5	NE

6.2.3. Uncertainties and time-series consistency

The results of uncertainty analysis are presented in Table 1.7. The detailed calculations of uncertainty are presented in Annex II.

6.2.4. Source-specific QA / QC and verification

Quality control and source-specific quality control is carried out based on the principles of inventory Quality Assurance / Quality Control (QA/QC) plan (section 1.6). The special procedures followed in the enteric fermentation source are:

- Cross checking information provided by the National Statistical Service and by the Department of Agriculture (Ministry of Agriculture, Natural Resources and Environment) regarding the animal population.
- Estimations were also checked with emissions trends.

6.2.5. Source-specific recalculations

The following changes have been made since the last submission for CH_4 emissions from enteric fermentation:

- The emissions for 2010 have been re-estimated for Non-Dairy Cattle, Sheep, Goats, Swine and Poultry, due to new data available for animal population.

The emissions from enteric fermentation in the current submission compared to the emissions estimated in the previous submission are presented in Table 6.6.

Table 6.6 Recalculations of CH_4 emissions from enteric fermentation2010

Enteric fermentation	2010
CH_4 (Gg) - NIR 2012	8.55
CH_4 (Gg) - NIR 2013	8.84
Difference	*+3.4%*

6.2.6. Source-specific planned improvements

The possibility of applying Tier 2 methodology for the estimation of methane emissions from the enteric fermentation is under examination.

6.3. Manure management (CRF source category 4B)

6.3.1. Source category description

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.

CH_4 and N_2O from manure management in 2011 accounted for 17% and 21% of total GHG emissions from Agriculture respectively, and for 1.3% and 1.6% of total national emissions respectively (without LULUCF). CH_4 emissions in 2011 increased by 40% compared to 1990 levels, while N_2O emissions increased by 17% compared to 1990 levels. CH_4 and N_2O emissions from manure management for the period 1990 – 2011 are presented in Table 6.7.

Table 6.7 CH_4 and N_2O emissions from manure management for the period 1990 – 2011, in Gg

	1990	1991	1992	1993	1994	1995	1996	1997
CH_4 (Gg)	4.187	4.346	4.865	5.299	5.190	5.446	5.751	5.810
N_2O (Gg)	0.414	0.412	0.418	0.439	0.440	0.455	0.472	0.486
Total (Gg CO_2 eq.)	216	219	232	247	245	256	267	273

	1998	1999	2000	2001	2002	2003	2004	2005
CH_4 (Gg)	5.891	5.733	5.642	6.098	6.596	6.523	6.338	5.859
N_2O (Gg)	0.483	0.487	0.507	0.553	0.582	0.541	0.530	0.492
Total (Gg CO_2 eq.)	273	271	276	299	319	305	297	276

	2006	2007	2008	2009	2010	2011
CH_4 (Gg)	5.981	5.968	6.122	6.075	6.101	5.877
N_2O (Gg)	0.450	0.476	0.468	0.456	0.479	0.483
Total (Gg CO_2 eq.)	265	273	274	269	277	273

6.3.2. 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 following emission factors were used for the estimation or methane from manure management (Table 6.8):

- For sheep, goats, horses and poultry, EFs for temperate developed countries were used (0.28, 0.18, 2.1 and 0.117 kg CH_4/head/yr. respectively), as indicated in Table 4-5 of therevised IPCC1996 guidelines reference manual (pg. 4.12).
- For dairy and non-dairy cattle, EFs for temperate Eastern Europe were used (19 and 13 kg CH_4/head/yr. respectively), as indicated in Table 4-6 of the reference manual (pg. 4.13).
- For swine, EF for temperate Eastern Europe were used (10 kg CH_4/head/yr.), as indicated in Table 4-6 of the reference manual (pg. 4.13).

Table 6.8 Emission factors used for the estimation of methane emissions from manure management

	kg CH_4/head/yr.
Dairy cattle	19[a]
Non-dairy cattle	13[a]
Poultry	0.117[b]
Sheep	0.28[b]
Swine	10[c]
Horses	2.1[b]

[a]Table 4-6, pg.4.13, Revised IPCC 1996 guidelines, reference manual – eastern Europe, temperate
[b]Table 4-5, pg.4.12, Revised IPCC 1996 guidelines, reference manual – developed countries, temperate
[c]Table 4-6, pg.4.13, Revised IPCC 1996 guidelines, reference manual – western Europe, temperate

The Livestock population has been already presented in Table 6.4.The distribution among waste management systems was prepared in consultation with the national experts on animal waste management[11]. The distribution among waste management systems for the period 1990-2011 is presented in Table 6.9.

Dairy, non-dairy cattle, sheep and goats are mainly stall or housed. Only for a small share of their life they are in pasture. Thus the manure produced from them is mainly managed in Solid storage and dry lot systems. The majority of swine in Cyprus remain in properly designed building infrastructures and their manure is mainly managed with liquid systems according to national legislation.

Where "other systems" is used in animal types other than swine, it refers to anaerobic digesters. For swine, it refers 100% for pit storage until 2000, whereas after 2000 there is an annual increase of waste from 0% to 30% managed by anaerobic digestion. The emission factors for N excretion and N_2O-N/N are those suggested by the IPCC Guidelines for Near East and Mediterranean (Table 4-6 of therevised IPCC1996 guidelines workbook, pg. 4.10).

To calculate N_2O emissions from manure management, the default IPCC methodology was used, according to the following equation:

$$E = \sum_S \left(\sum_T \left(N_T \cdot Nex_T \cdot MS_{(T,S)} \right) \right) \cdot EF_S \qquad [15]$$

where E is N_2O emissions, T is the animal species index, S is the manure management system index, N_T is the livestock population, 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_S is the N_2O emission factor for system S.

Table 6.9 Distribution among waste management systems for the period 1990-2011

	1990-2004	2005	2006	2007	2008	2009	2010-2011
Dairy Cattle							
Solid storage and dry lot	100%	100%	100%	100%	99%	99%	99%
Other AWMS	0%	0%	0%	0%	1%	1%	1%
Non-Dairy Cattle							
Solid storage and dry lot	100%	100%	100%	100%	99%	99%	99%
Other AWMS	0%	0%	0%	0%	1%	1%	1%
Sheep							

[11] Dr Chrystalla Stylianou and Mr Antis Athanasiades, Pollution Control Unit, Department of Environment, Ministry of Agriculture, Natural Resources and Environment

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%
Swine							
Other AWMS	100%	100%	100%	100%	100%	100%	100%
AD	12%	15%	18%	21%	24%	27%	30%
Poultry							
Solid storage and dry lot	100%	100%	98%	96%	94%	92%	90%
Other AWMS	0%	0%	2%	4%	6%	8%	10%

6.3.3. Uncertainties and time-series consistency

The results of uncertainty analysis are presented in Table 1.7. The detailed calculations of uncertainty are presented in Annex II.

6.3.4. Source-specific QA / QC

Quality control and source-specific quality control is carried out based on the principles of inventory Quality Assurance / Quality Control (QA/QC) plan. For manure management, investigation for information related to manure management systems applied in Cyprus per animal species and cross-checking is implemented. Information was collected from the Department of Agriculture and the Department of Environment.

6.3.5. Source-specific recalculations

The changes that have been made to the estimation of CH_4 emissions from manure management since the last submission are associated with (a) change in the emission factors, (b) change in the animal population of 2010 (all except dairy cattle and horses).

(a) The changes in the emission factors for the estimation of N_2O emissions from manure management are presented in Table 6.10. The change was caused by:
   a. The change of annual nitrogen excretion rate per animal: dairy cattle was changed to IPCC "western Europe" factor, to be consistent with sector 4A and goats was changed to the default proposed by EMEP/EEA Emission Inventory GB 2009(Table 3-8).
   b. The N_2O-N/kg nitrogen excreted for Solid storage and dry lot and Other AWMS, to be in line with the GPG.

(b) Revised animal population data was available for 2010, for non-dairy cattle, sheep, goats, swine and poultry.

The emissions from manure management in the present submission compared to the emissions estimated in the previous submission are presented in Table 6.11.

Table 6.10 Changes (with red) in the emission factors for the estimation of N_2O emissions from manure management between NIR2012 and NIR2013 (a) kg N ex/animal/year, (b) kgN2O-N/kg N ex per waste treatment technology

(a) kg N ex/animal/year	NIR2012	NIR2013
- Dairy Cattle	70 [a]	100[b]
- Non-Dairy Cattle	50 [a]	50 [a]

Sheep	12 [a]	12 [a]
Horses	40 [a]	15.5 [c]
Goats	40 [a]	40 [a]
Swine	16 [a]	16 [a]
Poultry	0.6 [a]	0.6 [a]

(b) kgN_2O-N/kg N ex	**NIR2012**	**NIR2013**
Anaerobic lagoon	0.001 [d]	0.001 [d]
Liquid system	0.001 [d]	0.001 [d]
Solid storage and dry lot	0.02 [d]	0.02 [e]
Pasture range and paddock	0.02 [d]	0.02 [d]
Other AWMS	0.005 [d]	0.001 [e]

[a] Revised IPCC 1996 guidelines (Table 4-6, pg.4.10, workbook),default for Near East & Mediterranean
[b] Revised IPCC 1996 guidelines (Table 4-6, pg.4.10, workbook), default for "Western Europe"
[c] EMEP/EEA Emission Inventory GB 2009, Table 3-8
[d] Revised IPCC 1996 guidelines (pg. 4.14 workbook), default for Near East & Mediterranean
[e] IPCC good practice guide, default factors

Table 6.11 Recalculations of emissions from manure management 1990-2010

	1990	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**
NIR 2012 (Gg CO_2 eq.)	202	205	217	230	230	239	253
NIR 2013 (Gg CO_2 eq.)	216	219	232	247	245	256	267
% difference	7.1%	6.9%	6.8%	7.5%	6.7%	6.9%	5.5%

	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
NIR 2012 (Gg CO_2 eq.)	267	272	273	280	306	328	311
NIR 2013 (Gg CO_2 eq.)	273	273	271	276	299	319	305
% difference	2.1%	0.5%	-0.6%	-1.6%	-2.2%	-2.7%	-2.0%

	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
NIR 2012 (Gg CO_2 eq.)	299	274	260	276	274	265	272
NIR 2013 (Gg CO_2 eq.)	297	276	265	273	274	269	277
% difference	-0.5%	0.6%	1.9%	-1.1%	-0.2%	1.4%	1.7%

6.3.6. Source-specific planned improvements

The possibility of applying Tier 2 methodology for the estimation of methane emissions from the manure management is under examination.

6.4. Rice cultivation (CRF source category 4C)

Rice cultivation does not occur in Cyprus.

6.5. Agricultural soils (CRF source category 4D)

6.5.1. 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:

- Pasture, range and paddock (animal production)
- Direct N_2O emissions
- Indirect N_2O emissions

Total emissions from agricultural soils in 2011 contributed 36% to the emissions from agriculture and 3% to the total emissions of the country (excluding LULUCF).

Direct N_2O emissions from agricultural soils in 2011 accounted for 19% of total GHG emissions from Agriculture and for 1.5% of total national emissions (without LULUCF). Direct emissions in 2011 decreased by 7.7% compared to 1990 levels. Emissions from animal manure deposited to soils during pasture, range and paddock have been reported as not occurring[12]. Indirect N_2O emissions in 2011 accounted for 17% of total GHG emissions from agriculture and for 1.4% of total national emissions (without LULUCF). Indirect emissions in 2011 reduced by 6% compared to 1990 levels. Emissions from agricultural soils for the period 1990 – 2011 are presented in Table 6.12.

The large fluctuations that exist between years (e.g. 2004/2005 and 2010/2011) are a result of the variations in the activity data (i.e. fertiliser input and crop production).

Table 6.12 N_2O emissions (in Gg) from agricultural soils for the period 1990 – 2011

Gg N_2O	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**
4D. Agricultural soils	0.92	0.92	1.05	1.05	1.05	1.06
4D1. Direct soil emissions	0.49	0.49	0.57	0.57	0.57	0.57
4D3. Indirect emissions	0.43	0.43	0.48	0.49	0.48	0.49
Gg N_2O	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
4D. Agricultural soils	1.09	1.00	1.01	1.01	0.93	1.00
4D1. Direct soil emissions	0.59	0.54	0.54	0.54	0.49	0.53
4D3. Indirect emissions	0.50	0.47	0.47	0.47	0.44	0.47
Gg N_2O	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
4D. Agricultural soils	1.06	1.06	0.99	0.90	0.87	0.86
4D1. Direct soil emissions	0.56	0.57	0.53	0.48	0.47	0.46
4D3. Indirect emissions	0.49	0.49	0.46	0.42	0.41	0.40
Gg N_2O	**2008**	**2009**	**2010**	**2011**		
4D. Agricultural soils	0.83	0.81	0.84	0.86		
4D1. Direct soil emissions	0.44	0.43	0.44	0.46		
4D3. Indirect emissions	0.39	0.38	0.39	0.40		

The reduction of N_2O emissions from agricultural soils is mainly due to the reduction in the use of synthetic nitrogen fertilizers. The decrease in the use of synthetic nitrogen fertilizers could probably be attributed to the improvement of fertilizer management by the farmer due the impact of initiatives to promote good practice in fertilizer use. Additionally, the annual changes in the amount of fertilizers used and the agricultural production are the basic factors that account for the fluctuation of emissions during the period 1990 – 2011.

[12] Dr Chrystalla Stylianou and Mr Antis Athanasiades, Pollution Control Unit, Department of Environment, Ministry of Agriculture, Natural Resources and Environment

6.5.2. Methodological issues

Direct emissions (4D1)

Direct N_2O emissions from agricultural soils derive from:

- The use of synthetic fertilizers
- Animal manure used as fertilizers
- The cultivation of N-fixing crops
- Crop residues that remain in soils
- Organic soils cultivation (NE)

Emissions from direct organic soils cultivation have not been estimated due to unavailability of activity data on area of cultivated organic soils.

The use of synthetic fertilizers (4D1.1)

For the estimation of N_2O emissions from the use of synthetic fertilizers, Tier 1a methodology suggested by the IPCC Good Practice Guidance was applied. The data regarding the annual quantities of synthetic fertilizers consumed in the country has been collected from the Statistical Service. As a part of the nitrogen contained in the fertilizer is volatised in ammonia and nitrogen oxides, the relevant conversion factor suggested by IPCC was used (revised IPCC 1996 guidelines, Table 4-19, pg. 4.94, reference manual). The fraction of N input converted to N_2O has also been used as proposed by the revised IPCC 1996 guidelines (Table 4-18, pg. 4.89, reference manual).The amount of synthetic nitrogen applied to soils and the subsequent N_2O emissions for the period 1990 – 2011 are presented in Table 6.13.

No changed have been made to previously submitted data.

Table 6.13 Synthetic nitrogen applied (in t) and respective N_2O emissions from synthetic fertilizers (in Gg), for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995
N_{FERT} (Gg N in fertilizer)	12.4	12.2	15.4	14.5	14.4	14.1
N_2O emissions (Gg)	0.220	0.215	0.272	0.256	0.254	0.250
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
N_{FERT} (Gg N in fertilizer)	13.9	10.6	10.7	10.8	7.7	7.8
N_2O emissions (Gg)	0.245	0.188	0.189	0.191	0.136	0.137
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
N_{FERT} (Gg N in fertilizer)	8.0	9.1	7.7	6.8	6.6	5.5
N_2O emissions (Gg)	0.141	0.160	0.137	0.120	0.117	0.097
	2008	**2009**	**2010**	**2011**		
N_{FERT} (Gg N in fertilizer)	4.6	4.3	4.3	5.1		
N_2O emissions (Gg)	0.081	0.076	0.076	0.090		

Animal manure used as fertilizers (4D1.2)

The basic methodology was also applied for the estimation of N_2O emissions from the use of animal manure as a fertilizing agent. Specifically, the total nitrogen excretion from animals was calculated, as in the case of manure management, and then corrected to account for the fraction that volatises in ammonia and nitrous oxides, by using the default emission factors proposed by IPCC (revised IPCC 1996 guidelines, Table 4-19, pg. 4.94, reference manual).

In Table 6.14 nitrogen input to soils from animal manure and the respective N_2O emissions are presented, for the period 1990 – 2010. Changes have been made to the nitrogen input to soils from animal manure and the respective N_2O emissions caused by the change factor used for annual N-excretion per animal (see table 6.10) for kgN_2O-N/kg N ex.

Table 6.14 Nitrogen input to soils from animal manure (in Gg) and N_2O emissions (in Gg) from animal manure used as fertilizers, for the period 1990– 2011

	1990	1991	1992	1993	1994	1995
FAW (Gg N)	13.9	14.1	14.8	15.7	15.5	16.1
N_2O emissions (Gg)	0.27	0.28	0.29	0.31	0.31	0.32
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
FAW (Gg N)	16.9	17.4	17.5	17.5	17.9	19.6
N_2O emissions (Gg)	0.33	0.34	0.34	0.34	0.35	0.38
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
FAW (Gg N)	20.8	19.7	19.2	17.8	17.0	17.7
N_2O emissions (Gg)	0.41	0.39	0.38	0.35	0.33	0.35
	2008	**2009**	**2010**	**2011**		
FAW (Gg N)	17.7	17.4	18.0	17.8		
N_2O emissions (Gg)	0.35	0.34	0.35	0.35		

The cultivation of N-fixing crops (4D1.3)

For the estimation of N_2O emissions from N-fixing crops, the Tier 1amethodology suggested by the revised IPCC 1996 guidelines has been followed. The parameters used were according to the default proposed by the revised IPCC 1996 guidelines (Table 4.17, pg. 4.35 – workbook). The fraction of residues that is burned on-site in fields, which needs to be subtracted, was assumed to be 10%. Data on agricultural crop production used for the calculation of emissions was obtained from the annual national statistics of the National Statistical Service.

N_2O emissions from N-fixing crops for the period 1990 – 2011 are presented in Table 6.15. Some mistakes have been identified in the estimations made for previous submission, which have been revised for all the years.

The coefficients used for the calculations are presented in Table 6.16.

Table 6.15 N_2O emissions (t) from N-fixing crops for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995	1996	1997
N_2O emissions (t)	0.0	0.3	0.6	0.7	0.9	1.1	1.4	1.7
	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
N_2O emissions (t)	1.7	0.7	0.8	0.8	0.9	2.7	2.9	1.0
	2006	**2007**	**2008**	**2009**	**2010**	**2011**		
N_2O emissions (t)	1.2	1.3	1.3	1.3	1.4	2.6		

Table 6.16 Coefficients used for the calculations of emissions from cultivation of N-fixing crops (4D1.3) according to revised IPCC 1996 guidelines (Table 4-19, pg. 4.94, reference manual) with the exceptions indicated

	Wheat	Barley	Oats	Dry bean	Peas	Potatoes
Residue/ Crop ratio	1.3	1.2	1.3	2.1	1.5	0.4
Dry matter (dm) fraction of residue	0.83	0.83	0.83	1	1	0.45
Fraction oxidized	0.9	0.9	0.9	0.9	0.9	0.9
C fraction of residue	0.49	0.46	0.4567	0.45	0.45	0.45
N-C ratio in biomass residues	0.012	0.012	0.012	0.05[a]	0.03 [b]	0.024 [b]

[a] GPG value used for N content from soy beans according to proposed corrections by TERT 2012

[b]GPG value used for N content according to proposed corrections by TERT 2012

<u>Crop residues that remain in soils (4D1.4)</u>

For the estimation of N_2O emissions from crop residues, the Tier 1a methodology suggested by the revised IPCC 1996 guidelines has been followed. The parameters used were according to the default proposed by the revised IPCC 1996 guidelines (Table 4.17, pg. 4.35 – workbook). The fraction of residues that is burned on-site in fields, which needs to be subtracted, was assumed to be 10%. Data on agricultural crop production used for the calculation of emissions was obtained from the annual national statistics of the National Statistical Service.

N_2O emissions from crop residues for the period 1990 – 2011 are presented in Table 6.17. Some mistakes have been identified in the estimations made for previous submission, which have been revised for all the years.

Table 6.17 N_2O emissions (t) from crop residues for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995	1996	1997
N_2O emissions (t)	0.0	0.9	3.2	5.0	5.1	6.7	8.2	4.1
	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
N_2O emissions (t)	6.2	9.6	5.5	10.8	13.4	16.7	14.3	11.0
	2006	**2007**	**2008**	**2009**	**2010**	**2011**		
N_2O emissions (t)	16.6	12.0	5.6	10.3	10.4	12.3		

Indirect N_2O emissions from agricultural soils (4D3)

Indirect N_2O emissions from agricultural soils are caused by:

- Volatilisation of nitrogen included in synthetic fertilizers, animal manure (used as fertilizer) and sewage sludge (used also as fertilizer) as NO_x and NH_3, followed by atmospheric deposition as NO_x, HNO_3 and NH_4^+ on soils and surface waters and subsequent N_2O formation.
- Leaching and runoff of nitrogen contained in applied fertilizers (synthetic, animal manure and sewage sludge).

For all sources of N_2O emissions, the Tier 1a methodology suggested by IPCC Good Practice Guidance has been applied. The activity data on the amount of nitrogen from synthetic fertilizers and animal manure are those used for the calculation of direct emissions. The emission factors used are the default ones suggested by revised IPCC 1996 guidelines

(Table 4-23, pg. 4.105 reference manual). The emission factor for atmospheric deposition reflects the fraction of nitrogen that volatiles as ammonia and nitrous oxides, while for leaching and runoff it reflects the fraction of nitrogen that leaks from synthetic fertilizers and animal manure. For the estimation of the fraction of nitrogen that volatilizes as NH_3 and NO_x from the input to soils the default values suggested by the IPCC Good Practice Guidance were used; i.e. 20% for animal manure and 10% for fertilisers.

The amount of nitrogen input and the indirect N_2O emissions for the period 1990 – 2011 are presented in Table 6.18. Some mistakes have been identified in the estimations made for previous submission, which have been revised for all the years.

Table 6.18 Nitrogen input (in Gg) and indirect N_2O emissions (in kt) from agricultural soils, for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995
Atmospheric deposition						
Volatilised N (Gg N/yr.)	4.72	4.74	5.24	5.36	5.32	5.45
N_2O deposited (Gg N_2O)	0.074	0.075	0.082	0.084	0.084	0.086
Leaching						
Leached N (Gg N/yr.)	8.95	8.94	10.16	10.21	10.13	10.29
Leaching N_2O (Gg N_2O)	0.351	0.351	0.399	0.401	0.398	0.404

	1996	1997	1998	1999	2000	2001
Atmospheric deposition						
Volatilised N (Gg N/yr.)	5.60	5.42	5.45	5.45	5.24	5.67
N_2O deposited (Gg N_2O)	0.088	0.085	0.086	0.086	0.082	0.089
Leaching						
Leached N (Gg N/yr.)	10.48	9.72	9.79	9.79	9.01	9.67
Leaching N_2O (Gg N_2O)	0.412	0.382	0.385	0.385	0.354	0.380

	2002	2003	2004	2005	2006	2007
Atmospheric deposition						
Volatilised N (Gg N/yr.)	6.00	5.83	5.58	5.12	4.91	4.96
N_2O deposited (Gg N_2O)	0.094	0.092	0.088	0.080	0.077	0.078
Leaching						
Leached N (Gg N/yr.)	10.20	10.11	9.52	8.69	8.35	8.27
Leaching N_2O (Gg N_2O)	0.401	0.397	0.374	0.341	0.328	0.325

	2008	2009	2010	2011
Atmospheric deposition				
Volatilised N (Gg N/yr.)	4.88	4.78	4.94	4.97
N_2O deposited (Gg N_2O)	0.077	0.075	0.078	0.078
Leaching				
Leached N (Gg N/yr.)	8.01	7.82	8.05	8.21
Leaching N_2O (Gg N_2O)	0.315	0.307	0.316	0.323

6.5.3. Uncertainties and time-series consistency

The results of uncertainty analysis are presented in section 1.7. The detailed calculations of uncertainty are presented in Annex II.

6.5.4. Source-specific QA / QC

Quality control and source-specific quality control is carried out based on the principles of inventory Quality Assurance / Quality Control (QA/QC) plan. The special procedure followed in the agricultural soils source is associated with estimation checking with calculations tools such as emissions trends.

6.5.5. Source-specific recalculations

The N_2O emissions from agricultural soils recalculations for the period 1990-2010 are presented in Table 6.19. The resulting changes in the emissions are presented in Table 6.20 compared to the emissions of the previous submission. The recalculations have been triggered by the comments made by the TERT assessment in 2012, i.e. changes in the kg N_2O-N/kg Nex for solid and pasture and kg Nex/yr for goats.

Table 6.19 Recalculation of N_2O emissions from agricultural soils

Agricultural Soils Source	Recalculations
4D1 Direct soil emissions	
4D1.1 Synthetic fertilisers	No
4D1.2 Animal manure applied to soils	Revised according to changes from manure management (4B) The multiplication of FAW by 44/28 was neglected in previous submissions
4D1.3 N-fixing crops	N-C ratio in biomass residue changed
4D1.4 Crop residue	Fraction burnt starts from 1 in 1990 and decreases linearly to 0.1 in 2008
4D1.5 Cultivation of histosols	Not estimated*
4D2 Pasture, range and paddock	No
4D3 Indirect emissions	
4D3.1 Atmospheric deposition	Revised according to changes from manure management (4B)
4D3.2 Nitrogen leaching and run-off	Revised according to changes from manure management (4B)

* no activity data available

Table 6.20 Changes in N_2O emissions from agricultural soils caused by recalculations, for the period 1990 – 2010

	1990	1991	1992	1993	1994	1995
NIR 2012, t N_2O						
4D12. Animal manure applied to soils	0.2	0.2	0.2	0.2	0.2	0.2
4D13. N-fixing crops	5.3	4.5	5.0	4.2	3.5	3.6
4D14. Crop residue	75.6	63.0	96.0	102.2	75.4	89.6
4D31. Atmospheric deposition	87.9	88.1	95.4	97.1	97.2	99.7
4D32. Leaching	490.6	490.3	543.9	546.3	546.2	556.9
Total	659.6	646.2	740.6	750.0	722.5	750.0
NIR 2013, t N_2O						
4D12. Animal manure applied to soils	273.4	277.0	290.7	307.5	305.2	317.0
4D13. N-fixing crops	0.0	0.3	0.6	0.7	0.9	1.1
4D14. Crop residue	0.0	0.9	3.2	5.0	5.1	6.7
4D31. Atmospheric deposition	74.2	74.5	82.3	84.2	83.6	85.6
4D32. Leaching	351.5	351.2	399.2	401.2	398.1	404.1
Total	699.0	703.8	776.0	798.6	792.9	814.4
% difference	***6%***	***9%***	***5%***	***6%***	***10%***	***9%***
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
NIR 2012, t N_2O						
4D12. Animal manure applied to soils	0.3	0.3	0.3	0.3	0.3	0.3
4D13. N-fixing crops	3.9	4.0	3.5	1.1	1.2	1.2
4D14. Crop residue	93.5	34.0	52.3	72.1	41.5	62.2
4D31. Atmospheric deposition	103.9	106.0	108.3	110.1	109.2	119.6
4D32. Leaching	575.4	566.0	577.4	586.3	564.2	614.1
Total	776.9	710.3	741.7	769.9	716.4	797.3

NIR 2013, t N_2O						
4D12. Animal manure applied to soils	331.2	342.0	344.3	343.5	351.0	384.1
4D13. N-fixing crops	1.4	1.7	1.7	0.7	0.8	0.8
4D14. Crop residue	8.2	4.1	6.2	9.6	5.5	10.8
4D31. Atmospheric deposition	88.0	85.1	85.7	85.7	82.3	89.0
4D32. Leaching	411.8	381.9	384.6	384.8	353.9	379.7
Total	840.7	814.8	822.4	824.2	793.5	864.6
% difference	***8%***	***15%***	***11%***	***7%***	***11%***	***8%***
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
NIR 2012, t N_2O						
4D12. Animal manure applied to soils	0.4	0.3	0.3	0.3	0.3	0.3
4D13. N-fixing crops	1.1	3.4	3.4	1.0	1.1	1.1
4D14. Crop residue	72.5	74.1	62.6	55.7	63.4	54.9
4D31. Atmospheric deposition	127.2	120.8	114.3	103.4	95.8	101.9
4D32. Leaching	651.2	627.0	588.2	531.2	494.2	516.3
Total	852.3	825.6	768.8	691.7	654.8	674.5
NIR 2013, t N_2O						
4D12. Animal manure applied to soils	408.6	387.3	377.4	348.8	333.5	347.0
4D13. N-fixing crops	0.9	2.7	2.9	1.0	1.2	1.3
4D14. Crop residue	13.4	16.7	14.3	11.0	16.6	12.0
4D31. Atmospheric deposition	94.3	91.7	87.6	80.4	77.1	78.0
4D32. Leaching	400.6	397.1	374.1	341.4	328.2	324.8
Total	917.7	895.5	856.2	782.6	756.6	763.2
% difference	***8%***	***8%***	***11%***	***13%***	***16%***	***13%***
	2008	**2009**	**2010**			
NIR 2012, t N_2O						
4D12. Animal manure applied to soils	0.3	0.3	0.3			
4D13. N-fixing crops	1.1	1.1	1.1			
4D14. Crop residue	30.6	41.5	37.1			
4D31. Atmospheric deposition	99.0	94.6	97.9			
4D32. Leaching	497.4	474.5	490.3			
Total	628.5	612.0	626.8			
NIR 2013, t N_2O						
4D12. Animal manure applied to soils	347.5	341.7	354.4			
4D13. N-fixing crops	1.3	1.3	1.4			
4D14. Crop residue	5.6	10.3	10.4			
4D31. Atmospheric deposition	76.7	75.1	77.6			
4D32. Leaching	314.8	307.1	316.2			
Total	746.0	735.6	760.0			
% difference	***19%***	***20%***	***21%***			

6.5.6. Source-specific planned improvements

The possibility of collecting data for area of cultivated organic soils for the estimation of emissions from Cultivation of histosols (4D1.5) is under examination.

6.6. Prescribed burning of Savannahs (CRF source category 4E)

Prescribed burning of Savannahs does not occur in Cyprus.

6.7. Field burning of agricultural residues (CRF source category 4F)

6.7.1. 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 burning on-site. According to the IPCC Good Practice Guidance, 10% constitutes an indicative value of the residues burned annually on the field. However, in Cyprus, in the early 1990s field burning of agricultural residues was the only practice applied, which has decreased gradually to the levels of developed countries to 10% in 2008. 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 2011 accounted for 0.2% of total GHG emissions from Agriculture and for 0.016% of total national emissions without LULUCF). Emissions in 2011 decreased by 94% compared to 1990 levels. CH_4 and N_2O emissions from field burning of agricultural residues for the period 1990 – 2011 are presented in Table 6.21.

The N_2O emissions have been recalculated based on the revised N-C ratio (Table 6.16).

Table 6.21 GHG emissions (in Gg) from field burning of agricultural residues, for 1990 – 2011

	1990	1991	1992	1993	1994	1995
CH_4 emissions (Gg CH_4)	0.418	0.277	0.560	0.580	0.424	0.393
N_2O emissions (Gg N_2O)	0.027	0.022	0.030	0.025	0.019	0.018
Total (Gg CO_2 eq.)	17.2	12.7	21.1	19.9	14.9	14.0
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
CH_4 emissions (Gg CH_4)	0.365	0.127	0.162	0.241	0.099	0.188
N_2O emissions (Gg N_2O)	0.018	0.012	0.011	0.008	0.005	0.006
Total (Gg CO_2 eq.)	13.3	6.3	6.8	7.6	3.7	5.9
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
CH_4 emissions (Gg CH_4)	0.188	0.187	0.119	0.069	0.088	0.039
N_2O emissions (Gg N_2O)	0.006	0.008	0.006	0.003	0.003	0.002
Total (Gg CO_2 eq.)	5.9	6.5	4.5	2.3	2.8	1.4
	2008	**2009**	**2010**	**2011**		
CH_4 emissions (Gg CH_4)	0.008	0.022	0.023	0.025		
N_2O emissions (Gg N_2O)	0.001	0.001	0.001	0.002		
Total (Gg CO_2 eq.)	0.4	0.8	0.8	1.0		

6.7.2. Methodological issues

For the estimation of CH_4 and N_2O emissions from field burning of agricultural residues the default methodology suggested in IPCC Guidelines has been applied. In order to calculate the biomass that is burned agricultural production per crop, the default factors proposed by IPCC for the residues to crop product ratio, the dry matter fraction and the oxidation factor, as well as to the fraction of residues burned were used (IPCC good practice guide Table 4-16, revised IPCC 1996 guidelines, Table 4-17). The emission factors used are the defaults suggested by revised IPCC 1996 guidelines (IPCC 1997, Table 4-16) with the exception of N-C ratio that is according to the IPCC Good Practice Guidance.

According to the IPCC Good Practice Guidance, 10% constitutes an indicative value of the residues burned annually on the field. However, in Cyprus, in the early 1990s field burning of agricultural residues was the only practice applied (100%), which has decreased gradually to the levels of developed countries in (10%) in 2008.

The crop production and productivity data used are presented in Table 6.22 for the period 1990-2011.

Maize (4F1.3), Rye (4F1.5), Rice (4F1.6), Soybeans (4F2.3) and Sugar cane (4F4) are not cultivated in Cyprus and are therefore reported as NO.

Table 6.22 Crop production and productivity according to crop, for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995
4F1 . Cereals						
4F1.1 Wheat						
Crop Production (Gg)	10.4	5.6	10.5	11.7	8.0	12.3
Productivity (tn/Ha)	2.0	1.1	2.1	2.3	2.4	3.5
4F1.2 Barley						
Crop Production (Gg)	98.0	59.5	171.0	193.0	154.0	133.8
Productivity (tn/Ha)	1.9	1.4	2.9	3.0	2.6	2.3
4F1.4 Oats						
Crop Production (Gg)	0.1	0.1	0.1	0.1	0.2	0.2
Productivity (tn/Ha)	1.0	0.8	1.3	0.7	0.8	0.8
4F2. Pulses						
4F2.1 Dry bean						
Crop Production (Gg)	3.6	3.3	4.1	3.0	2.6	2.6
Productivity (tn/Ha)	3.3	3.0	4.2	3.7	3.5	3.1
4F2.2 Peas						
Crop Production (Gg)	1.7	1.2	0.9	1.2	0.9	1.0
Productivity (tn/Ha)	10.3	8.0	7.4	10.9	12.9	13.8
4F3 . Tubers and Roots						
4F3.1 Potatoes						
Crop Production (Gg)	185.9	179.7	195.4	199.0	135.0	207.7
Productivity (tn/Ha)	23.2	20.7	20.3	24.6	18.0	25.0

	1996	1997	1998	1999	2000	2001
4F1 . Cereals						
4F1.1 Wheat						
Crop Production (Gg)	13.0	11.5	11.5	14.0	10.0	10.5
Productivity (tn/Ha)	3.5	2.2	2.0	2.1	1.6	1.9
4F1.2 Barley						
Crop Production (Gg)	128.0	36.0	54.0	112.7	37.6	116.5
Productivity (tn/Ha)	2.3	1.0	1.0	2.2	0.8	2.3
4F1.4 Oats						
Crop Production (Gg)	0.2	0.3	0.3	0.4	0.4	0.4
Productivity (tn/Ha)	0.8	1.0	1.1	1.2	1.1	1.0
4F2. Pulses						
4F2.1 Dry bean						
Crop Production (Gg)	2.8	2.8	2.4	1.0	1.1	1.1
Productivity (tn/Ha)	3.1	5.8	9.2	2.3	2.6	2.4
4F2.2 Peas						
Crop Production (Gg)	1.1	1.2	1.1	0.1	0.1	0.1
Productivity (tn/Ha)	13.8	14.6	13.8	1.3	1.1	1.4
4F3 . Tubers and Roots						
4F3.1 Potatoes						

Crop Production (Gg)	228.0	81.5	138.1	161.5	117.0	121.0
Productivity (tn/Ha)	25.0	11.6	18.4	23.8	18.0	21.2

	2002	2003	2004	2005	2006	2007
4F1 . Cereals						
4F1.1 Wheat						
Crop Production (Gg)	12.9	14.3	9.9	9.2	66.8	10.7
Productivity (tn/Ha)	2.2	2.0	1.3	1.8	12.4	2.0
4F1.2 Barley						
Crop Production (Gg)	128.4	150.0	101.0	60.3	58.4	52.0
Productivity (tn/Ha)	2.5	2.3	1.7	1.1	1.2	1.5
4F1.4 Oats						
Crop Production (Gg)	0.4	0.4	3.3	0.7	0.9	0.8
Productivity (tn/Ha)	1.0	0.8	4.1	0.1	0.2	0.2
4F2. Pulses						
4F2.1 Dry bean						
Crop Production (Gg)	1.0	2.5	2.5	1.0	1.0	1.1
Productivity (tn/Ha)	2.3	8.7	8.8	2.7	2.7	3.5
4F2.2 Peas						
Crop Production (Gg)	0.1	0.9	0.9	0.1	0.1	0.1
Productivity (tn/Ha)	1.2	9.5	9.5	4.6	3.4	4.2
4F3 . Tubers and Roots						
4F3.1 Potatoes						
Crop Production (Gg)	148.5	127.5	131.7	152.5	127.5	155.5
Productivity (tn/Ha)	23.3	23.1	24.5	24.6	29.7	24.7

	2008	2009	2010	2011
4F1 . Cereals				
4F1.1 Wheat				
Crop Production (Gg)	2.5	14.7	19.6	
Productivity (tn/Ha)	0.5	2.5	3.4	
4F1.2 Barley				
Crop Production (Gg)	3.5	40.1	45.2	
Productivity (tn/Ha)	0.1	1.8	2.0	
4F1.4 Oats				
Crop Production (Gg)	0.4	0.6	0.8	
Productivity (tn/Ha)	0.1	0.2	0.3	
4F2. Pulses				
4F2.1 Dry bean				
Crop Production (Gg)	1.0	1.0	1.0	
Productivity (tn/Ha)	5.5	6.1	6.2	
4F2.2 Peas				
Crop Production (Gg)	0.1	0.1	0.1	
Productivity (tn/Ha)	2.5	1.8	2.1	
4F3 . Tubers and Roots				
4F3.1 Potatoes				
Crop Production (Gg)	115.0	110.0	82.0	
Productivity (tn/Ha)	22.5	22.1	16.5	

6.7.3. Uncertainties and time-series consistency

The results of uncertainty analysis are presented in section 1.7. The detailed calculations of uncertainty are presented in Annex II.

6.7.4. Source-specific QA / QC

Not applied.

6.7.5. Source-specific recalculations

The N_2O emissions have been recalculated based on the revised N-C ratio (Table 6.16). The emission factors previously used were all based on the defaults suggested by revised IPCC 1996 guidelines (IPCC 1997, Table 4-16). For this submission, N-C ratio is according to the IPCC Good Practice Guidance. The resulting changes in the emissions for 1990-2010 are presented in Table 6.23 compared to the emissions of the previous submission.

Table 6.23 Changes in emissions from field burning of agricultural residues caused by recalculations, for the period 1990 – 2010

	1990	1991	1992	1993	1994	1995	1996
NIR 2012 (Gg CO_2 eq.)	11.9	7.9	16	16.6	12.1	11.2	10.4
NIR 2013 (Gg CO_2 eq.)	17.2	12.7	21.1	19.9	14.9	14.0	13.3
% difference	44.5%	60.5%	31.7%	20.2%	23.0%	24.7%	27.7%

	1997	1998	1999	2000	2001	2002	2003
NIR 2012 (Gg CO_2 eq.)	3.6	4.6	6.9	2.8	5.4	5.4	5.3
NIR 2013 (Gg CO_2 eq.)	6.3	6.8	7.6	3.7	5.9	5.9	6.5
% difference	74.4%	47.5%	10.2%	31.1%	10.2%	8.7%	22.7%

	2004	2005	2006	2007	2008	2009	2010
NIR 2012 (Gg CO_2 eq.)	3.4	2	2.5	1.1	0.2	0.6	0.7
NIR 2013 (Gg CO_2 eq.)	4.5	2.3	2.8	1.4	0.4	0.8	0.8
% difference	31.2%	16.6%	10.3%	23.5%	98.2%	27.9%	15.0%

6.7.6. Source-specific planned improvements

None planned.

Chapter 7: LULUCF (CRF sector 5)

7.1. Overview of LULUCF

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 (NOx and CO) are released in relatively small quantities when biomass is burnt. 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 fellings and wildfires.

LULUCF is one of the most incomplete sectors in the inventory of Cyprus. The system for the collection of data has not yet implemented sufficiently 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 land* (source 5A1) and emissions from *Harvest wood products* (under 5G). An attempt has been made to estimate emissions from cropland (5B) but the data collected was not sufficient to complete the calculations and only some data was reported.

According to the IPCC guidelines, the sector should cover emissions from forest land, cropland, grassland, wetlands, settlements and other land.

According to the Corine land cover 2006, the distribution of land use for the whole of Cyprus (including the areas that are not under the effective control of the Republic of Cyprus) is as shown in Figure 7.1. The areas have been calculated to the nearest hectare. The total area of Cyprus is 925,148 ha.

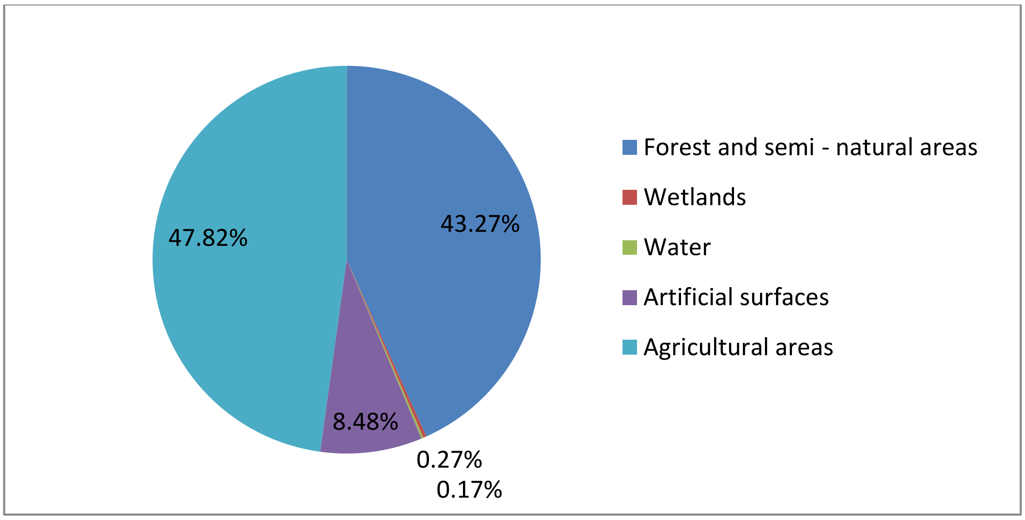

Figure 7.1. Percentage of Level 1 class of Corine Land Cover (CLC) 2006 in Cyprus[13]

[13] Department of Environment, Natural Resource Information and Remote Sensing Centre, Ministry of Agriculture, Natural Resources and Environment (MANRE) AA, Lefkosia, 2009

The Land Use, Land Use Change and Forestry sector was a net sink of greenhouse gases during the period 1990 – 2010, with an exception in 1998 due to a very large wildfire (4056.27 ha burnt[14]). For 2011 emissions from LULUCF were estimated to be a net sink of 76 Gg CO_2 eq. or 0.8% of the total reported emissions of Cyprus (without LULUCF). During 1990-2011, the LULUCF sector offset about 0.8% - 2.5% of the total national emissions (without LULUCF), with the exception of 1998. The magnitude of this sink was 139Gg CO_2 eq in 1990, while in 2011 it reduced to 76 Gg CO_2 eq in 2011 (Figure 7.2).

Even though during 2011 there was an increase of the area covered with forests by 211 ha, the CO_2 balance is reduced due to a large wildfire (1974 ha burnt). The removals/ emissions according to source and gas for the period 1990-2011are presented in Table 7.1.

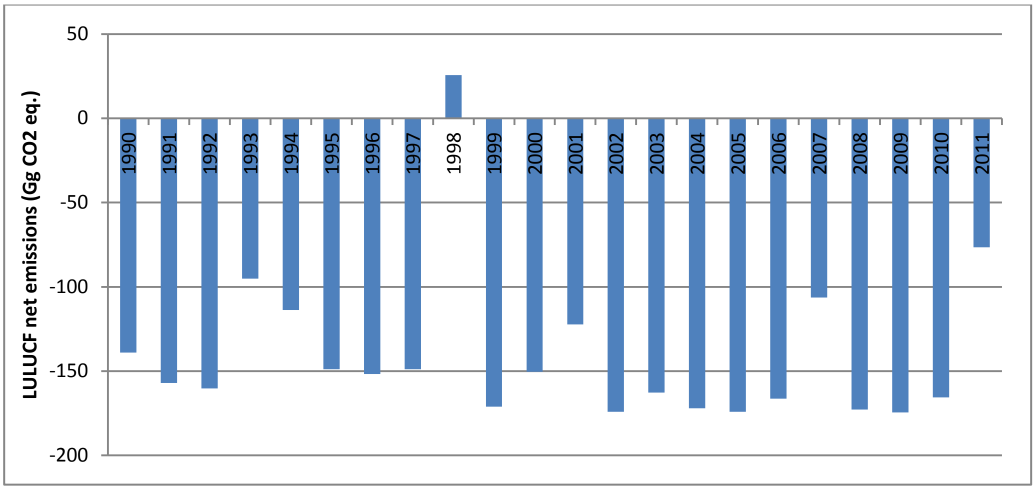

Figure 7.2. Net GHG emissions / removals (in kt CO_2 eq) from the Land Use. Land Use Change and Forestry sector by category for the period 1990 – 2011

Table 7.1 GHG emissions / removals (in Gg) from the Land Use Change and Forestry sector by category and gas for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995
5A Forest land						
CO_2 (Gg)	-156.4	-168.9	-171.1	-118.9	-133.0	-162.7
CH_4 (Gg)	0.013	0.001	0.0004	0.055	0.042	0.013
N_2O (Gg)	0.008	0.001	0.0002	0.032	0.024	0.007
Total (Gg CO_2 eq.)	-153.8	-168.7	-171.0	-107.7	-124.5	-160.2
5G Other (harvested wood products) –CO_2 (Gg)	14.9	11.7	10.7	12.6	10.9	11.4
5 LULUCF TOTAL						
CO_2 (Gg)	-141.5	-157.2	-160.3	-106.2	-122.1	-151.4
CH_4 (Gg)	0.013	0.001	0.0004	0.055	0.042	0.013
N_2O (Gg)	0.008	0.001	0.0002	0.032	0.024	0.007
Total (Gg CO_2 eq.)	-138.9	-157.0	-160.3	-95.1	-113.7	-148.8

	1996	1997	1998	1999	2000	2001
5A Forest land						
CO_2 (Gg)	-164.9	-161.6	-16.5	-179.8	-160.6	-136.8

[14] Department of Forestry, 2010, Overview of forest fires (Ανασκόπηση δασικών πυρκαγιών), Ministry of Agriculture, Natural Resources and Environment.

CH_4 (Gg)	0.012	0.016	0.167	0.0002	0.021	0.045
N_2O (Gg)	0.007	0.010	0.097	0.0001	0.012	0.026
Total (Gg CO_2 eq.)	-162.6	-158.4	17.1	-179.8	-156.3	-127.7
5G Other (harvested wood products) –CO_2 (Gg)	10.8	9.5	8.4	8.7	6.0	5.3
5 LULUCF TOTAL						
CO_2 (Gg)	-154.1	-152.1	-8.1	-171.2	-154.6	-131.5
CH_4 (Gg)	0.012	0.016	0.167	0.0002	0.021	0.045
N_2O (Gg)	0.007	0.010	0.097	0.0001	0.012	0.026
Total (Gg CO_2 eq.)	-151.8	-148.8	25.5	-171.1	-150.3	-122.4

	2002	2003	2004	2005	2006	2007
5A Forest land						
CO_2 (Gg)	-178.4	-168.3	-175.5	-177.3	-170.2	-121.1
CH_4 (Gg)	0.003	0.013	0.006	0.004	0.011	0.057
N_2O (Gg)	0.002	0.007	0.003	0.002	0.006	0.034
Total (Gg CO_2 eq.)	-177.8	-165.8	-174.4	-176.5	-168.1	-109.5
5G Other (harvested wood products) –CO_2 (Gg)	3.8	2.9	2.3	2.3	1.7	3.2
5 LULUCF TOTAL						
CO_2 (Gg)	-174.6	-165.4	-173.2	-175.0	-168.5	-117.9
CH_4 (Gg)	0.003	0.013	0.006	0.004	0.011	0.057
N_2O (Gg)	0.002	0.007	0.003	0.002	0.006	0.034
Total (Gg CO_2 eq.)	-174.0	-162.8	-172.1	-174.2	-166.4	-106.3

	2008	2009	2010	2011
5A Forest land				
CO_2 (Gg)	-176.2	-178.1	-169.4	-94.3
CH_4 (Gg)	0.005	0.003	0.011	0.081
N_2O (Gg)	0.003	0.002	0.007	0.047
Total (Gg CO_2 eq.)	-175.2	-177.4	-167.1	-77.9
5G Other (harvested wood products) –CO_2 (Gg)	2.4	2.9	1.6	1.5
5 LULUCF TOTAL				
CO_2 (Gg)	-173.8	-175.2	-167.8	-92.9
CH_4 (Gg)	0.005	0.003	0.011	0.081
N_2O (Gg)	0.003	0.002	0.007	0.047
Total (Gg CO_2 eq.)	-172.8	-174.5	-165.5	-76.5

7.2. Forest Land (5A)

7.2.1. Description

Emissions have been estimated only for forest land remaining forest land (5A1). Land converted to forest land (5A2) was included in the forest land remaining forest land (5A1).

7.2.2. Information on approaches used for representing land areas and on land-use databases used for the inventory preparation

Not available.

7.2.3. Land-use definitions and the classification systems used and their correspondence to the LULUCF categories

Not applied.

7.2.4. Methodological issues

Activity data for calculation of carbon stock change (area) with the resulting carbon stock change in living biomass (gains) and the areas burnt during wildfires (for 5V biomass burning) are presented in Table 7.2.

Table 7.2 Area of forest land remaining forest land, calculated carbon stock change in living biomass (gains) and areas burnt during wildfires, for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995
Area(ha)	161110	162270	163430	164590	165750	166910
Carbon stock change in living biomass (gains), Gg	46.09	46.42	46.75	47.08	47.42	47.75
Area burnt during wildfires (ha)	314	32	9	1344	1021	309

	1996	1997	1998	1999	2000	2001
Area (ha)	168070	169230	170390	171610	172770	172760
Carbon stock change in living biomass (gains), Gg	48.08	48.41	48.74	49.09	49.43	49.42
Area burnt during wildfires (ha)	285	397	4056	4	517	1099

	2002	2003	2004	2005	2006	2007
Area (ha)	172750	172741	172731	172851	172852	172853
Carbon stock change in living biomass (gains), Gg	49.42	49.42	49.41	49.45	49.45	49.45
Area burnt during wildfires (ha)	69	311	135	95	260	1397

	2008	2009	2010	2011
Area (ha)	172919	172985	173182	173393
Carbon stock change in living biomass (gains), Gg	49.47	49.48	49.54	49.60
Area burnt during wildfires (ha)	119	77	276	1974

Assumptions, constants and sources of data used for the estimation of the emissions are the following:

- Data on forest area was available for 1990, 2000, 2005, 2007 and projections for 2010, from the Department of Forestry. Data for remaining years was complete based on the assumption that the changes between the years were linear.

- The area of broadleaved forests was assumed constant at 1 kha for 1990 to 2004 and at 1.13 kha for 2005 to 2008, based on the available data for 1990, 2000, 2005, 2007 and projections for 2010, from the Department of Forestry.

- The annual growth rate (tdm/ha) for coniferous and broadleaved was assumed constant at 0.57 and 0.53 respectively, as this was reported by the Department of Forestry in the report "inventory of productive forests 1991-92", in 1994.

- Carbon Fraction of Dry Matter and Biomass conversion/ expansion ratio were assumed constant for all years at 0.5 and 0.95 t dm/m3 respectively, as recommended by IPCC 1996 guidelines.

The emission factors used for the estimation of methane and nitrous oxide are based on the ratio to C of 0.012 and 0.007 respectively, according to the revised IPCC 1996 guidelines (pg. 5.18). The estimated emission factors are presented in Table 7.3 for the period 1990-2011.

Table 7.3 Estimated emission factors for methane and nitrous oxide for emissions per kha burnt during a wildfire, for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995
CH_4 (t/kha burnt)	41.1	4.2	1.2	176.0	133.7	40.4
N_2O (t/kha burnt)	24.0	2.5	0.7	102.7	78.0	23.6
	1996	**1997**	**1998**	**1999**	**2000**	**2001**
CH_4 (t/kha burnt)	37.2	51.9	530.9	0.6	67.6	145.4
N_2O (t/kha burnt)	21.7	30.3	309.7	0.3	39.4	84.8
	2002	**2003**	**2004**	**2005**	**2006**	**2007**
CH_4 (t/kha burnt)	9.2	42.1	18.5	13.1	36.3	197.0
N_2O (t/kha burnt)	5.4	24.5	10.8	7.7	21.2	114.9
	2008	**2009**	**2010**	**2011**		
CH_4 (t/kha burnt)	16.9	11.0	40.1			
N_2O (t/kha burnt)	9.9	6.4	23.4			

7.2.5. Uncertainties and time-series consistency

The results of uncertainty analysis are presented in section 1.7. The detailed calculations of uncertainty are presented in Annex II.

7.2.6. Category-specific QA / QC and verification

Not available.

7.2.7. Category-specific recalculations

No recalculations have been performed since the previous submission.

7.2.8. Category-specific planned improvements

LULUCF is one of the most incomplete sectors in the inventory of Cyprus. The system for the collection of data has not yet implemented sufficiently to collect the necessary activity data for the complete reporting of emissions. The estimation of emissions from the sector will be completely revised within the following years, to collect sufficient data for the estimation of emissions and sinks of LULUCF.

7.3. Other (5G)

7.3.1. Description

The emissions reported under Other (5G), are for harvested wood products.

7.3.2. Information on approaches used for representing land areas and on land-use databases used for the inventory preparation

Not available.

7.3.3. Land-use definitions and the classification systems used and their correspondence to the LULUCF categories

Not applied.

7.3.4. Methodological issues

The activity data for volume of harvested wood products was obtained from the statistical service for 1990-2011 and from the annual report of the Department of Forestry[15] for 2002-2011. The data is presented in Table 7.4 in 1000 m^3 round wood of Total timber production. Only CO_2 emissions were estimated.

Carbon Fraction of Dry Matter is considered 0.5 as the default in the revised IPCC 1996 guidelines.

Table 7.4 Total timber production (1000 m^3 round wood), for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995	1996	1997
Total timber production (1000 m^3 round wood)	63	49	45	53	46	48	45	40

	1998	1999	2000	2001	2002	2003	2004	2005
Total timber production (1000 m^3 round wood)	35	36	25	22	16	12	10	10

	2006	2007	2008	2009	2010	2011
Total timber production (1000 m^3 round wood)	7	13	10.1	12.3	6.7	6.2

7.3.5. Uncertainties and time-series consistency

The results of uncertainty analysis are presented in section 1.7. The detailed calculations of uncertainty are presented in Annex II.

7.3.6. Category-specific QA / QC and verification

Not available.

7.3.7. Category-specific recalculations

No recalculations have been performed.

[15] Department of Forestry, 2012, Annual report for the year 2011 (Ετήσια έκθεση για το έτος 2011), Ministry of Agriculture, Natural Resources and Environment

7.3.8. Category-specific planned improvements

LULUCF is one of the most incomplete sectors in the inventory of Cyprus. The system for the collection of data has not yet implemented sufficiently to collect the necessary activity data for the complete reporting of emissions. The estimation of emissions from the sector will be completely revised within the following years, to collect sufficient data for the estimation of emissions and sinks of LULUCF.

Chapter 8: Waste (CRF sector 6)

8.1. Overview of sector

According to the IPCC Directives, the following source categories are included in the sector of waste: Solid waste disposal on land, Wastewater handling and Waste incineration. In the present report data is presented only for Solid waste disposal on land and Wastewater handling. Waste incineration took place in Cyprus until 2003 but no data is available to estimate the emissions resulting from the operation of the incinerators.

8.1.1. Emission trends

Emissions from the Waste Sector in 2011 contributed 6% of the total emissions (without LULUCF) and increased by 26% since 1990.

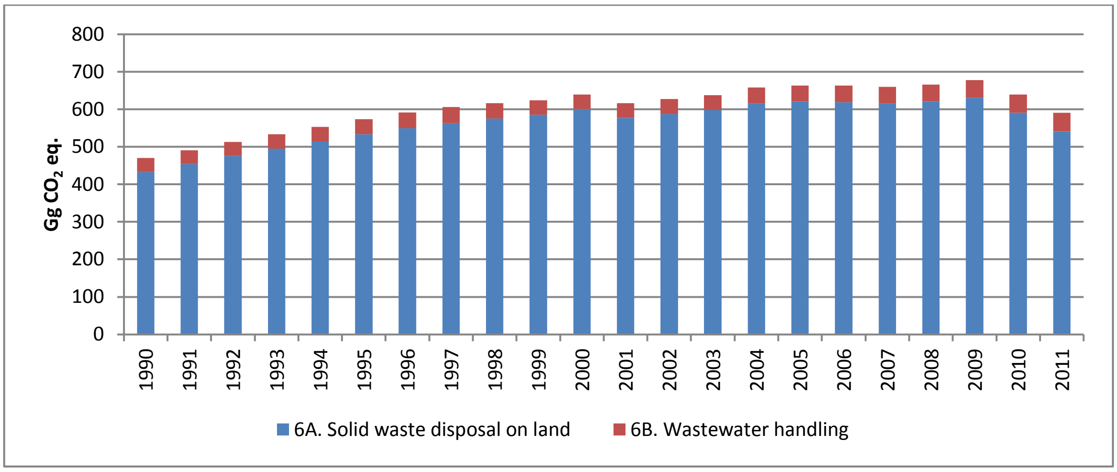

Figure 8.1. Total emissions (in Gg CO_2 eq) from Waste for the period 1990-2011, according to source

The sector of waste is responsible for the emission of CO_2, CH_4 and N_2O, but due to lack of methodology, CO_2 emissions have not been estimated. The emissions according to gas and source are presented in Table 8.1.

Methane represents the major greenhouse gas from Waste, which in 2011 was 96% of the total emissions of the sector. The sudden decrease that occurs between 2010 and 2011 for

Table 8.1 Emissions from Waste per gas and source for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995
6A. Solid waste disposed on land						
CH_4 (Gg)	20.6	21.6	22.6	23.6	24.5	25.4
6B. Wastewater handling						
CH_4 (Gg)	0.9	0.9	0.9	1.0	1.0	1.0
N2O (Gg)	0.06	0.06	0.06	0.06	0.06	0.06
6. Waste						
CH_4 (Gg)	22	23	24	25	25	26
N_2O (Gg)	0.06	0.06	0.06	0.06	0.06	0.06
TOTAL (Gg CO_2 eq.)	470	491	512	533	553	574

	1996	1997	1998	1999	2000	2001
6A. Solid waste disposed on land						
CH_4 (Gg)	26.2	26.8	27.4	27.9	28.6	27.5
6B. Wastewater handling						
CH_4 (Gg)	1.1	1.1	1.0	0.8	0.9	0.9
N2O (Gg)	0.06	0.06	0.07	0.07	0.07	0.07
6. Waste						
CH_4 (Gg)	27	28	28	29	29	28
N_2O (Gg)	0.06	0.06	0.07	0.07	0.07	0.07
TOTAL (Gg CO_2 eq.)	592	606	616	624	639	617

	2002	2003	2004	2005	2006	2007
6A. Solid waste disposed on land						
CH_4 (Gg)	28.0	28.5	29.3	29.6	29.5	29.3
6B. Wastewater handling						
CH_4 (Gg)	0.9	0.9	1.0	1.0	1.1	1.1
N2O (Gg)	0.07	0.07	0.07	0.07	0.07	0.07
6. Waste						
CH_4 (Gg)	29	29	30	31	31	30
N_2O (Gg)	0.07	0.07	0.07	0.07	0.07	0.07
TOTAL (Gg CO_2 eq.)	627	638	658	663	663	659

	2008	2009	2010	2011
6A. Solid waste disposed on land				
CH_4 (Gg)	29.6	30.0	28.1	25.8
6B. Wastewater handling				
CH_4 (Gg)	1.1	1.1	1.2	1.2
N2O (Gg)	0.07	0.07	0.07	0.08
6. Waste				
CH_4 (Gg)	31	31	29	27
N_2O (Gg)	0.07	0.07	0.07	0.08
TOTAL (Gg CO_2 eq.)	666	677	639	590

8.1.2. Methodology

The calculation of GHG emissions from Waste is based on the methodologies and emission factors suggested by the IPCC Guidelines and the IPCC Good Practice Guidance.

- Data on quantities of solid waste generated, waste sent to managed or unmanaged landfills and per capita solid waste generation, is provided by the Statistical Service for the years 1990-2007 and by the Waste management sector of the Ministry of Interior for the years 2008-2011.
- Data on population used in the calculations are provided by the Statistical Service.
- For industrial wastewater production, the activity data on industrial production was according to the national statistics for industrial production. No data was available for 2011. Because no trend was apparent for the industrial production, the production of 2011was considered the same as the production of 2010.

The methodology applied for the calculation of emissions per source category is presented in Table 8.2, while detailed description of the methods is given in the Sections 8.2.2 and 8.2.3.

Table 8.2 Methodology for the estimation of emissions from waste

	CO_2		CH_4		N_2O	
	Method	EF	Method	EF	Method	EF
6A Solid waste disposal on land			D	D	D	D
6B Wastewater handling			D	D	D	CR
6C Waste incineration	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO	NE,NO

D: IPCC default methodology and emission factor
CR: CORINAIR emission factor
NE: Not estimated
NO: Not occurring

Key categories

Key categories analysis is presented in section 1.5 and in Annex I.

Uncertainty

The results of the uncertainty analysis are presented in Section 1.7, while the detail calculations are presented in Annex II.

8.1.3. Completeness

Table 8.3 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 waste sector.

Table 8.3 Waste – completeness

	CO_2	CH_4	N_2O
6A. Solid waste disposal on land			
1. Managed waste disposal on land	NE1	✓	
2. Unmanaged waste disposal on land			
1. Deep (>5m)	NO	NO	
2. Shallow (<5m)	NE1	✓	
6B. Wastewater handling			
1. Industrial wastewater			
Wastewater		✓	✓
Sludge		NA	NA
2. Domestic and commercial wastewater			
1. Domestic and commercial wastewater (w/o human sewage)			
Wastewater		✓	✓
Sludge		NO	NO
2. Human sewage			✓
6C. Incineration			
1. Biogenic	NA	NA	NA

NA: Not available
NO: Not occurring
NE1: Not estimated due to lack of method
NE2: Not estimated due to lack of activity data

8.2. Solid waste disposal on land (6A)

8.2.1. Source category description

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. Moreover, other factors such as the type of waste disposed, the characteristics of the disposal sites and the climate conditions, affect the decomposition rate. Methane emissions were calculated using the default method proposed by the revised IPCC 1996 guidelines.

Carbon dioxide emissions occur during the flaring of biogas released from the decomposition of waste. However, these emissions should not be included in the total GHG emissions of the sector as they are of biogenic origin. 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 2011 accounted for 91.7% of total GHG emissions from Waste and for 5.9% of total national emissions (without LULUCF). 84% of the solid waste disposal on land emissions is from managed waste disposal and the remaining 16% from unmanaged waste disposal. All unmanaged waste disposal is considered shallow. The increase of emissions between 1990 and 2011 was 25%. The sudden decrease that occurs in emission of both managed and unmanaged waste disposal on land between 2010 and 2011 could be attributed to the expansion of the recycling systems throughout the area under the effective control of the Republic of Cyprus in late 2010. CH_4 emissions from managed and unmanaged solid waste disposal sites are presented in Table 8.4.

Table 8.4 CH_4 Emissions from managed and unmanaged solid waste disposal sites, per gas and source for the period 1990 – 2011 (in Gg CH_4)

	1990	1991	1992	1993	1994	1995	1996	1997
6A1. Managed waste disposal on land	17.1	18.0	18.9	19.7	20.5	21.3	22.1	22.6
6A22. Unmanaged waste disposal on land - *Shallow*	3.5	3.6	3.7	3.9	3.9	4.1	4.1	4.2
6A. TOTAL	20.6	21.6	22.6	23.6	24.5	25.4	26.2	26.8

	1998	1999	2000	2001	2002	2003	2004	2005
6A1. Managed waste disposal on land	23.1	23.6	24.2	23.3	23.7	24.1	24.8	25.0
6A22. Unmanaged waste disposal on land - *Shallow*	4.2	4.3	4.4	4.2	4.3	4.4	4.6	4.6
6A. TOTAL	27.4	27.9	28.6	27.5	28.0	28.5	29.3	29.6

	2006	2007	2008	2009	2010	2011
6A1. Managed waste disposal on land	24.8	24.7	24.9	25.2	23.6	21.6
6A22. Unmanaged waste disposal on land - *Shallow*	4.6	4.6	4.7	4.8	4.5	4.2
6A. TOTAL	29.5	29.3	29.6	30.0	28.1	25.8

8.2.2. Methodological

Data

Annual solid waste production data was obtained from the National Statistical Service[16] and for the years 2008-2011 from the Waste Management unit of the Ministry of Interior[17]. The National Statistical Service revised their estimates for per capita generation and composition of waste in 2012.

Data for solid waste disposed land for 1996-2007 was available from the National Statistical Service. For 1990-1995, the trend of 1996-2007 was used to estimate the portion of the total solid waste production that is disposed of on land. For the years 2008-2011 data was available from the Waste Management unit of the Ministry of Interior.

The composition of waste disposed on land was available for the period 1994-2010. For the years 1990-1993, it was assumed that the composition of the waste is the same as 1994 and for 2011 it was assumed the same as 2010.

For 1990-2006, the estimation of the portion of solid waste disposed on land going to managed disposal sites, it was assumed that all waste from urban areas were going to managed disposal sites, whereas the waste produced by rural population was going to unmanaged disposal sites.

Method

The method applied for the estimation of emissions from the solid waste disposal on land was according to the methodology proposed by the revised IPCC 1996 guidelines (equation 1, pg. 6.3 workbook):

- Fraction of CH_4 in landfill gas was assumed 0.50 (default, revised IPCC 1996 guidelines pg. 6.3 workbook)
- Oxidation factor was assumed 0.00 (default, revised IPCC 1996 guidelines pg. 6.3 workbook)
- DOC assimilated was assumed 0.55 (average of range proposed in 2000 IPCC GPG)
- DOC of waste was estimated according to equation 2 in pg. 6.9 of revised IPCC 1996 workbook
    - 1990-2000: 0.21 was used as DOC for garden and other organic non-food, food waste and wood and straw (average of the three), since no data was available for the breakdown of waste to the particular waste streams.
    - 2001-2011: data on the wood fraction of the waste was also available. The default according to the revised IPCC 1996 guidelines was used. Food and garden waste data was still not available, therefore the 0.16 was used as DOC for the two (average of the two).
- For managed waste disposal on land, Methane Conversion Factor (MCF) was assumed 1, while for unmanaged waste disposal on land MCF was assumed 0.4 (default IPCC1996 guidelines, pg. 6.8 workbook)

The population, the per capita waste generation, the amounts of waste disposed to managed disposal and unmanaged disposal, the fraction of waste according to waste streams and the total DOC are presented in Table 8.5.

All sets of activity data have been revised according to the new information from the Ministry of Interior and the new population estimates prepared after the 2011 census. These changes have led to considerable changes in the emissions.

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[17] Mr Stergios Palpanis, Waste Management unit, Ministry of Interior (+357 22806454, spalpanis@moi.gov.cy)

Table 8.5 Activity data and parameters used for the estimation of CH_4 from solid waste disposed on land for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995
Population (1000s)	587	603	619	633	645	656
Per capita waste generation (kg /cap)	528	539	549	560	571	582
Waste disposed to managed (t)	206	216	227	237	247	256
Waste disposed to unmanaged (t)	105	109	113	116	118	123
Fraction paper, pulp & products & textiles	35.2%	35.2%	35.2%	35.2%	35.2%	35.2%
Fraction of organic matter	41.6%	41.6%	41.6%	41.6%	41.6%	41.6%
Fraction of food & garden waste						
Fraction of wood						
Total DOC (%)	22.7%	22.7%	22.7%	22.7%	22.7%	22.7%

	1996	1997	1998	1999	2000	2001
Population (1000s)	666	675	683	691	698	706
Per capita waste generation (kg /cap)	592	603	614	621	631	652
Waste disposed to managed (t)	265	272	278	284	291	304
Waste disposed to unmanaged (t)	124	126	128	129	132	138
Fraction paper, pulp & products & textiles	35.2%	35.2%	35.2%	35.2%	35.2%	32.9%
Fraction of organic matter	41.6%	41.6%	41.6%	41.6%	41.6%	
Fraction of food & garden waste						43.9%
Fraction of wood						2.3%
Total DOC (%)	22.7%	22.7%	22.7%	22.7%	22.7%	20.9%

	2002	2003	2004	2005	2006	2007
Population (1000s)	714	723	733	744	758	776
Per capita waste generation (kg /cap)	657	673	684	684	694	704
Waste disposed to managed (t)	310	321	330	334	341	348
Waste disposed to unmanaged (t)	140	146	152	155	159	164
Fraction paper, pulp & products & textiles	32.9%	32.7%	32.5%	32.6%	31.3%	29.5%
Fraction of organic matter						
Fraction of food & garden waste	43.8%	42.2%	42.5%	42.3%	42.3%	43.2%
Fraction of wood	2.3%	2.3%	2.3%	1.9%	1.9%	1.9%
Total DOC (%)	20.8%	20.5%	20.5%	20.4%	19.9%	19.3%

	2008	2009	2010	2011
Population (1000s)	797	819	840	862
Per capita waste generation (kg /cap)	729	730	691	660
Waste disposed to managed (t)	360	365	331	303
Waste disposed to unmanaged (t)	170	174	159	146
Fraction paper, pulp & products & textiles	28.1%	27.6%	30.1%	30.1%
Fraction of organic matter				
Fraction of food & garden waste	43.8%	44.8%	42.0%	42.0%
Fraction of wood	1.9%	2.0%	2.3%	2.3%
Total DOC (%)	18.8%	18.8%	19.5%	19.5%

8.2.3. Uncertainties and time-series consistency

The results of the uncertainty analysis are presented in Section 1.7, while the detail calculations are presented in Annex II.

8.2.4. Source-specific QA / QC and verification

For the preparation of previous submissions, data was obtain from the national statistical service and confirmed with the Department of Environment, especially for the amounts of waste recycled and the composition of the waste. For the first time, data was also checked with data from the Ministry of Interior. All the assumptions made for the composition and production of solid waste were confirmed with all three departments: Ministry of Interior, Statistical Service and Department of Environment.

8.2.5. Source-specific recalculations

Recalculations have been made to whole of the period because of the following:

(a) Changes in the waste production due to (a) change of permanent population after 2002, (b) change of waste generation per capita for 1990-2010.

(b) DOC assimilated in previous submissions was assumed 0.77 in the previous submission while for the current submission was assumed 0.5 according to the average of the range proposed by the revised 2000 IPCC GPG.

(c) New waste composition data available from 2001.

The changes in the activity data are presented in Table 8.6, and the result of these changes in the CH_4 emissions is presented in Table 8.7.

Table 8.6 Changes in activity data between NIR 2012 and NIR 2013 (changes in red)

	1990	1991	1992	1993	1994	1995	1996
NIR 2012							
Population (1000s)	587.1	603.1	619.2	632.9	645.4	656.3	666.3
Per capita waste generation (kg /cap)	575.0	585.0	596.0	607.0	617.0	628.0	637.0
Waste disposed to managed (t)	217.8	226.8	235.9	245.8	251.1	263.5	265.5
Waste disposed to unmanaged (t)	104.1	108.4	112.8	115.2	117.7	123.5	123.5
Fraction paper, pulp & products & textiles	35.2%	35.2%	35.2%	35.2%	35.2%	35.2%	35.2%
Fraction of organic matter	41.6%	41.6%	41.6%	41.6%	41.6%	41.6%	41.6%
Fraction of food & garden waste							
Fraction of wood							
Total DOC (%)	22.7%	22.7%	22.7%	22.7%	22.7%	22.7%	22.7%
NIR 2013							
Population (1000s)	587.1	603.1	619.2	632.9	645.4	656.3	666.3
Per capita waste generation (kg /cap)	528.0	538.7	549.4	560.1	570.9	581.6	592.3
Waste disposed to managed (t)	206.0	216.4	227.0	237.0	246.8	256.2	265.5
Waste disposed to unmanaged (t)	99.5	103.9	108.3	112.4	116.3	120.0	123.5
Fraction paper, pulp & products & textiles	35.2%	35.2%	35.2%	35.2%	35.2%	35.2%	35.2%
Fraction of organic matter	41.6%	41.6%	41.6%	41.6%	41.6%	41.6%	41.6%
Fraction of food & garden waste							
Fraction of wood							
Total DOC (%)	22.7%	22.7%	22.7%	22.7%	22.7%	22.7%	22.7%

	1997	1998	1999	2000	2001	2002	2003
NIR 2012							
Population (1000s)	675.2	682.9	690.5	697.5	705.5	715.1	730.4
Per capita waste generation (kg /cap)	646.0	660.0	666.0	677.0	699.0	704.0	718.0
Waste disposed to managed (t)	272.2	278.3	283.7	291.2	304.9	311.0	323.2
Waste disposed to unmanaged (t)	125.8	127.7	129.3	131.8	137.1	138.9	143.4
Fraction paper, pulp & products & textiles	35.2%	35.2%	35.2%	35.2%	35.2%	35.2%	35.2%
Fraction of organic matter	41.6%	41.6%	41.6%	41.6%	41.6%	41.6%	41.6%
Fraction of food & garden waste							
Fraction of wood							

Total DOC (%)	22.7%	22.7%	22.7%	22.7%	22.7%	22.7%	22.7%
NIR 2013							
Population (1000s)	675	683	691	698	706	714	723
Per capita waste generation (kg /cap)	603	614	621	631	652	657	673
Waste disposed to managed (t)	272	278	284	291	304	310	321
Waste disposed to unmanaged (t)	126	128	129	132	138	140	146
Fraction paper, pulp & products & textiles	35.2%	35.2%	35.2%	35.2%	32.9%	32.9%	32.7%
Fraction of organic matter	41.6%	41.6%	41.6%	41.6%			
Fraction of food & garden waste					43.9%	43.8%	42.2%
Fraction of wood					2.3%	2.3%	2.3%
Total DOC (%)	22.7%	22.7%	22.7%	22.7%	20.9%	20.8%	20.5%

	2004	2005	2006	2007	2008	2009	2010
NIR 2012							
Population (1000s)	749.2	766.4	778.7	789.3	796.9	803.2	808.2
Per capita waste generation (kg /cap)	732.0	730.0	741.0	747.0	756.0	763.0	693.0
Waste disposed to managed (t)	334.3	340.4	348.2	376.6	403.6	428.9	404.8
Waste disposed to unmanaged (t)	147.3	148.9	151.2	135.6	118.2	99.5	71.5
Fraction paper, pulp & products & textiles	35.2	35.2	35.2	31.7	31.7	31.7	31.7
Fraction of organic matter	41.6	41.6	41.6	44.0	44.0	44.0	44.0
Fraction of food & garden waste							
Fraction of wood							
Total DOC (%)	22.7%	22.7%	22.7%	21.8%	21.8%	21.8%	21.8%
NIR 2013							
Population (1000s)	733	744	758	776	797	819	840
Per capita waste generation (kg /cap)	684	684	694	704	729	730	691
Waste disposed to managed (t)	330	334	341	348	360	365	331
Waste disposed to unmanaged (t)	152	155	159	164	170	174	159
Fraction paper, pulp & products & textiles	32.5%	32.6%	31.3%	29.5%	28.1%	27.6%	30.1%
Fraction of organic matter							
Fraction of food & garden waste	42.5%	42.3%	42.3%	43.2%	43.8%	44.8%	42.0%
Fraction of wood	2.3%	1.9%	1.9%	1.9%	1.9%	2.0%	2.3%
Total DOC (%)	20.5%	20.4%	19.9%	19.3%	18.8%	18.8%	19.5%

Table 8.7 Changes in the methane emissions from solid waste disposal on land due to recalculations for the period 1990 – 2010, in Gg CH_4

	1990	1991	1992	1993	1994	1995
NIR 2012						
6A1. Managed waste disposal on land	25.4	26.4	27.5	28.6	29.2	30.7
6A22. Unmanaged waste disposal on land - *Shallow*	4.8	5	5.3	5.4	5.5	5.7
6A TOTAL	30.2	31.4	32.7	34	34.7	36.4
NIR 2013						
6A1. Managed waste disposal on land	17.1	18.0	18.9	19.7	20.5	21.3
6A22. Unmanaged waste disposal on land - *Shallow*	3.5	3.6	3.7	3.9	3.9	4.1
6A TOTAL	20.6	21.6	22.6	23.6	24.5	25.4
% difference of Total	*-31.7%*	*-31.2%*	*-30.8%*	*-30.7%*	*-29.5%*	*-30.2%*

	1996	1997	1998	1999	2000	2001
NIR 2012						
6A1. Managed waste disposal on land	30.9	31.7	32.4	33	33.9	35.5
6A22. Unmanaged waste disposal on land - *Shallow*	5.8	5.9	5.9	6	6.1	6.4
6A TOTAL	36.7	37.5	38.3	39	40	41.9
NIR 2013						
6A1. Managed waste disposal on land	22.1	22.6	23.1	23.6	24.2	23.3
6A22. Unmanaged waste disposal on land - *Shallow*	4.1	4.2	4.2	4.3	4.4	4.2
6A TOTAL	26.2	26.8	27.4	27.9	28.6	27.5
% difference of Total	*-28.7%*	*-28.5%*	*-28.5%*	*-28.5%*	*-28.5%*	*-34.4%*

	2002	2003	2004	2005	2006	2007
NIR 2012			38.9	39.6	40.5	43.8
6A1. Managed waste disposal on land	36.2	37.6	6.9	6.9	7	6.3
6A22. Unmanaged waste disposal on land - *Shallow*	6.5	6.7	45.8	46.6	47.6	50.1
6A TOTAL	42.7	44.3	27.4	27.8	28.3	29.0
NIR 2013						
6A1. Managed waste disposal on land	23.7	24.1	24.8	25.0	24.8	24.7
6A22. Unmanaged waste disposal on land - *Shallow*	4.3	4.4	4.6	4.6	4.6	4.6
6A TOTAL	28.0	28.5	29.3	29.6	29.5	29.3
% difference of Total	*-34.5%*	*-35.7%*	*-36.0%*	*-36.5%*	*-38.1%*	*-41.5%*

	2008	2009	2010
NIR 2012			
6A1. Managed waste disposal on land	47	49.9	47.1
6A22. Unmanaged waste disposal on land - *Shallow*	5.5	4.6	3.3
6A TOTAL	52.5	54.6	50.4
NIR 2013			
6A1. Managed waste disposal on land	24.9	25.2	23.6
6A22. Unmanaged waste disposal on land - *Shallow*	4.7	4.8	4.5
6A TOTAL	29.6	30.0	28.1
% difference of Total	*-43.7%*	*-45.0%*	*-44.2%*

8.2.6. Source-specific planned improvements

Further improvement of activity data quality is still necessary. The involved authorities are in the process of improving the system of collection and preparation of data. Moreover, the tourists have not been taken into account in the population of the island. Tourists should be taken into account for the estimation of the waste production, since they contribute considerably to the population of island. Finally, it is assessed whether data is available to use Tier 2 for the estimation of emissions from solid waste disposal on land.

8.3. Wastewater handling (6B)

8.3.1. Source category description

Domestic and industrial wastewater handling under anaerobic conditions produces CH_4. In Cyprus, domestic wastewater handling in aerobic treatment facilities shows a substantial increase during the recent years, while in the industrial sector only approximately 5% of wastewater is handled under anaerobic conditions.

Emissions from wastewater handling in 2011 accounted for 0.5% of total GHG emissions (without LULUCF) and for 8% of GHG emissions from Waste. CH_4 and N_2O emissions from wastewater handling for the period 1990 – 2011 are presented in Table 8.8.

Total emissions from wastewater handling in 2011 increased by 33% compared to 1990 and by 1.4% compared to 2010 levels. The emissions from Industrial wastewater in 2011 increased by 68% compared to 1990, while the emissions from Domestic and commercial wastewater increased by 12% compared to 1990.

The reduction of emissions from domestic wastewater handling is mainly due to the increased number of wastewater handling facilities under aerobic conditions compared to anaerobic septic tanks that were used previously.

The large change compared to previously submitted estimates for industrial wastewater emissions has been caused by the correction of a mistake that was identified in the activity data (industrial production).

Table 8.8 CH_4 and N_2O emissions from wastewater handling for the period 1990 – 2011

	1990	1991	1992	1993	1994	1995
6B1. Industrial wastewater						
CH_4 (t)	626	594	604	640	691	703
N_2O (t)	0.90	0.87	0.91	0.96	1.08	1.09
Total (Gg CO_2 eq.)	13.4	12.7	13.0	13.7	14.9	15.1
6B2. Domestic & commercial						
CH_4 (t)	321	319	316	311	305	297
N_2O (t)	54.4	55.9	57.4	58.7	59.8	60.8
Total (Gg CO_2 eq.)	23.6	24.0	24.4	24.7	24.9	25.1
6B. TOTAL						
CH_4 (t)	948	913	919	951	996	1000
N_2O (t)	55.3	56.8	58.3	59.6	60.9	61.9
Total (Gg CO_2 eq.)	37.1	36.8	37.4	38.5	39.8	40.2

	1996	1997	1998	1999	2000	2001
6B1. Industrial wastewater						
CH_4 (t)	773	797	716	584	608	647
N_2O (t)	1.10	1.16	1.12	1.07	1.11	1.15
Total (Gg CO_2 eq.)	16.6	17.1	15.4	12.6	13.1	13.9
6B2. Domestic & commercial						
CH_4 (t)	289	280	269	259	248	237
N_2O (t)	61.8	63.2	63.9	65.3	65.9	66.7
Total (Gg CO_2 eq.)	25.2	25.5	25.5	25.7	25.6	25.6
6B. TOTAL						
CH_4 (t)	1062	1076	986	843	856	884
N_2O (t)	62.9	64.4	65.0	66.3	67.0	67.8
Total (Gg CO_2 eq.)	41.8	42.6	40.9	38.3	38.8	39.6

	2002	2003	2004	2005	2006	2007
6B1. Industrial wastewater						
CH_4 (t)	677	682	801	781	937	915
N_2O (t)	1.13	1.08	0.97	0.91	0.89	0.89
Total (Gg CO_2 eq.)	14.6	14.6	17.1	16.7	19.9	19.5
6B2. Domestic & commercial						
CH_4 (t)	236	214	202	190	179	168
N_2O (t)	66.2	65.7	66.6	67.6	66.8	68.4
Total (Gg CO_2 eq.)	25.5	24.9	24.9	25.0	24.5	24.7
6B. TOTAL						
CH_4 (t)	913	895	1003	972	1115	1083
N_2O (t)	67.3	66.8	67.6	68.5	67.7	69.3
Total (Gg CO_2 eq.)	40.0	39.5	42.0	41.6	44.4	44.2

	2008	2009	2010	2011
6B1. Industrial wastewater				
CH_4 (t)	930	1004	1062	1062
N_2O (t)	0.98	0.93	0.98	0.98
Total (Gg CO_2 eq.)	19.8	21.4	22.6	22.6
6B2. Domestic & commercial				
CH_4 (t)	156	144	137	141
N_2O (t)	70.2	72.2	74.0	75.9
Total (Gg CO_2 eq.)	25.0	25.4	25.8	26.5
6B. TOTAL				
CH_4 (t)	1086	1148	1200	1203
N_2O (t)	71.2	73.1	75.0	76.9
Total (Gg CO_2 eq.)	44.9	46.8	48.4	49.1

8.3.2. Methodological issues

CH_4 and N_2O emissions from wastewater handling were estimated according to the default methodologies suggested by IPCC (revised IPCC 1996 guidelines).

Industrial wastewater – methane emissions

The methodology applied for the estimation of methane emissions from industrial wastewater is the following:

(a) Collection of data for industrial production from national statistics (Table 8.9). It should be noted that the data available is for 1990 - 2009 and is data concerning sales of industrial products *and not production*, which is the only data available. Data for 2011 was assumed equal to the data for 2000.

(b) Wastewater production was estimated by multiplying the industrial production by the wastewater generation coefficients in Table 8.10 (good practice guide, p.5.22).

(c) Total organic wastewater in kg COD/year per industrial product was then estimated by multiplying the wastewater production by the COD coefficient of each industrial product in Table 8.10 (good practice guide, p.5.22). Degradable carbon (DC) in Gg is the sum of the COD of each industrial product divided by 1000000 (Table 8.11).

(d) The wastewater generated was categorised to anaerobic and aerobic treatment according to the assumptions of Table 8.12. The assumptions were prepared in collaboration with the head of pollution prevention unit of the department of environment, Dr Chrystalla Stylianou.

(e) Methane conversion factor was assumed 0 for aerobic treatment and 1 for anaerobic treatment, according to the revised IPCC 1996 guidelines (pg. 6.21, reference manual). Maximum producing capacity was assumed 0.25 kg CH4 / kg according to the revised

IPCC 1996 guidelines (pg. 6.14, workbook). The resulting methane emission factor estimated according to waste stream is presented in Table 8.13.

(f) 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 8.9 Industrial production (kt) by product category, 1990 – 2011

	1990	1991	1992	1993	1994	1995
alcohol	1.02	0.99	0.97	1.01	1.05	1.09
beer	33	35	37	36	36	35
soft drinks	47	50	55	55	56	57
dairy products	61	65	69	71	74	77
meat & poultry	64	63	68	76	81	81
refinery	635	763	727	781	897	828
soaps & detergents	12	13	14	11	10	10
vegetable oils	22	25	29	27	27	26
veg., fruits & juices	48	35	34	38	52	56
wine	49	53	57	56	56	56

	1996	1997	1998	1999	2000	2001
alcohol	0.93	0.98	1.01	2.07	2.55	3.93
beer	33	33	37	40	41	40
soft drinks	58	58	59	60	61	63
dairy products	81	81	86	84	83	89
meat & poultry	88	97	94	69	81	88
refinery	760	1043	1083	1140	1135	1115
soaps & detergents	9	7	7	7	7	8
vegetable oils	28	26	23	23	22	20
veg., fruits & juices	53	52	48	49	50	52
wine	54	42	31	43	37	34

	2002	2003	2004	2005	2006	2007
alcohol	3.84	2.47	1.90	1.34	1.15	0.99
beer	38	37	37	38	37	40
soft drinks	62	62	61	67	58	62
dairy products	92	93	94	96	99	98
meat & poultry	90	92	93	96	94	94
refinery	1046	932	269	0	0	0
soaps & detergents	8	6	7	6	6	6
vegetable oils	21	19	20	19	19	18
veg., fruits & juices	49	44	42	38	34	35
wine	38	36	32	30	26	20

	2008	2009	2010	2011
alcohol	0.89	0.72	0.73	0.73
beer	43	36	34	34
soft drinks	63	59	58	58
dairy products	112	104	106	106
meat & poultry	102	99	106	106
refinery	0	0	0	0
soaps & detergents	7	7	7	7
vegetable oils	18	16	17	17
veg., fruits & juices	41	40	45	45
wine	16	12	11	11

Table 8.10 Wastewater generation coefficient (m^3 /t product) and COD concentration (kg COD/m^3) according to industrial product

	wastewater (m^3/t)	COD (kg/m^3)
Alcohol	24	11
Beer	6	3
Soft drinks	2	2
Dairy products	7	3
Meat& poultry	13	4
Refinery	0.6	1.0
Soaps& detergents	3.0	0.9
Vegetable oils	3.1	0.9
Vegetables, fruits & juices	20.0	5.0
Wine	23.0	1.5

Table 8.11 Degradable carbon (Gg), 1990-2011

	1990	1991	1992	1993	1994	1995
Degradable carbon (Gg)	12.61	11.55	11.95	12.85	14.63	15.07

	1996	1997	1998	1999	2000	2001
Degradable carbon (Gg)	15.03	15.22	14.39	13.97	14.57	15.49

	2002	2003	2004	2005	2006	2007
Degradable carbon (Gg)	15.38	14.53	13.71	13.07	12.53	12.42

	2008	2009	2010	2011
Degradable carbon (Gg)	13.50	12.86	13.68	13.68

Table 8.12 Treatment of waste by anaerobic treatment according to industrial production, 1990-2011

	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	2009-2011
alcohol	1.1%	1.5%	1.8%	2.1%	2.3%	2.8%
beer	18%	18%	18%	17%	15%	19%
soft drinks	0.77%	0.70%	0.80%	0.75%	0.74%	0.78%
dairy products	0	0	5.00%	5.09%	4.44%	4.78%
meat & poultry	5.00%	4.89%	4.97%	4.95%	4.57%	4.71%
refinery	0	0	0	0	0	0
soaps & detergents	0	0	0	0	0	0
vegetable oils	0	0	0.5%	0.5%	0.5%	0.6%
veg., fruits & juices	1.1%	1.3%	1.4%	1.4%	1.2%	1.2%
wine	0	0	0	0	0	0

Table 8.13 Methane emission factor estimated according to waste stream (kg CH_4/kg COD), 1990-2011

	1990	1991	1992	1993	1994	1995	1996
alcohol	0.005	0.005	0.005	0.005	0.005	0.005	0.005
beer	0.050	0.048	0.045	0.046	0.046	0.047	0.050
soft drinks	0.002	0.002	0.002	0.002	0.002	0.002	0.002
dairy products							
meat & poultry							
refinery							
soaps & detergents							
vegetable oils							
veg., fruits & juices	0.002	0.003	0.004	0.003	0.002	0.002	0.002
wine							

	1997	1998	1999	2000	2001	2002	2003
alcohol	0.005	0.005	0.002	0.002	0.001	0.001	0.002
beer	0.050	0.045	0.041	0.040	0.041	0.043	0.045
soft drinks	0.002	0.002	0.002	0.002	0.002	0.002	0.002
dairy products							
meat & poultry							
refinery							
soaps & detergents							
vegetable oils							
veg., fruits & juices	0.002	0.002	0.002	0.002	0.002	0.002	0.003
wine							

	2004	2005	2006	2007	2008	2009	2010 & 2011
alcohol	0.003	0.004	0.004	0.005	0.006	0.007	0.007
beer	0.045	0.044	0.044	0.042	0.039	0.046	0.048
soft drinks	0.002	0.002	0.002	0.002	0.002	0.002	0.002
dairy products			0.012	0.013	0.011	0.012	0.012
meat & poultry	0.012	0.012	0.012	0.012	0.011	0.012	0.011
refinery							
soaps & detergents							
vegetable oils	0.00	0.00	0.001	0.001	0.001	0.001	0.001
veg., fruits & juices	0.003	0.003	0.003	0.003	0.003	0.003	0.003
wine							

Industrial wastewater – nitrous oxide emissions

The nitrous oxide emissions were estimated by multiplying the total annual industrial wastewater production (Table 8.14) by the default emission factor of 0.25 g N_2O/m^3 wastewater according to CORINAIR.

Table 8.14 Total industrial wastewater production (1000 m^3/year), 1990-2011

	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 & 2011
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	910
Wine	730	685	609	465	366	285	254

Industrial sludge – methane emissions

The fraction of degradable organic component removed in sludge proposed as default by the revised IPCC 1996 guidelines is 0 (pg. 6.21, workbook). Therefore, the methane emissions from the industrial sludge are 0.

Domestic and Commercial Wastewater – methane emissions

The following methodology was applied to estimate the methane emissions from Domestic and Commercial Wastewater:

(a) Total domestic organic wastewater was estimated according to the method proposed by the revised IPCC 1996 guidelines (reference manual, pg. 6.18). For the application of the method 60g BOD/person/day were used[18].
(b) Fraction of degradable organic component removed as sludge (DS_{dom}) was assumed 0, as proposed by the revised IPCC 1996 guidelines as default (pg. 6.13 workbook).

8.3.3. Uncertainties and time-series consistency

The results of uncertainty analysis are presented in section 1.7.

8.3.4. Source-specific QA / QC and verification

No source specific QA/QC.

8.3.5. Source-specific recalculations

The recalculations performed were caused by the following changes:

(a) Data for wine production was revised for 1990-2011
(b) The per average annual per capita protein consumption was not multiplied by 365 in NIR2012 to be converted from kg/person/day to kg/person/yr – this was corrected in the current submission.

The changes in the resulting emissions are presented in Table 8.15.

Table 8.15. Change in wastewater handling emissions due to recalculations for the period 1990-2010

	1990	1991	1992	1993	1994	1995	1996
NIR 2012, Gg CO_2 eq.	244	252	259	535	1117	2381	2475
NIR 2013, Gg CO_2 eq.	37	37	37	38	40	40	42
% difference	*-85%*	*-85%*	*-86%*	*-93%*	*-96%*	*-98%*	*-98%*
	1997	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
NIR 2012, Gg CO_2 eq.	1897	1302	1587	1353	1240	1413	1414
NIR 2013, Gg CO_2 eq.	43	41	38	39	40	40	39
% difference	*-98%*	*-97%*	*-98%*	*-97%*	*-97%*	*-97%*	*-97%*
	2004	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
NIR 2012, Gg CO_2 eq.	1561	1472	1613	1208	896	797	797
NIR 2013, Gg CO_2 eq.	42	42	44	44	45	47	48
% difference	*-97%*	*-97%*	*-97%*	*-96%*	*-95%*	*-94%*	*-94%*

8.3.6. Source-specific planned improvements

Further improvement of activity data quality is still necessary. The involved authorities are in the process of improving the system of collection and preparation of data. Moreover, the tourists have not been taken into account in the population of the island. Tourists should be taken into account for the estimation of the wastewater production, since they contribute considerably to the population of island.

[18] Directive 91/271

Chapter 9: Other (CRF sector 7)

Not applicable

Chapter 10: Recalculations and improvements

10.1. Recalculations and planned improvements

Recalculations and planned improvements are presented for each sector and source separately. Table 10 presents the total emissions by sector for NIR 2013 compared to the present submission.

Table 10.1. Total emissions by sector as reported by NIR 2012 and NIR 2013 for 1990 and 2010

Sector	NIR 2012 ($Gg\ CO_2$ eq.)		NIR 2013 ($Gg\ CO_2$ eq.)		% change	
	1990	2010	1990	2010	1990	2010
Energy	4,214	7,671	4214	7440	0%	-3%
Industrial processes	728	833	728	642	0%	-23%
Solvent & other product use	NE	NE	NE	NE		
Agriculture	647	656	679	722	5%	10%
LULUCF	-139	-175	-139	-165	0%	-6%
Waste	879	1,943	407	639	-54%	-67%
TOTAL excl. LULUCF	**6,468**	**11,103**	**6091**	**9444**	-6%	-15%
TOTAL incl. LULUCF	**6,329**	**10,928**	**5952**	**9278**	-6%	-15%

10.2. Inventory improvement plan

An inventory improvement plan will be developed in the framework of the climate change framework law currently in preparation in Cyprus and is expected to be in force by 2013.

Nevertheless, there are certain improvements for sources of emissions that have to be addressed the soonest possible. The aim is that these improvements will be applied by the submission of the NIR 2014. These are the following:

(a) To obtain fuel consumption data for industrial activities in addition to ETS activities.
(b) To obtain fuel consumption data for domestic aviation and maritime activities.
(c) To obtain data for equipment installed that use f-gases and SF6.
(d) Determine a methodology for the estimation of emissions from solvent and other product use.
(e) Obtain the necessary data to estimation emissions from enteric fermentation and manure management by higher Tier methods.
(f) Improvement of activity data for wastewater management.

In addition to the above, that have to be implemented the soonest possible, the estimation of emissions from LULUCF are also considered a priority, for which the basic infrastructure and system arrangements have to be first developed to obtain the necessary data for the estimation of emissions.

ANNEXES TO THE NATIONAL INVENTORY REPORT

Annex I. Key categories analysis

I1. Description of methodology used for identifying key categories

The determination of the key categories without LULUCF for the national inventory of Cyprus is based on the application of the Tier 1 methodology described in the chapter 7 of the IPCC Good Practice Guidance (Tables 7.2 and 7.3), adopting the categorization of sources that is presented in Table 7.1 of the IPCC Good Practice Guidance.

Key categories are those which, when summed together in descending order of magnitude, contribute over 95% of total emissions (level assessment) or the trend of the inventory in absolute terms. It should be noted that, according to the IPCC GPG the trend is estimated on the basis of the base year (1990). The methodology for the determination of key categories with LULUCF is in fact the same as for the one for key sources without LULUCF.

I2. Information on the level of disaggregation

The key categories analysis has been performed for the total of the time series (years 1990-2011) on both level and trend analysis basis. Any differences between the key categories in the time-series are due to the fluctuation of the trend in specific categories and refer to trend analysis.

I3. Reference to the key category tables in the CRF

The results of the analysis for each year can be viewed in Table 7 of the corresponding CRF excel file.

I4. Tables 7.2and 7.3 of the IPCC good practice guidance

Tables 7.2 - 7.3 of the IPCC good practice guidance for 1990 and 2010 are presented in the following pages as follows:

(a) Key categories analysis without LULUCF – Level assessment for 2011 (Table I.1)
(b) Key categories analysis with LULUCF – Level assessment for 2011 (Table I.2)
(c) Key categories analysis without LULUCF – Level assessment for 1990 (Table I.3)
(d) Key categories analysis with LULUCF – Level assessment for 1990 (Table I.4)
(e) Key categories analysis without LULUCF – Trend assessment for 2011 (Table I.5)
(f) Key categories analysis with LULUCF – Trend assessment for 2011 (Table I.6)

Table I1 Key categories analysis without LULUCF – Level assessment for 2011

IPCC Source category	Direct GHG	2011 estimate (Gg)	Level assessment	Cumulative total of level assessment
1AA1A. Public electricity and heat production	**CO_2**	**3710.0**	**0.4**	**40.5%**
1AA3B. Road transport	**CO_2**	**2235.0**	**0.2**	**64.9%**
2A1. Cement Production	**CO_2**	**546.0**	**0.1**	**70.9%**
6A. Solid waste disposal on land	**CH_4**	**541.3**	**0.1**	**76.8%**
1AA4B. Residential	**CO_2**	**479.4**	**0.1**	**82.1%**
1AA2F2. Non-metallic minerals	**CO_2**	**378.3**	**0.0**	**86.2%**
4A. Enteric Fermentation	**CH_4**	**190.5**	**0.0**	**88.3%**
4B. Manure Management	**N_2O**	**149.7**	**0.0**	**89.9%**
4D1. Direct Soil Emissions	**N_2O**	**141.1**	**0.0**	**91.4%**
1AA2F1. Other	**CO_2**	**131.0**	**0.0**	**92.9%**
2F. Consumption of halocarbons and SF6	**HFC&SF_6**	**126.6**	**0.0**	**94.3%**
4D3. Indirect emissions	N_2O	124.2	0.0	95.6%
4B. Manure Management	CH_4	123.4	0.0	97.0%
1AA4C. Agriculture/ Forestry/ Fisheries	CO_2	79.4	0.0	97.8%
1AA4A. Commercial/ Institutional	CO_2	69.7	0.0	98.6%
6B. Wastewater handling	CH_4	25.3	0.0	98.9%
6B. Wastewater handling	N_2O	23.8	0.0	99.1%
1AA5A. Other Stationary	CO_2	19.1	0.0	99.3%
2A7.2. Ceramics Production	CO_2	17.4	0.0	99.5%
1AA1A. Public electricity and heat production	N_2O	8.9	0.0	99.6%
1AA3B. Road transport	CH_4	8.8	0.0	99.7%
2A2. Lime production	CO_2	6.9	0.0	99.8%
1AA3B. Road transport	N_2O	6.0	0.0	99.9%
1AA1A. Public electricity and heat production	CH_4	3.0	0.0	99.9%
1AA4B. Residential	CH_4	2.9	0.0	99.9%
1AA4B. Residential	N_2O	1.6	0.0	99.9%
1AA2F2. Non-metallic minerals	N_2O	1.1	0.0	100.0%
1AA4A. Commercial/ Institutional	CH_4	0.9	0.0	100.0%
4F. Field burning of agricultural residues	CH_4	0.5	0.0	100.0%
4F. Field burning of agricultural residues	N_2O	0.5	0.0	100.0%
1AA2F2. Non-metallic minerals	CH_4	0.5	0.0	100.0%
1AA2F1. Other	N_2O	0.3	0.0	100.0%
1AA4A. Commercial/ Institutional	N_2O	0.3	0.0	100.0%
1AA4C. Agriculture/ Forestry/ Fisheries	CH_4	0.2	0.0	100.0%
1AA4C. Agriculture/ Forestry/ Fisheries	N_2O	0.2	0.0	100.0%
1AA2F1. Other	CH_4	0.1	0.0	100.0%
1AA5A. Other Stationary	CH_4	0.1	0.0	100.0%
1AA5A. Other Stationary	N_2O	0.1	0.0	100.0%
1AA1B. Petroleum refining	CO_2		0.0	100.0%
1AA1B. Petroleum refining	CH_4		0.0	100.0%
1B2A4. Refining / Storage	CH_4	0.0	0.0	100.0%
1AA1B. Petroleum refining	N_2O		0.0	100.0%
TOTAL		9154.4		

Table I2 Key categories analysis with LULUCF – Level assessment for 2011

IPCC Source category	Direct GHG	2011 estimate (Gg)	Level assessment	Cumulative total of level assessment
1AA1A. Public electricity and heat production	**CO_2**	**3710.0**	**0.4**	**40.0%**
1AA3B. Road transport	**CO_2**	**2235.0**	**0.2**	**64.2%**
2A1. Cement Production	**CO_2**	**546.0**	**0.1**	**70.1%**
6A. Solid waste disposal on land	**CH_4**	**541.3**	**0.1**	**75.9%**
1AA4B. Residential	**CO_2**	**479.4**	**0.1**	**81.1%**
1AA2F2. Non-metallic minerals	**CO_2**	**378.3**	**0.0**	**85.2%**
4A. Enteric Fermentation	**CH_4**	**190.5**	**0.0**	**87.2%**
4B. Manure Management	**N_2O**	**149.7**	**0.0**	**88.8%**
4D1. Direct Soil Emissions	**N_2O**	**141.1**	**0.0**	**90.4%**
1AA2F1. Other	**CO_2**	**131.0**	**0.0**	**91.8%**
2F. Consumption of halocarbons and SF6	**$HFC\&SF_6$**	**126.6**	**0.0**	**93.1%**
4D3. Indirect emissions	**N_2O**	**124.2**	**0.0**	**94.5%**
4B. Manure Management	CH_4	123.4	0.0	95.8%
5. LULUCF	CO_2	92.9	0.0	96.8%
1AA4C. Agriculture/ Forestry/ Fisheries	CO_2	79.4	0.0	97.7%
1AA4A. Commercial/ Institutional	CO_2	69.7	0.0	98.4%
6B. Wastewater handling	CH_4	25.3	0.0	98.7%
6B. Wastewater handling	N_2O	23.8	0.0	99.0%
1AA5A. Other Stationary	CO_2	19.1	0.0	99.2%
2A7.2. Ceramics Production	CO_2	17.4	0.0	99.4%
5. LULUCF	N_2O	14.7	0.0	99.5%
1AA1A. Public electricity and heat production	N_2O	8.9	0.0	99.6%
1AA3B. Road transport	CH_4	8.8	0.0	99.7%
2A2. Lime production	CO_2	6.9	0.0	99.8%
1AA3B. Road transport	N_2O	6.0	0.0	99.8%
1AA1A. Public electricity and heat production	CH_4	3.0	0.0	99.9%
1AA4B. Residential	CH_4	2.9	0.0	99.9%
5. LULUCF	CH_4	1.7	0.0	99.9%
1AA4B. Residential	N_2O	1.6	0.0	99.9%
1AA2F2. Non-metallic minerals	N_2O	1.1	0.0	100.0%
1AA4A. Commercial/ Institutional	CH_4	0.9	0.0	100.0%
4F. Field burning of agricultural residues	CH_4	0.5	0.0	100.0%
4F. Field burning of agricultural residues	N_2O	0.5	0.0	100.0%
1AA2F2. Non-metallic minerals	CH_4	0.5	0.0	100.0%
1AA2F1. Other	N_2O	0.3	0.0	100.0%
1AA4A. Commercial/ Institutional	N_2O	0.3	0.0	100.0%
1AA4C. Agriculture/ Forestry/ Fisheries	CH_4	0.2	0.0	100.0%
1AA4C. Agriculture/ Forestry/ Fisheries	N_2O	0.2	0.0	100.0%
1AA2F1. Other	CH_4	0.1	0.0	100.0%
1AA5A. Other Stationary	CH_4	0.1	0.0	100.0%
1AA5A. Other Stationary	N_2O	0.1	0.0	100.0%
1AA1B. Petroleum refining	CO_2		0.0	100.0%
1AA1B. Petroleum refining	CH_4		0.0	100.0%
1B2A4. Refining / Storage	CH_4		0.0	100.0%
1AA1B. Petroleum refining	N_2O		0.0	100.0%
TOTAL with LULUCF		9263.6		

Table I3 Key categories analysis without LULUCF – Level assessment for 1990

IPCC Source category	Direct GHG	1990 estimate (Gg)	Level assessment	Cumulative total of level assessment
1AA1A. Public electricity and heat production	**CO_2**	**1674.0**	**0.3**	**27.5%**
1AA3B. Road transport	**CO_2**	**1168.2**	**0.2**	**46.7%**
2A1. Cement Production	**CO_2**	**667.7**	**0.1**	**57.6%**
1AA2F2. Non-metallic minerals	**CO_2**	**649.0**	**0.1**	**68.3%**
6A. Solid waste disposal on land	**CH_4**	**433.0**	**0.1**	**75.4%**
1AA2F1. Other	**CO_2**	**428.1**	**0.1**	**82.4%**
1AA4B. Residential	**CO_2**	**182.9**	**0.0**	**85.4%**
4A. Enteric Fermentation	**CH_4**	**160.7**	**0.0**	**88.1%**
4D1. Direct Soil Emissions	**N_2O**	**152.8**	**0.0**	**90.6%**
4D3. Indirect emissions	**N_2O**	**132.0**	**0.0**	**92.7%**
4B. Manure Management	**N_2O**	**128.3**	**0.0**	**94.8%**
1AA1B. Petroleum refining	CO_2	91.1	0.0	96.3%
4B. Manure Management	CH_4	87.9	0.0	97.8%
2A7.2. Ceramics Production	CO_2	56.8	0.0	98.7%
6B. Wastewater handling	CH_4	19.9	0.0	99.0%
6B. Wastewater handling	N_2O	17.1	0.0	99.3%
4F. Field burning of agricultural residues	CH_4	8.8	0.0	99.5%
4F. Field burning of agricultural residues	N2O	8.4	0.0	99.6%
1AA1A. Public electricity and heat production	N_2O	4.1	0.0	99.7%
1AA3B. Road transport	CH_4	4.0	0.0	99.7%
2A2. Lime production	CO_2	3.7	0.0	99.8%
1AA3B. Road transport	N_2O	3.1	0.0	99.8%
1AA2F2. Non-metallic minerals	N_2O	2.0	0.0	99.9%
1AA1A. Public electricity and heat production	CH_4	1.4	0.0	99.9%
1AA2F1. Other	N_2O	1.1	0.0	99.9%
1B2A4. Refining / Storage	CH_4	0.9	0.0	99.9%
1AA5A. Other Stationary	CH_4	0.9	0.0	100.0%
1AA2F2. Non-metallic minerals	CH_4	0.9	0.0	100.0%
1AA4B. Residential	CH_4	0.6	0.0	100.0%
1AA4B. Residential	N_2O	0.5	0.0	100.0%
1AA2F1. Other	CH_4	0.4	0.0	100.0%
1AA1B. Petroleum refining	N_2O	0.2	0.0	100.0%
1AA5A. Other Stationary	N_2O	0.2	0.0	100.0%
1AA1B. Petroleum refining	CH_4	0.1	0.0	100.0%
1AA4A. Commercial/ Institutional	CO_2		0.0	100.0%
1AA4C. Agriculture/ Forestry/ Fisheries	CO_2		0.0	100.0%
1AA5A. Other Stationary	CO_2		0.0	100.0%
1AA4A. Commercial/ Institutional	CH_4		0.0	100.0%
1AA4C. Agriculture/ Forestry/ Fisheries	CH_4		0.0	100.0%
1AA4A. Commercial/ Institutional	N_2O		0.0	100.0%
1AA4C. Agriculture/ Forestry/ Fisheries	N_2O		0.0	100.0%
2F. Consumption of halocarbons and SF6	HFC&SF_6		0.0	100.0%
TOTAL		6090.8		

Table I4 Key categories analysis with LULUCF – Level assessment for 1990

IPCC Source category	Direct GHG	1990 estimate (Gg)	Level assessment	Cumulative total of level assessment
1AA1A. Public electricity and heat production	**CO_2**	**1674.0**	**0.3**	**26.8%**
1AA3B. Road transport	**CO_2**	**1168.2**	**0.2**	**45.6%**
2A1. Cement Production	**CO_2**	**667.7**	**0.1**	**56.3%**
1AA2F2. Non-metallic minerals	**CO_2**	**649.0**	**0.1**	**66.7%**
6A. Solid waste disposal on land	**CH_4**	**433.0**	**0.1**	**73.6%**
1AA2F1. Other	**CO_2**	**428.1**	**0.1**	**80.5%**
1AA4B. Residential	**CO_2**	**182.9**	**0.0**	**83.4%**
4A. Enteric Fermentation	**CH_4**	**160.7**	**0.0**	**86.0%**
4D1. Direct Soil Emissions	**N_2O**	**152.8**	**0.0**	**88.5%**
5. LULUCF	**CO_2**	**141.5**	**0.0**	**90.7%**
4D3. Indirect emissions	**N_2O**	**132.0**	**0.0**	**92.9%**
4B. Manure Management	**N_2O**	**128.3**	**0.0**	**94.9%**
1AA1B. Petroleum refining	CO_2	91.1	0.0	96.4%
4B. Manure Management	CH4	87.9	0.0	97.8%
2A7.2. Ceramics Production	CO_2	56.8	0.0	98.7%
6B. Wastewater handling	CH_4	19.9	0.0	99.0%
6B. Wastewater handling	N_2O	17.1	0.0	99.3%
4F. Field burning of agricultural residues	CH_4	8.8	0.0	99.4%
4F. Field burning of agricultural residues	N_2O	8.4	0.0	99.6%
1AA1A. Public electricity and heat production	N_2O	4.1	0.0	99.6%
1AA3B. Road transport	CH_4	4.0	0.0	99.7%
2A2. Lime production	CO_2	3.7	0.0	99.8%
1AA3B. Road transport	N_2O	3.1	0.0	99.8%
5. LULUCF	N_2O	2.3	0.0	99.8%
1AA2F2. Non-metallic minerals	N_2O	2.0	0.0	99.9%
1AA1A. Public electricity and heat production	CH_4	1.4	0.0	99.9%
1AA2F1. Other	N_2O	1.1	0.0	99.9%
1B2A4. Refining / Storage	CH_4	0.9	0.0	99.9%
1AA5A. Other Stationary	CH_4	0.9	0.0	99.9%
1AA2F2. Non-metallic minerals	CH_4	0.9	0.0	100.0%
1AA4B. Residential	CH_4	0.6	0.0	100.0%
1AA4B. Residential	N_2O	0.5	0.0	100.0%
1AA2F1. Other	CH_4	0.4	0.0	100.0%
5. LULUCF	CH_4	0.3	0.0	100.0%
1AA1B. Petroleum refining	N_2O	0.2	0.0	100.0%
1AA5A. Other Stationary	N_2O	0.2	0.0	100.0%
1AA1B. Petroleum refining	CH_4	0.1	0.0	100.0%
1AA4A. Commercial/ Institutional	CO_2		0.0	100.0%
1AA4C. Agriculture/ Forestry/ Fisheries	CO_2		0.0	100.0%
1AA5A. Other Stationary	CO_2		0.0	100.0%
1AA4A. Commercial/ Institutional	CH_4		0.0	100.0%
1AA4C. Agriculture/ Forestry/ Fisheries	CH_4		0.0	100.0%
1AA4A. Commercial/ Institutional	N_2O		0.0	100.0%
1AA4C. Agriculture/ Forestry/ Fisheries	N_2O		0.0	100.0%
2F. Consumption of halocarbons and SF6	HFC&SF_6		0.0	100.0%
TOTAL wt LULUCF		6235.0		

Table I5 Key categories analysis without LULUCF – Trend assessment for 2011

IPCC Source category	Direct GHG	1990 estimate	2011 estimate	Level assessment	Trend assessment	% contribution to trend	Cumulative total of level assessment
1AA1A. Public electricity and heat production	**CO_2**	**1674.0**	**3710.0**	**0.4**	**0.1**	**28%**	**28.2%**
1AA2F2. Non-metallic minerals	**CO_2**	**649.0**	**378.3**	**0.0**	**0.0**	**14%**	**42.3%**
1AA2F1. Other	**CO_2**	**428.1**	**131.0**	**0.0**	**0.0**	**12%**	**54.4%**
1AA3B. Road transport	**CO_2**	**1168.2**	**2235.0**	**0.2**	**0.0**	**11%**	**65.8%**
2A1. Cement Production	**CO_2**	**667.7**	**546.0**	**0.1**	**0.0**	**11%**	**76.6%**
1AA4B. Residential	**CO_2**	**182.9**	**479.4**	**0.1**	**0.0**	**5%**	**81.4%**
2F. Consumption of halocarbons and SF6	**HFC&SF_6**	**0.0**	**126.6**	**0.0**	**0.0**	**3%**	**84.4%**
6A. Solid waste disposal on land	**CH_4**	**433.0**	**541.3**	**0.1**	**0.0**	**3%**	**87.0%**
4D1. Direct Soil Emissions	**N_2O**	**152.8**	**141.1**	**0.0**	**0.0**	**2%**	**89.1%**
1AA4C. Agriculture/ Forestry/ Fisheries	**CO_2**	**0.0**	**79.4**	**0.0**	**0.0**	**2%**	**91.0%**
4D3. Indirect emissions	**N_2O**	**132.0**	**124.2**	**0.0**	**0.0**	**2%**	**92.7%**
1AA4A. Commercial/ Institutional	**CO_2**	**0.0**	**69.7**	**0.0**	**0.0**	**2%**	**94.4%**
2A7.2. Ceramics Production	CO_2	56.8	17.4	0.0	0.0	2%	96.0%
4A. Enteric Fermentation	CH_4	160.7	190.5	0.0	0.0	1%	97.2%
4B. Manure Management	N_2O	128.3	149.7	0.0	0.0	1%	98.2%
1AA5A. Other Stationary	CH_4	0.9	19.1	0.0	0.0	0%	98.6%
4F. Field burning of agricultural residues	CH_4	8.8	0.5	0.0	0.0	0%	98.9%
4F. Field burning of agricultural residues	N_2O	8.4	0.5	0.0	0.0	0%	99.2%
4B. Manure Management	CH_4	87.9	123.4	0.0	0.0	0%	99.4%
6B. Wastewater handling	CH_4	19.9	25.3	0.0	0.0	0%	99.5%
1AA1A. Public electricity and heat production	N_2O	4.1	8.9	0.0	0.0	0%	99.6%
1AA3B. Road transport	CH_4	4.0	8.8	0.0	0.0	0%	99.6%
1AA4B. Residential	CH_4	0.6	2.9	0.0	0.0	0%	99.7%
6B. Wastewater handling	N_2O	17.1	23.8	0.0	0.0	0%	99.7%
1AA2F2. Non-metallic minerals	N_2O	2.0	1.1	0.0	0.0	0%	99.8%
2A2. Lime production	CO_2	3.7	6.9	0.0	0.0	0%	99.8%

IPCC Source category	Direct GHG	1990 estimate	2011 estimate	Level assessment	Trend assessment	% contribution to trend	Cumulative total of level assessment
1AA3B. Road transport	N_2O	3.1	6.0	0.0	0.0	0%	99.9%
1AA2F1. Other	N_2O	1.1	0.3	0.0	0.0	0%	99.9%
1AA1A. Public electricity and heat production	CH_4	1.4	3.0	0.0	0.0	0%	99.9%
1AA4A. Commercial/ Institutional	CH_4	0.0	0.9	0.0	0.0	0%	99.9%
1AA2F2. Non-metallic minerals	CH_4	0.9	0.5	0.0	0.0	0%	99.9%
1AA4B. Residential	N_2O	0.5	1.6	0.0	0.0	0%	100.0%
1AA2F1. Other	CH_4	0.4	0.1	0.0	0.0	0%	100.0%
1AA4A. Commercial/ Institutional	N_2O	0.0	0.3	0.0	0.0	0%	100.0%
1AA4C. Agriculture/ Forestry/ Fisheries	CH_4	0.0	0.2	0.0	0.0	0%	100.0%
1AA4C. Agriculture/ Forestry/ Fisheries	N_2O	0.0	0.2	0.0	0.0	0%	100.0%
1AA5A. Other Stationary	N_2O	0.2	0.1	0.0	0.0	0%	100.0%
1AA5A. Other Stationary	CO_2	0.0	0.1	0.0	0.0	0%	100.0%
1AA1B. Petroleum refining	CO_2	91.1	0.0	0.0	0.0	0%	100.0%
1AA1B. Petroleum refining	N_2O	0.2	0.0	0.0	0.0	0%	100.0%
1AA1B. Petroleum refining	CH_4	0.1	0.0	0.0	0.0	0%	100.0%
1B2A4. Refining / Storage	CH_4	0.9	0.0	0.0	0.0	0%	100.0%
TOTAL		6090.8	9154.4		0.3		

Table I6 Key categories analysis with LULUCF – Trend assessment for 2011

IPCC Source category	Direct GHG	1990 estimate	2011 estimate	Level assessment	Trend assessment	% contribution to trend	Cumulative total of level assessment
1AA1A. Public electricity and heat production	**CO_2**	**1674.0**	**3710.0**	**0.4**	**0.1**	**28%**	**28.0%**
1AA2F2. Non-metallic minerals	**CO_2**	**649.0**	**378.3**	**0.0**	**0.0**	**13%**	**41.5%**
1AA2F1. Other	**CO_2**	**428.1**	**131.0**	**0.0**	**0.0**	**12%**	**53.0%**
1AA3B. Road transport	**CO_2**	**1168.2**	**2235.0**	**0.2**	**0.0**	**11%**	**64.5%**
2A1. Cement Production	**CO_2**	**667.7**	**546.0**	**0.1**	**0.0**	**10%**	**74.7%**
1AA4B. Residential	**CO_2**	**182.9**	**479.4**	**0.1**	**0.0**	**5%**	**79.5%**
2F. Consumption of halocarbons and SF6	**$HFC\&SF_6$**	**0.0**	**126.6**	**0.0**	**0.0**	**3%**	**82.4%**
5. LULUCF	**CO_2**	**141.5**	**92.9**	**0.0**	**0.0**	**3%**	**85.1%**
6A. Solid waste disposal on land	**CH_4**	**433.0**	**541.3**	**0.1**	**0.0**	**2%**	**87.4%**
4D1. Direct Soil Emissions	**N_2O**	**152.8**	**141.1**	**0.0**	**0.0**	**2%**	**89.4%**
1AA4C. Agriculture/ Forestry/ Fisheries	**CO_2**	**0.0**	**79.4**	**0.0**	**0.0**	**2%**	**91.2%**
4D3. Indirect emissions	**N_2O**	**132.0**	**124.2**	**0.0**	**0.0**	**2%**	**92.8%**
1AA4A. Commercial/ Institutional	**CO_2**	**0.0**	**69.7**	**0.0**	**0.0**	**2%**	**94.4%**
2A7.2. Ceramics Production	CO_2	56.8	17.4	0.0	0.0	2%	96.0%
4A. Enteric Fermentation	CH_4	160.7	190.5	0.0	0.0	1%	97.1%
4B. Manure Management	N_2O	128.3	149.7	0.0	0.0	1%	98.0%
1AA5A. Other Stationary	CH_4	0.9	19.1	0.0	0.0	0%	98.4%
4F. Field burning of agricultural residues	CH_4	8.8	0.5	0.0	0.0	0%	98.7%
4F. Field burning of agricultural residues	N_2O	8.4	0.5	0.0	0.0	0%	99.0%
5. LULUCF	N_2O	2.3	14.7	0.0	0.0	0%	99.2%
4B. Manure Management	CH_4	87.9	123.4	0.0	0.0	0%	99.4%
6B. Wastewater handling	CH_4	19.9	25.3	0.0	0.0	0%	99.5%
1AA1A. Public electricity and heat production	N_2O	4.1	8.9	0.0	0.0	0%	99.6%
1AA3B. Road transport	CH_4	4.0	8.8	0.0	0.0	0%	99.6%
1AA4B. Residential	CH_4	0.6	2.9	0.0	0.0	0%	99.7%
1AA2F2. Non-metallic minerals	N_2O	2.0	1.1	0.0	0.0	0%	99.7%
6B. Wastewater handling	N_2O	17.1	23.8	0.0	0.0	0%	99.8%
2A2. Lime production	CO_2	3.7	6.9	0.0	0.0	0%	99.8%
1AA3B. Road transport	N_2O	3.1	6.0	0.0	0.0	0%	99.8%

IPCC Source category	Direct GHG	1990 estimate	2011 estimate	Level assessment	Trend assessment	% contribution to trend	Cumulative total of level assessment
5. LULUCF	CH_4	0.3	1.7	0.0	0.0	0%	99.9%
1AA2F1. Other	N_2O	1.1	0.3	0.0	0.0	0%	99.9%
1AA1A. Public electricity and heat production	CH_4	1.4	3.0	0.0	0.0	0%	99.9%
1AA4A. Commercial/ Institutional	CH_4	0.0	0.9	0.0	0.0	0%	99.9%
1AA2F2. Non-metallic minerals	CH_4	0.9	0.5	0.0	0.0	0%	99.9%
1AA4B. Residential	N_2O	0.5	1.6	0.0	0.0	0%	100.0%
1AA2F1. Other	CH_4	0.4	0.1	0.0	0.0	0%	100.0%
1AA4A. Commercial/ Institutional	N_2O	0.0	0.3	0.0	0.0	0%	100.0%
1AA4C. Agriculture/ Forestry/ Fisheries	CH_4	0.0	0.2	0.0	0.0	0%	100.0%
1AA4C. Agriculture/ Forestry/ Fisheries	N_2O	0.0	0.2	0.0	0.0	0%	100.0%
1AA5A. Other Stationary	N_2O	0.2	0.1	0.0	0.0	0%	100.0%
1AA5A. Other Stationary	CO_2	0.0	0.1	0.0	0.0	0%	100.0%
1AA1B. Petroleum refining	CO_2	91.1	0.0	0.0	0.0	0%	100.0%
1AA1B. Petroleum refining	N_2O	0.2	0.0	0.0	0.0	0%	100.0%
1AA1B. Petroleum refining	CH_4	0.1	0.0	0.0	0.0	0%	100.0%
1B2A4. Refining / Storage	CH_4	0.9	0.0	0.0	0.0	0%	100.0%
TOTAL		6235.0	9263.6		0.3		

Annex II. Uncertainty analysis

Uncertainty analysis constitutes a key activity in the annual inventory cycle. The realisation of such an analysis is foreseen in the reporting guidelines under the Convention and represents a specific function to be performed by a National System.

There are two methods for the uncertainty estimation suggested by the IPCC Good Practice Guidance. A basic method (Tier 1) which is mandatory and an analytic one (Tier 2), which uses Monte Carlo analysis. Tier 2 analysis is suitable for a composite system such as the calculation of GHG emissions in national level. Its application however, requires significant resources and time.

Uncertainty of the Cyprus national inventory was estimated according to Tier I methodology of the 2000 IPCC Good Practice Guidance. Emission factors uncertainties are based on the default uncertainties proposed by the IPCC (2000 IPCC Good Practice Guidance).Uncertainty estimations on activity data and on the emission factors are based on IPCC defaults using expert judgement. Reasoning details and explanation regarding their choice for each sector is presented in Table II.1.

The base year for the uncertainty analysis is 1990 except for HFCs for which it is 1994. Where no data is available or not occurring, the respective cells were left blanks.

Table II.2 presents the uncertainty analysis for each year.

Table II1 Activity data and emission factor uncertainty values used for calculation of uncertainty

Source category	Activity data uncertainty	Emission factor uncertainty
CO_2		
Stationary Combustion -solid fuels	Activity data obtained from national energy balance and plant specific data.5% corresponds to the IPCC default uncertainty range.	Default carbon content per fuel has been used according to IPCC guidelines with 95% confidence intervals. The % uncertainty is estimated < 5%. For conservative reasons we select 5%.
Stationary Combustion -liquid fuels	Activity data obtained from national energy balance and plant specific data.5% corresponds to the IPCC default uncertainty range.	Default carbon content per fuel has been used according to IPCC guidelines with 95% confidence intervals. The % uncertainty is estimated < 5%. For conservative reasons we select 5%.
Stationary Combustion -Other fuels	Activity data obtained from national energy balance and plant specific data.5% corresponds to the IPCC default uncertainty range.	Default carbon content per fuel has been used according to IPCC guidelines with 95% confidence intervals. The % uncertainty is estimated < 5%. For conservative reasons we select 5%.
Road Transport	Default IPCC uncertainty is 5%.	Default IPCC uncertainty is 5%.
Cement Production	Plant level production data	Plant level production data

Source category	Activity data uncertainty	Emission factor uncertainty
	(IPCC GPG); 2%.	(IPCC GPG); 2%.
Lime Production	Plant level production data (IPCC GPG); 2%.	Plant level production data (IPCC GPG); 2%.
CH_4		
Stationary Combustion -all fuels	Activity data obtained from national energy balance.5% corresponds to the IPCC default uncertainty range.	According to Table 2.5 of IPCC GPG p 2.41 the default uncertainty for stationary combustion EF is 50-150%. We select the mean 100%.
Road transport	Default IPCC uncertainty is 5%.	Default IPCC uncertainty is 40%.
Oil and Natural gas	Activity data obtained from national energy balance.5% corresponds to the IPCC default uncertainty range.	In IPCC GPG is mentioned that the EF used (from Table 2.16 p. 2.84) may be expected to limit uncertainties to within an order of magnitude. However, to be conservative, the value 300% is selected.
Enteric fermentation	5% uncertainty given by the national statistics for the livestock population data.	According to Good Practice Guidance, pg. 4.27: 30%.
Manure Management	5% uncertainty given by the national statistics for the livestock population data.	Country specific data taking into account that there is a wide variety of manure management systems: 50% used.
Field burning of agricultural residues	5% uncertainty given by the national statistics for the livestock population data.	According to Good Practice Guidance, Table 4.22, p. 4.82: 20%
Managed solid waste disposal	Good Practice Guidance Page 5.12. Table 5.2 (Use of a multiplying factor of two on the suggested value): 20%	Estimated value according to Good , Practice Guidance, Table 5.2, p. 5.12: 40%
Unmanaged solid waste disposal	Good Practice Guidance Page 5.12. Table 5.2 (Use of a multiplying factor of two on the suggested value): 20%	Estimated value according to Good , Practice Guidance, Table 5.2, p. 5.12: 50%
Wastewater handling	According to Good Practice Guidance. Page 5.19Table 5.3 and Page 5.23 Table 5.5: 30%	Estimated value according to Good Practice Guidance. Page 5.19 Table 5.3 and Page 5.23 Table 5.5: 100%
N_2O		
Stationary Combustion -all fuels	Activity data obtained from national energy balance. 5% corresponds to the IPCC default uncertainty range.	In IPCC GPG is mentioned that the EF used (from Table 2.16 p. 2.84) may be expected to limit uncertainties to within an order of magnitude. However, to be conservative, the value 300% is selected.
Road transport	Default IPCC uncertainty is 5%.	Default IPCC uncertainty is 50%.
Manure Management	5% uncertainty given by the national statistics for the livestock population	According to Good Practice Guidance. Page 4.43. Table 4.12 and Page 4.44. Table 4.13:

Source category	Activity data uncertainty	Emission factor uncertainty
	data.	100% used.
Agricultural soils – direct emissions	Uncertainty given by national statistics for the crop production data: 20%	Country specific data: 400%
Agricultural soils – indirect emissions	Uncertainty given by national statistics for the crop production data: 20%	According to Good Practice Guidance. P. 4.75: 50%
Field burning of agricultural residues	5% uncertainty given by the national statistics for the livestock population data.	According to Good Practice Guidance, Table 4.22, p. 4.82: 20%
Wastewater handling	According to Good Practice Guidance. Page 5.19 Table 5.3 and Page 5.23 Table 5.5: 5%	Country specific: 10%
HFC		
Consumption of HFCs	According to Good Practice Guidance.	Estimation from National Association of Refrigerating and Cooling Technicians: 200%

Table II2 Table 6.1 of IPCC Good Practice Guidance for years 1990-2011

Tier I UNCERTAINTY CALCULATION AND REPORTING - 1990

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	1990 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	1674	5%	5%	7.1%	1.94%	0.00%	27.48%	0.00	0.02	1.94%	D	R		
1AA1B. Petroleum refining	CO2	91	91	5%	5%	7.1%	0.11%	0.00%	1.50%	0.00	0.00	0.11%	D	R		
1AA2F1. Other	CO2	428	428	5%	5%	7.1%	0.50%	0.00%	7.03%	0.00	0.00	0.50%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	649	5%	5%	7.1%	0.75%	0.00%	10.66%	0.00	0.01	0.75%	D	R		
1AA3B. Road transport	CO2	1168	1168	5%	5%	7.1%	1.36%	0.00%	19.18%	0.00	0.01	1.36%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	183	5%	5%	7.1%	0.21%	0.00%	3.00%	0.00	0.00	0.21%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	668	2%	2%	2.8%	0.31%	0.00%	10.96%	0.00	0.00	0.31%	D	R		
2A2. Lime production	CO2	4	4	2%	2%	2.8%	0.00%	0.00%	0.06%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	57	2%	2%	2.8%	0.03%	0.00%	0.93%	0.00	0.00	0.03%	D	R		
TOTAL	**CO2**	**4922**	**4922**				**2.57%**					5.21%				
1AA1A. Public electricity and heat production	CH4	1.4	1.4	5%	100%	100.1%	0.02%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
1AA1B. Petroleum refining	CH4	0.08	0.08	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.4	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.87	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA3B. Road transport	CH4	4.02	4.02	4%	40%	40.2%	0.03%	0.00%	0.07%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.9	5%	100%	100.1%	0.02%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1B2A4. Refining / Storage	CH4	1	1	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
4A. Enteric Fermentation	CH4	161	161	5%	30%	30.4%	0.80%	0.00%	2.64%	0.00	0.00	0.19%	D	R		
4B. Manure Management	CH4	88	88	5%	50%	50.2%	0.73%	0.00%	1.44%	0.00	0.00	0.10%	D	R		
4F. Field burning of agricultural residues	CH4	9	9	5%	20%	20.6%	0.03%	0.00%	0.14%	0.00	0.00	0.01%	D	R		
6A. Solid waste disposal on land	CH4	433	433	20%	40%	44.7%	3.18%	0.00%	7.11%	0.00	0.02	2.01%	D	R		
6B. Wastewater handling	CH4	20	20	30%	100%	104.4%	0.34%	0.00%	0.33%	0.00	0.00	0.14%	D	R		
TOTAL	**CH4**	**719**	**719**				**3.38%**					2.46%				
1AA1A. Public electricity and heat production	N2O	4.07	4.07	5%	300%	300.0%	0.20%	0.00%	0.07%	0.00	0.00	0.00%	D	R		
1AA1B. Petroleum refining	N2O	0.24	0.24	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	N2O	1.09	1.09	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	2.02	5%	300%	300.0%	0.10%	0.00%	0.03%	0.00	0.00	0.00%	D	R		
1AA3B. Road transport	N2O	3.05	3.05	5%	50%	50.2%	0.03%	0.00%	0.05%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.03%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.18	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
4B. Manure Management	N2O	128.32	128.32	5%	100%	100.1%	2.11%	0.00%	2.11%	0.00	0.00	0.15%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	152.84	20%	400%	400.5%	10.05%	0.00%	2.51%	0.00	0.01	0.71%	D	R		
4D3. Indirect emissions	N2O	131.96	131.96	20%	50%	53.9%	1.17%	0.00%	2.17%	0.00	0.01	0.61%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	8.42	20%	20%	28.3%	0.04%	0.00%	0.14%	0.00	0.00	0.04%	D	R		
6B. Wastewater handling	N2O	17.15	17.15	5%	10%	11.2%	0.03%	0.00%	0.28%	0.00	0.00	0.02%	D	R		
TOTAL	**N2O**	**450**	**450**				**10.34%**					0.01%				
2F. Consumption of Halocarbons and SF6	HCFs			50%	200%	206.2%	0.00%	0.00%	0.00%	0.00	0.00	0.00%				
TOTAL	**HCFs**	**0.0**	**0.0**				**0.0**					0.00%				
TOTAL EMISSIONS		**6091**	**6091**				**16.28%**					**7.68%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**40.35%**				**Trend uncertainty:**	**27.71%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 1991

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	1991 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	1736	5%	5%	7.1%	1.93%	-0.17%	28.51%	0.00	0.02	2.02%	D	R		
1AA1B. Petroleum refining	CO2	91	91	5%	5%	7.1%	0.10%	-0.07%	1.49%	0.00	0.00	0.11%	D	R		
1AA2F1. Other	CO2	428	361	5%	5%	7.1%	0.40%	-1.41%	5.93%	0.00	0.00	0.42%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	940	5%	5%	7.1%	1.05%	4.32%	15.44%	0.00	0.01	1.11%	D	R		
1AA3B. Road transport	CO2	1168	1164	5%	5%	7.1%	1.30%	-0.89%	19.12%	0.00	0.01	1.35%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	183	5%	5%	7.1%	0.20%	-0.13%	3.00%	0.00	0.00	0.21%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	629	2%	2%	2.8%	0.28%	-1.11%	10.33%	0.00	0.00	0.29%	D	R		
2A2. Lime production	CO2	4	3	2%	2%	2.8%	0.00%	-0.01%	0.06%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	55	2%	2%	2.8%	0.02%	-0.07%	0.90%	0.00	0.00	0.03%	D	R		
TOTAL	**CO2**	**4922**	**5163**				**2.61%**					5.54%				
1AA1A. Public electricity and heat production	CH4	1.4	1.4	5%	100%	100.1%	0.02%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
1AA1B. Petroleum refining	CH4	0.08	0.08	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.3	5%	100%	100.1%	0.00%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	1.10	5%	100%	100.1%	0.02%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
1AA3B. Road transport	CH4	4.02	4.12	4%	40%	40.2%	0.03%	0.00%	0.07%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.8	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1B2A4. Refining / Storage	CH4	1	1	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.01%	D	R		
4A. Enteric Fermentation	CH4	161	163	5%	30%	30.4%	0.78%	-0.07%	2.68%	0.00	0.00	0.19%	D	R		
4B. Manure Management	CH4	88	91	5%	50%	50.2%	0.72%	-0.01%	1.50%	0.00	0.00	0.11%	D	R		
4F. Field burning of agricultural residues	CH4	9	6	5%	20%	20.6%	0.02%	-0.05%	0.10%	0.00	0.00	0.01%	D	R		
6A. Solid waste disposal on land	CH4	433	454	20%	40%	44.7%	3.19%	0.03%	7.45%	0.00	0.02	2.11%	D	R		
6B. Wastewater handling	CH4	20	19	30%	100%	104.4%	0.31%	-0.03%	0.31%	0.00	0.00	0.14%	D	R		
TOTAL	**CH4**	**719**	**743**				**3.38%**					2.57%				
1AA1A. Public electricity and heat production	N2O	4.07	4.22	5%	300%	300.0%	0.20%	0.00%	0.07%	0.00	0.00	0.01%	D	R		
1AA1B. Petroleum refining	N2O	0.24	0.24	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	N2O	1.09	0.92	5%	300%	300.0%	0.04%	0.00%	0.02%	0.00	0.00	0.01%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	2.72	5%	300%	300.0%	0.13%	0.01%	0.04%	0.00	0.00	0.03%	D	R		
1AA3B. Road transport	N2O	3.05	3.04	5%	50%	50.2%	0.02%	0.00%	0.05%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.03%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.15	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
4B. Manure Management	N2O	128.32	127.87	5%	100%	100.1%	2.01%	-0.10%	2.10%	0.00	0.00	0.18%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	152.92	20%	400%	400.5%	9.64%	-0.11%	2.51%	0.00	0.01	0.83%	D	R		
4D3. Indirect emissions	N2O	131.96	131.96	20%	50%	53.9%	1.12%	-0.09%	2.17%	0.00	0.01	0.61%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	6.87	20%	20%	28.3%	0.03%	-0.03%	0.11%	0.00	0.00	0.03%	D	R		
6B. Wastewater handling	N2O	17.15	17.60	5%	10%	11.2%	0.03%	0.00%	0.29%	0.00	0.00	0.02%	D	R		
TOTAL	**N2O**	**450**	**449**				**9.91%**					0.05%				
2F. Consumption of Halocarbons and SF6	HCFs			50%	200%	206.2%	0.00%	0.00%	0.00%	0.00	0.00	0.00%				
TOTAL	**HCFs**	**0.0**	**0**				**0.0**					0.00%				
TOTAL EMISSIONS		**6091**	**6355**				**15.90%**					**8.17%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**39.88%**				**Trend uncertainty:**	**28.58%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 1992

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	1992 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	2030	5%	5%	7.1%	2.12%	2.72%	33.34%	0.00	0.02	2.36%	D	R		
1AA1B. Petroleum refining	CO2	91	94	5%	5%	7.1%	0.10%	-0.12%	1.54%	0.00	0.00	0.11%	D	R		
1AA2F1. Other	CO2	428	419	5%	5%	7.1%	0.44%	-0.94%	6.89%	0.00	0.00	0.49%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	699	5%	5%	7.1%	0.73%	-0.39%	11.47%	0.00	0.01	0.81%	D	R		
1AA3B. Road transport	CO2	1168	1310	5%	5%	7.1%	1.37%	0.15%	21.51%	0.00	0.02	1.52%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	217	5%	5%	7.1%	0.23%	0.21%	3.56%	0.00	0.00	0.25%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	686	2%	2%	2.8%	0.29%	-0.95%	11.25%	0.00	0.00	0.32%	D	R		
2A2. Lime production	CO2	4	3	2%	2%	2.8%	0.00%	-0.01%	0.05%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	48	2%	2%	2.8%	0.02%	-0.25%	0.79%	0.00	0.00	0.02%	D	R		
TOTAL	**CO2**	**4922**	**5506**				**2.69%**					5.89%				
1AA1A. Public electricity and heat production	CH4	1.4	1.7	5%	100%	100.1%	0.02%	0.00%	0.03%	0.00	0.00	0.00%	D	R		
1AA1B. Petroleum refining	CH4	0.08	0.08	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.4	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.63	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	4.36	4%	40%	40.2%	0.03%	0.00%	0.07%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.7	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1B2A4. Refining / Storage	CH4	1	1	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
4A. Enteric Fermentation	CH4	161	164	5%	30%	30.4%	0.74%	-0.24%	2.69%	0.00	0.00	0.20%	D	R		
4B. Manure Management	CH4	88	102	5%	50%	50.2%	0.76%	0.07%	1.68%	0.00	0.00	0.12%	D	R		
4F. Field burning of agricultural residues	CH4	9	12	5%	20%	20.6%	0.04%	0.03%	0.19%	0.00	0.00	0.02%	D	R		
6A. Solid waste disposal on land	CH4	433	475	20%	40%	44.7%	3.13%	-0.12%	7.80%	0.00	0.02	2.21%	D	R		
6B. Wastewater handling	CH4	20	19	30%	100%	104.4%	0.30%	-0.05%	0.32%	0.00	0.00	0.14%	D	R		
TOTAL	**CH4**	**719**	**782**				**3.32%**					2.71%				
1AA1A. Public electricity and heat production	N2O	4.07	4.93	5%	300%	300.0%	0.22%	0.01%	0.08%	0.00	0.00	0.02%	D	R		
1AA1B. Petroleum refining	N2O	0.24	0.25	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	N2O	1.09	1.06	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.01%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	1.71	5%	300%	300.0%	0.08%	-0.01%	0.03%	0.00	0.00	0.03%	D	R		
1AA3B. Road transport	N2O	3.05	3.42	5%	50%	50.2%	0.03%	0.00%	0.06%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.03%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.15	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
4B. Manure Management	N2O	128.32	129.60	5%	100%	100.1%	1.91%	-0.22%	2.13%	0.00	0.00	0.27%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	175.54	20%	400%	400.5%	10.37%	0.09%	2.88%	0.00	0.01	0.89%	D	R		
4D3. Indirect emissions	N2O	131.96	149.26	20%	50%	53.9%	1.19%	0.04%	2.45%	0.00	0.01	0.69%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	9.32	20%	20%	28.3%	0.04%	0.00%	0.15%	0.00	0.00	0.04%	D	R		
6B. Wastewater handling	N2O	17.15	18.07	5%	10%	11.2%	0.03%	-0.02%	0.30%	0.00	0.00	0.02%	D	R		
TOTAL	**N2O**	**450**	**494**				**10.61%**					0.06%				
2F. Consumption of Halocarbons and SF6	HCFs			50%	200%	206.2%	0.00%	0.00%	0.00%	0.00	0.00	0.00%				
TOTAL	**HCFs**	**0.0**	**0**				**0.0**					0.00%				
TOTAL EMISSIONS		**6091**	**6782**				**16.62%**					**8.66%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**40.76%**				**Trend uncertainty:**	**29.43%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 1993

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	1993 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	2163	5%	5%	7.1%	2.16%	3.53%	35.52%	0.00	0.03	2.52%	D	R		
1AA1B. Petroleum refining	CO2	91	81	5%	5%	7.1%	0.08%	-0.40%	1.34%	0.00	0.00	0.10%	D	R		
1AA2F1. Other	CO2	428	435	5%	5%	7.1%	0.43%	-1.03%	7.15%	0.00	0.01	0.51%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	747	5%	5%	7.1%	0.75%	-0.13%	12.27%	0.00	0.01	0.87%	D	R		
1AA3B. Road transport	CO2	1168	1330	5%	5%	7.1%	1.33%	-0.48%	21.83%	0.00	0.02	1.54%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	202	5%	5%	7.1%	0.20%	-0.18%	3.31%	0.00	0.00	0.23%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	747	2%	2%	2.8%	0.30%	-0.49%	12.26%	0.00	0.00	0.35%	D	R		
2A2. Lime production	CO2	4	4	2%	2%	2.8%	0.00%	0.00%	0.07%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	57	2%	2%	2.8%	0.02%	-0.16%	0.93%	0.00	0.00	0.03%	D	R		
TOTAL	**CO2**	**4922**	**5766**				**2.70%**					6.14%				
1AA1A. Public electricity and heat production	CH4	1.4	1.8	5%	100%	100.1%	0.03%	0.00%	0.03%	0.00	0.00	0.00%	D	R		
1AA1B. Petroleum refining	CH4	0.08	0.07	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.4	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.67	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	4.34	4%	40%	40.2%	0.02%	-0.01%	0.07%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.7	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1B2A4. Refining / Storage	CH4	1	1	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
4A. Enteric Fermentation	CH4	161	170	5%	30%	30.4%	0.73%	-0.27%	2.80%	0.00	0.00	0.21%	D	R		
4B. Manure Management	CH4	88	111	5%	50%	50.2%	0.79%	0.15%	1.83%	0.00	0.00	0.15%	D	R		
4F. Field burning of agricultural residues	CH4	9	12	5%	20%	20.6%	0.04%	0.03%	0.20%	0.00	0.00	0.02%	D	R		
6A. Solid waste disposal on land	CH4	433	495	20%	40%	44.7%	3.12%	-0.14%	8.13%	0.00	0.02	2.30%	D	R		
6B. Wastewater handling	CH4	20	20	30%	100%	104.4%	0.29%	-0.05%	0.33%	0.00	0.00	0.15%	D	R		
TOTAL	**CH4**	**719**	**818**				**3.32%**					2.85%				
1AA1A. Public electricity and heat production	N2O	4.07	5.25	5%	300%	300.0%	0.22%	0.01%	0.09%	0.00	0.00	0.03%	D	R		
1AA1B. Petroleum refining	N2O	0.24	0.21	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	N2O	1.09	1.10	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.01%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	1.81	5%	300%	300.0%	0.08%	-0.01%	0.03%	0.00	0.00	0.03%	D	R		
1AA3B. Road transport	N2O	3.05	3.46	5%	50%	50.2%	0.02%	0.00%	0.06%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.02%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.15	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
4B. Manure Management	N2O	128.32	135.94	5%	100%	100.1%	1.92%	-0.22%	2.23%	0.00	0.00	0.27%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	176.41	20%	400%	400.5%	9.97%	-0.02%	2.90%	0.00	0.01	0.82%	D	R		
4D3. Indirect emissions	N2O	131.96	150.48	20%	50%	53.9%	1.14%	-0.05%	2.47%	0.00	0.01	0.70%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	7.77	20%	20%	28.3%	0.03%	-0.03%	0.13%	0.00	0.00	0.04%	D	R		
6B. Wastewater handling	N2O	17.15	18.48	5%	10%	11.2%	0.03%	-0.02%	0.30%	0.00	0.00	0.02%	D	R		
TOTAL	**N2O**	**450**	**502**				**10.22%**					0.07%				
2F. Consumption of Halocarbons and SF6	HCFs			50%	200%	206.2%	0.00%	0.00%	0.00%	0.00	0.00	0.00%				
TOTAL	**HCFs**	**0.0**	**0**				**0.0**					0.00%				
TOTAL EMISSIONS		**6091**	**7086**				**16.24%**					**9.07%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**40.30%**				**Trend uncertainty:**	**30.11%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 1994

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	1994 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	2257	5%	5%	7.1%	2.11%	2.91%	37.05%	0.00	0.03	2.62%	D	R		
1AA1B. Petroleum refining	CO2	91	119	5%	5%	7.1%	0.11%	0.10%	1.96%	0.00	0.00	0.14%	D	R		
1AA2F1. Other	CO2	428	448	5%	5%	7.1%	0.42%	-1.37%	7.36%	0.00	0.01	0.52%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	956	5%	5%	7.1%	0.89%	2.46%	15.70%	0.00	0.01	1.12%	D	R		
1AA3B. Road transport	CO2	1168	1383	5%	5%	7.1%	1.29%	-1.12%	22.70%	0.00	0.02	1.61%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	202	5%	5%	7.1%	0.19%	-0.42%	3.31%	0.00	0.00	0.24%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	784	2%	2%	2.8%	0.29%	-0.74%	12.87%	0.00	0.00	0.36%	D	R		
2A2. Lime production	CO2	4	6	2%	2%	2.8%	0.00%	0.02%	0.09%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	50	2%	2%	2.8%	0.02%	-0.34%	0.82%	0.00	0.00	0.02%	D	R		
TOTAL	**CO2**	**4922**	**6204**				**2.69%**					6.64%				
1AA1A. Public electricity and heat production	CH4	1.4	1.9	5%	100%	100.1%	0.02%	0.00%	0.03%	0.00	0.00	0.00%	D	R		
1AA1B. Petroleum refining	CH4	0.08	0.11	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.4	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	1.10	5%	100%	100.1%	0.01%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
1AA3B. Road transport	CH4	4.02	4.57	4%	40%	40.2%	0.02%	-0.01%	0.08%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.5	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1B2A4. Refining / Storage	CH4	1	1	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.01%	D	R		
4A. Enteric Fermentation	CH4	161	173	5%	30%	30.4%	0.70%	-0.43%	2.84%	0.00	0.00	0.24%	D	R		
4B. Manure Management	CH4	88	109	5%	50%	50.2%	0.72%	0.00%	1.79%	0.00	0.00	0.13%	D	R		
4F. Field burning of agricultural residues	CH4	9	9	5%	20%	20.6%	0.02%	-0.03%	0.15%	0.00	0.00	0.01%	D	R		
6A. Solid waste disposal on land	CH4	433	513	20%	40%	44.7%	3.04%	-0.40%	8.43%	0.00	0.02	2.39%	D	R		
6B. Wastewater handling	CH4	20	21	30%	100%	104.4%	0.29%	-0.06%	0.34%	0.00	0.00	0.16%	D	R		
TOTAL	**CH4**	**719**	**836**				**3.21%**					2.96%				
1AA1A. Public electricity and heat production	N2O	4.07	5.48	5%	300%	300.0%	0.22%	0.01%	0.09%	0.00	0.00	0.02%	D	R		
1AA1B. Petroleum refining	N2O	0.24	0.32	5%	300%	300.0%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	N2O	1.09	1.14	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.01%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	2.72	5%	300%	300.0%	0.11%	0.00%	0.04%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	N2O	3.05	3.60	5%	50%	50.2%	0.02%	0.00%	0.06%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.02%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.11	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	136.44	5%	100%	100.1%	1.81%	-0.38%	2.24%	0.00	0.00	0.41%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	175.17	20%	400%	400.5%	9.27%	-0.24%	2.88%	-0.01	0.01	1.26%	D	R		
4D3. Indirect emissions	N2O	131.96	149.34	20%	50%	53.9%	1.06%	-0.24%	2.45%	0.00	0.01	0.70%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	5.98	20%	20%	28.3%	0.02%	-0.07%	0.10%	0.00	0.00	0.03%	D	R		
6B. Wastewater handling	N2O	17.15	18.88	5%	10%	11.2%	0.03%	-0.04%	0.31%	0.00	0.00	0.02%	D	R		
TOTAL	**N2O**	**450**	**500**				**9.51%**					0.05%				
2F. Consumption of Halocarbons and SF6	HCFs		25	50%	200%	206.2%	0.67%	0.41%	0.41%	0.01	0.00	0.86%				
TOTAL	**HCFs**	**0.0**	**25**				**0.0**					0.86%				
TOTAL EMISSIONS		**6091**	**7564**				**16.09%**					**10.51%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**40.11%**				**Trend uncertainty:**	**32.41%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 1995

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	1995 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	2074	5%	5%	7.1%	1.96%	0.50%	33.92%	0.00	0.02	2.40%	D	R		
1AA1B. Petroleum refining	CO2	91	94	5%	5%	7.1%	0.09%	-0.29%	1.53%	0.00	0.00	0.11%	D	R		
1AA2F1. Other	CO2	428	486	5%	5%	7.1%	0.46%	-0.60%	7.95%	0.00	0.01	0.56%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	956	5%	5%	7.1%	0.91%	2.68%	15.64%	0.00	0.01	1.11%	D	R		
1AA3B. Road transport	CO2	1168	1468	5%	5%	7.1%	1.39%	0.68%	24.00%	0.00	0.02	1.70%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	205	5%	5%	7.1%	0.19%	-0.30%	3.35%	0.00	0.00	0.24%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	751	2%	2%	2.8%	0.28%	-1.05%	12.28%	0.00	0.00	0.35%	D	R		
2A2. Lime production	CO2	4	3	2%	2%	2.8%	0.00%	-0.02%	0.06%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	50	2%	2%	2.8%	0.02%	-0.31%	0.82%	0.00	0.00	0.02%	D	R		
TOTAL	**CO2**	**4922**	**6088**				**2.64%**					6.49%				
1AA1A. Public electricity and heat production	CH4	1.4	1.7	5%	100%	100.1%	0.02%	0.00%	0.03%	0.00	0.00	0.00%	D	R		
1AA1B. Petroleum refining	CH4	0.08	0.08	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.4	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	1.10	5%	100%	100.1%	0.01%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
1AA3B. Road transport	CH4	4.02	4.74	4%	40%	40.2%	0.03%	0.00%	0.08%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.6	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1B2A4. Refining / Storage	CH4	1	1	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
4A. Enteric Fermentation	CH4	161	180	5%	30%	30.4%	0.73%	-0.27%	2.94%	0.00	0.00	0.22%	D	R		
4B. Manure Management	CH4	88	114	5%	50%	50.2%	0.77%	0.12%	1.87%	0.00	0.00	0.14%	D	R		
4F. Field burning of agricultural residues	CH4	9	8	5%	20%	20.6%	0.02%	-0.04%	0.13%	0.00	0.00	0.01%	D	R		
6A. Solid waste disposal on land	CH4	433	534	20%	40%	44.7%	3.20%	0.08%	8.73%	0.00	0.02	2.47%	D	R		
6B. Wastewater handling	CH4	20	21	30%	100%	104.4%	0.29%	-0.05%	0.34%	0.00	0.00	0.16%	D	R		
TOTAL	**CH4**	**719**	**868**				**3.38%**					3.03%				
1AA1A. Public electricity and heat production	N2O	4.07	5.04	5%	300%	300.0%	0.20%	0.00%	0.08%	0.00	0.00	0.01%	D	R		
1AA1B. Petroleum refining	N2O	0.24	0.24	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	N2O	1.09	1.23	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	2.70	5%	300%	300.0%	0.11%	0.00%	0.04%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	N2O	3.05	3.82	5%	50%	50.2%	0.03%	0.00%	0.06%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.02%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.11	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	141.13	5%	100%	100.1%	1.89%	-0.25%	2.31%	0.00	0.00	0.30%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	178.03	20%	400%	400.5%	9.55%	-0.14%	2.91%	-0.01	0.01	0.99%	D	R		
4D3. Indirect emissions	N2O	131.96	151.79	20%	50%	53.9%	1.09%	-0.15%	2.48%	0.00	0.01	0.71%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	5.71	20%	20%	28.3%	0.02%	-0.07%	0.09%	0.00	0.00	0.03%	D	R		
6B. Wastewater handling	N2O	17.15	19.20	5%	10%	11.2%	0.03%	-0.03%	0.31%	0.00	0.00	0.02%	D	R		
TOTAL	**N2O**	**450**	**510**				**9.80%**					0.03%				
2F. Consumption of Halocarbons and SF6	HCFs	25	0	50%	200%	206.2%	0.00%	-0.49%	0.00%	-0.01	0.00	0.99%				
TOTAL	**HCFs**	**24.7**	**0**				**0.0**					0.99%				
TOTAL EMISSIONS		**6116**	**7465**				**15.82%**					**10.54%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**39.77%**				**Trend uncertainty:**	**32.46%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 1996

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	1996 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	2195	5%	5%	7.1%	1.97%	0.63%	35.89%	0.00	0.03	2.54%	D	R		
1AA1B. Petroleum refining	CO2	91	87	5%	5%	7.1%	0.08%	-0.49%	1.43%	0.00	0.00	0.10%	D	R		
1AA2F1. Other	CO2	428	512	5%	5%	7.1%	0.46%	-0.65%	8.36%	0.00	0.01	0.59%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	1068	5%	5%	7.1%	0.96%	3.78%	17.46%	0.00	0.01	1.25%	D	R		
1AA3B. Road transport	CO2	1168	1518	5%	5%	7.1%	1.36%	0.23%	24.83%	0.00	0.02	1.76%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	208	5%	5%	7.1%	0.19%	-0.45%	3.40%	0.00	0.00	0.24%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	811	2%	2%	2.8%	0.29%	-0.80%	13.26%	0.00	0.00	0.38%	D	R		
2A2. Lime production	CO2	4	4	2%	2%	2.8%	0.00%	-0.02%	0.06%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	48	2%	2%	2.8%	0.02%	-0.41%	0.79%	0.00	0.00	0.02%	D	R		
TOTAL	**CO2**	**4922**	**6451**				**2.65%**					6.88%				
1AA1A. Public electricity and heat production	CH4	1.4	1.8	5%	100%	100.1%	0.02%	0.00%	0.03%	0.00	0.00	0.00%	D	R		
1AA1B. Petroleum refining	CH4	0.08	0.08	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.4	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	1.18	5%	100%	100.1%	0.01%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
1AA3B. Road transport	CH4	4.02	4.86	4%	40%	40.2%	0.02%	-0.01%	0.08%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.9	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1B2A4. Refining / Storage	CH4	1	1	5%	300%	300.0%	0.04%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
4A. Enteric Fermentation	CH4	161	183	5%	30%	30.4%	0.71%	-0.40%	2.99%	0.00	0.00	0.24%	D	R		
4B. Manure Management	CH4	88	121	5%	50%	50.2%	0.77%	0.12%	1.97%	0.00	0.00	0.15%	D	R		
4F. Field burning of agricultural residues	CH4	9	8	5%	20%	20.6%	0.02%	-0.06%	0.13%	0.00	0.00	0.01%	D	R		
6A. Solid waste disposal on land	CH4	433	550	20%	40%	44.7%	3.12%	-0.13%	8.99%	0.00	0.03	2.54%	D	R		
6B. Wastewater handling	CH4	20	22	30%	100%	104.4%	0.30%	-0.05%	0.36%	0.00	0.00	0.16%	D	R		
TOTAL	**CH4**	**719**	**894**				**3.31%**					3.14%				
1AA1A. Public electricity and heat production	N2O	4.07	5.33	5%	300%	300.0%	0.20%	0.00%	0.09%	0.00	0.00	0.01%	D	R		
1AA1B. Petroleum refining	N2O	0.24	0.23	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	N2O	1.09	1.30	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.01%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	2.93	5%	300%	300.0%	0.11%	0.01%	0.05%	0.00	0.00	0.02%	D	R		
1AA3B. Road transport	N2O	3.05	3.95	5%	50%	50.2%	0.03%	0.00%	0.06%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.02%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.17	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
4B. Manure Management	N2O	128.32	146.18	5%	100%	100.1%	1.86%	-0.31%	2.39%	0.00	0.00	0.36%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	181.64	20%	400%	400.5%	9.24%	-0.25%	2.97%	-0.01	0.01	1.30%	D	R		
4D3. Indirect emissions	N2O	131.96	154.95	20%	50%	53.9%	1.06%	-0.25%	2.53%	0.00	0.01	0.73%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	5.60	20%	20%	28.3%	0.02%	-0.09%	0.09%	0.00	0.00	0.03%	D	R		
6B. Wastewater handling	N2O	17.15	19.49	5%	10%	11.2%	0.03%	-0.04%	0.32%	0.00	0.00	0.02%	D	R		
TOTAL	**N2O**	**450**	**522**				**9.48%**					0.04%				
2F. Consumption of Halocarbons and SF6	HCFs	25	10	50%	200%	206.2%	0.25%	-0.36%	0.16%	-0.01	0.00	0.73%				
TOTAL	**HCFs**	**24.7**	**10**				**0.0**					0.73%				
TOTAL EMISSIONS		**6116**	**7877**				**15.69%**					**10.79%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**39.61%**				**Trend uncertainty:**	**32.86%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 1997

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	1997 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	2320	5%	5%	7.1%	2.07%	2.37%	37.93%	0.00	0.03	2.68%	D	R		
1AA1B. Petroleum refining	CO2	91	94	5%	5%	7.1%	0.08%	-0.40%	1.54%	0.00	0.00	0.11%	D	R		
1AA2F1. Other	CO2	428	540	5%	5%	7.1%	0.48%	-0.26%	8.83%	0.00	0.01	0.62%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	957	5%	5%	7.1%	0.85%	1.86%	15.65%	0.00	0.01	1.11%	D	R		
1AA3B. Road transport	CO2	1168	1585	5%	5%	7.1%	1.41%	1.10%	25.91%	0.00	0.02	1.83%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	217	5%	5%	7.1%	0.19%	-0.33%	3.55%	0.00	0.00	0.25%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	780	2%	2%	2.8%	0.28%	-1.42%	12.76%	0.00	0.00	0.36%	D	R		
2A2. Lime production	CO2	4	5	2%	2%	2.8%	0.00%	0.00%	0.08%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	45	2%	2%	2.8%	0.02%	-0.47%	0.74%	0.00	0.00	0.02%	D	R		
TOTAL	**CO2**	**4922**	**6542**				**2.71%**					7.00%				
1AA1A. Public electricity and heat production	CH4	1.4	1.9	5%	100%	100.1%	0.02%	0.00%	0.03%	0.00	0.00	0.00%	D	R		
1AA1B. Petroleum refining	CH4	0.08	0.08	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.5	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	1.08	5%	100%	100.1%	0.01%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
1AA3B. Road transport	CH4	4.02	5.02	4%	40%	40.2%	0.03%	0.00%	0.08%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.4	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1B2A4. Refining / Storage	CH4	1	2	5%	300%	300.0%	0.06%	0.01%	0.02%	0.00	0.00	0.02%	D	R		
4A. Enteric Fermentation	CH4	161	179	5%	30%	30.4%	0.68%	-0.49%	2.92%	0.00	0.00	0.25%	D	R		
4B. Manure Management	CH4	88	122	5%	50%	50.2%	0.77%	0.13%	2.00%	0.00	0.00	0.15%	D	R		
4F. Field burning of agricultural residues	CH4	9	3	5%	20%	20.6%	0.01%	-0.14%	0.04%	0.00	0.00	0.03%	D	R		
6A. Solid waste disposal on land	CH4	433	563	20%	40%	44.7%	3.17%	0.01%	9.21%	0.00	0.03	2.60%	D	R		
6B. Wastewater handling	CH4	20	23	30%	100%	104.4%	0.30%	-0.05%	0.37%	0.00	0.00	0.17%	D	R		
TOTAL	**CH4**	**719**	**900**				**3.35%**					3.25%				
1AA1A. Public electricity and heat production	N2O	4.07	5.63	5%	300%	300.0%	0.21%	0.01%	0.09%	0.00	0.00	0.02%	D	R		
1AA1B. Petroleum refining	N2O	0.24	0.25	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	N2O	1.09	1.37	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	2.66	5%	300%	300.0%	0.10%	0.00%	0.04%	0.00	0.00	0.00%	D	R		
1AA3B. Road transport	N2O	3.05	4.12	5%	50%	50.2%	0.03%	0.00%	0.07%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.02%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.09	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	150.61	5%	100%	100.1%	1.90%	-0.26%	2.46%	0.00	0.00	0.31%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	166.11	20%	400%	400.5%	8.38%	-0.53%	2.72%	-0.02	0.01	2.25%	D	R		
4D3. Indirect emissions	N2O	131.96	144.77	20%	50%	53.9%	0.98%	-0.43%	2.37%	0.00	0.01	0.70%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	3.61	20%	20%	28.3%	0.01%	-0.12%	0.06%	0.00	0.00	0.03%	D	R		
6B. Wastewater handling	N2O	17.15	19.95	5%	10%	11.2%	0.03%	-0.04%	0.33%	0.00	0.00	0.02%	D	R		
TOTAL	**N2O**	**450**	**500**				**8.65%**					0.04%				
2F. Consumption of Halocarbons and SF6	HCFs	25		50%	200%	206.2%	0.00%	-0.52%	0.00%	-0.01	0.00	1.05%				
TOTAL	**HCFs**	**24.7**	**0**				**0.0**					1.05%				
TOTAL EMISSIONS		**6116**	**7942**				**14.71%**					**11.33%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**38.35%**				**Trend uncertainty:**	**33.67%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 1998

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	1998 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	2549	5%	5%	7.1%	2.24%	5.71%	41.68%	0.00	0.03	2.96%	D	R		
1AA1B. Petroleum refining	CO2	91	97	5%	5%	7.1%	0.09%	-0.37%	1.59%	0.00	0.00	0.11%	D	R		
1AA2F1. Other	CO2	428	572	5%	5%	7.1%	0.50%	0.16%	9.35%	0.00	0.01	0.66%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	746	5%	5%	7.1%	0.66%	-1.74%	12.20%	0.00	0.01	0.87%	D	R		
1AA3B. Road transport	CO2	1168	1661	5%	5%	7.1%	1.46%	2.06%	27.15%	0.00	0.02	1.92%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	215	5%	5%	7.1%	0.19%	-0.42%	3.51%	0.00	0.00	0.25%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	740	2%	2%	2.8%	0.26%	-2.24%	12.09%	0.00	0.00	0.34%	D	R		
2A2. Lime production	CO2	4	3	2%	2%	2.8%	0.00%	-0.02%	0.06%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	42	2%	2%	2.8%	0.01%	-0.54%	0.68%	0.00	0.00	0.02%	D	R		
TOTAL	**CO2**	**4922**	**6624**				**2.82%**					7.14%				
1AA1A. Public electricity and heat production	CH4	1.4	2.1	5%	100%	100.1%	0.03%	0.00%	0.03%	0.00	0.00	0.01%	D	R		
1AA1B. Petroleum refining	CH4	0.08	0.09	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.5	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.63	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	5.19	4%	40%	40.2%	0.03%	0.00%	0.08%	0.00	0.00	0.00%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.4	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1B2A4. Refining / Storage	CH4	1	2	5%	300%	300.0%	0.06%	0.01%	0.03%	0.00	0.00	0.02%	D	R		
4A. Enteric Fermentation	CH4	161	172	5%	30%	30.4%	0.65%	-0.64%	2.81%	0.00	0.00	0.28%	D	R		
4B. Manure Management	CH4	88	124	5%	50%	50.2%	0.77%	0.13%	2.02%	0.00	0.00	0.16%	D	R		
4F. Field burning of agricultural residues	CH4	9	3	5%	20%	20.6%	0.01%	-0.13%	0.06%	0.00	0.00	0.03%	D	R		
6A. Solid waste disposal on land	CH4	433	575	20%	40%	44.7%	3.20%	0.11%	9.41%	0.00	0.03	2.66%	D	R		
6B. Wastewater handling	CH4	20	21	30%	100%	104.4%	0.27%	-0.09%	0.34%	0.00	0.00	0.17%	D	R		
TOTAL	**CH4**	**719**	**906**				**3.37%**					3.34%				
1AA1A. Public electricity and heat production	N2O	4.07	6.19	5%	300%	300.0%	0.23%	0.01%	0.10%	0.00	0.00	0.04%	D	R		
1AA1B. Petroleum refining	N2O	0.24	0.26	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	N2O	1.09	1.45	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	1.71	5%	300%	300.0%	0.06%	-0.02%	0.03%	0.00	0.00	0.05%	D	R		
1AA3B. Road transport	N2O	3.05	4.32	5%	50%	50.2%	0.03%	0.01%	0.07%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.02%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.08	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	149.61	5%	100%	100.1%	1.87%	-0.31%	2.45%	0.00	0.00	0.35%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	167.91	20%	400%	400.5%	8.37%	-0.54%	2.75%	-0.02	0.01	2.28%	D	R		
4D3. Indirect emissions	N2O	131.96	145.78	20%	50%	53.9%	0.98%	-0.45%	2.38%	0.00	0.01	0.71%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	3.39	20%	20%	28.3%	0.01%	-0.13%	0.06%	0.00	0.00	0.03%	D	R		
6B. Wastewater handling	N2O	17.15	20.16	5%	10%	11.2%	0.03%	-0.04%	0.33%	0.00	0.00	0.02%	D	R		
TOTAL	**N2O**	**450**	**501**				**8.64%**					0.10%				
2F. Consumption of Halocarbons and SF6	HCFs	25		50%	200%	206.2%	0.00%	-0.53%	0.00%	-0.01	0.00	1.06%				
TOTAL	**HCFs**	**24.7**	**0**				**0.0**					1.06%				
TOTAL EMISSIONS		**6116**	**8032**				**14.83%**					**11.65%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**38.51%**				**Trend uncertainty:**	**34.13%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 1999

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	1999 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	2719	5%	5%	7.1%	2.31%	7.15%	44.46%	0.00	0.03	3.16%	D	R		
1AA1B. Petroleum refining	CO2	91	113	5%	5%	7.1%	0.10%	-0.18%	1.85%	0.00	0.00	0.13%	D	R		
1AA2F1. Other	CO2	428	588	5%	5%	7.1%	0.50%	0.08%	9.61%	0.00	0.01	0.68%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	770	5%	5%	7.1%	0.65%	-1.87%	12.59%	0.00	0.01	0.89%	D	R		
1AA3B. Road transport	CO2	1168	1704	5%	5%	7.1%	1.45%	1.85%	27.87%	0.00	0.02	1.97%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	208	5%	5%	7.1%	0.18%	-0.67%	3.41%	0.00	0.00	0.24%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	740	2%	2%	2.8%	0.25%	-2.76%	12.10%	0.00	0.00	0.35%	D	R		
2A2. Lime production	CO2	4	5	2%	2%	2.8%	0.00%	0.00%	0.08%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	48	2%	2%	2.8%	0.02%	-0.49%	0.78%	0.00	0.00	0.02%	D	R		
TOTAL	**CO2**	**4922**	**6894**				**2.86%**					7.46%				
1AA1A. Public electricity and heat production	CH4	1.4	2.2	5%	100%	100.1%	0.03%	0.01%	0.04%	0.00	0.00	0.01%	D	R		
1AA1B. Petroleum refining	CH4	0.08	0.10	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.5	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.66	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	5.37	4%	40%	40.2%	0.03%	0.00%	0.09%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.6	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1B2A4. Refining / Storage	CH4	1	2	5%	300%	300.0%	0.06%	0.01%	0.03%	0.00	0.00	0.02%	D	R		
4A. Enteric Fermentation	CH4	161	171	5%	30%	30.4%	0.62%	-0.78%	2.80%	0.00	0.00	0.31%	D	R		
4B. Manure Management	CH4	88	120	5%	50%	50.2%	0.73%	0.01%	1.97%	0.00	0.00	0.14%	D	R		
4F. Field burning of agricultural residues	CH4	9	5	5%	20%	20.6%	0.01%	-0.11%	0.08%	0.00	0.00	0.02%	D	R		
6A. Solid waste disposal on land	CH4	433	586	20%	40%	44.7%	3.14%	-0.07%	9.58%	0.00	0.03	2.71%	D	R		
6B. Wastewater handling	CH4	20	18	30%	100%	104.4%	0.22%	-0.15%	0.29%	0.00	0.00	0.20%	D	R		
TOTAL	**CH4**	**719**	**912**				**3.30%**					3.43%				
1AA1A. Public electricity and heat production	N2O	4.07	6.61	5%	300%	300.0%	0.24%	0.02%	0.11%	0.00	0.00	0.05%	D	R		
1AA1B. Petroleum refining	N2O	0.24	0.30	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	N2O	1.09	1.49	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	1.78	5%	300%	300.0%	0.06%	-0.02%	0.03%	0.00	0.00	0.05%	D	R		
1AA3B. Road transport	N2O	3.05	4.43	5%	50%	50.2%	0.03%	0.00%	0.07%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.02%	0.00%	0.01%	0.00	0.00	0.01%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.11	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	150.99	5%	100%	100.1%	1.81%	-0.39%	2.47%	0.00	0.00	0.43%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	168.80	20%	400%	400.5%	8.12%	-0.64%	2.76%	-0.03	0.01	2.69%	D	R		
4D3. Indirect emissions	N2O	131.96	145.84	20%	50%	53.9%	0.94%	-0.55%	2.38%	0.00	0.01	0.73%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	2.55	20%	20%	28.3%	0.01%	-0.15%	0.04%	0.00	0.00	0.03%	D	R		
6B. Wastewater handling	N2O	17.15	20.57	5%	10%	11.2%	0.03%	-0.05%	0.34%	0.00	0.00	0.02%	D	R		
TOTAL	**N2O**	**450**	**504**				**8.37%**					0.12%				
2F. Consumption of Halocarbons and SF6	HCFs	25	19	50%	200%	206.2%	0.48%	-0.23%	0.32%	0.00	0.00	0.52%				
TOTAL	**HCFs**	**24.7**	**19**				**0.0**					0.52%				
TOTAL EMISSIONS		**6116**	**8329**				**15.01%**					**11.52%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**38.75%**				**Trend uncertainty:**	**33.95%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 2000

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	2000 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	2849	5%	5%	7.1%	2.35%	8.19%	46.59%	0.00	0.03	3.32%	D	R		
1AA1B. Petroleum refining	CO2	91	110	5%	5%	7.1%	0.09%	-0.30%	1.79%	0.00	0.00	0.13%	D	R		
1AA2F1. Other	CO2	428	607	5%	5%	7.1%	0.50%	0.11%	9.92%	0.00	0.01	0.70%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	789	5%	5%	7.1%	0.65%	-1.98%	12.90%	0.00	0.01	0.92%	D	R		
1AA3B. Road transport	CO2	1168	1745	5%	5%	7.1%	1.44%	1.75%	28.54%	0.00	0.02	2.02%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	233	5%	5%	7.1%	0.19%	-0.38%	3.81%	0.00	0.00	0.27%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	763	2%	2%	2.8%	0.25%	-2.83%	12.47%	0.00	0.00	0.36%	D	R		
2A2. Lime production	CO2	4	4	2%	2%	2.8%	0.00%	-0.01%	0.07%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	44	2%	2%	2.8%	0.01%	-0.58%	0.72%	0.00	0.00	0.02%	D	R		
TOTAL	**CO2**	**4922**	**7144**				**2.89%**					7.74%				
1AA1A. Public electricity and heat production	CH4	1.4	2.3	5%	100%	100.1%	0.03%	0.01%	0.04%	0.00	0.00	0.01%	D	R		
1AA1B. Petroleum refining	CH4	0.08	0.10	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.5	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.79	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	5.47	4%	40%	40.2%	0.03%	0.00%	0.09%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.5	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1B2A4. Refining / Storage	CH4	1	2	5%	300%	300.0%	0.06%	0.01%	0.03%	0.00	0.00	0.02%	D	R		
4A. Enteric Fermentation	CH4	161	176	5%	30%	30.4%	0.62%	-0.80%	2.88%	0.00	0.00	0.32%	D	R		
4B. Manure Management	CH4	88	118	5%	50%	50.2%	0.69%	-0.08%	1.94%	0.00	0.00	0.14%	D	R		
4F. Field burning of agricultural residues	CH4	9	2	5%	20%	20.6%	0.01%	-0.17%	0.03%	0.00	0.00	0.03%	D	R		
6A. Solid waste disposal on land	CH4	433	600	20%	40%	44.7%	3.13%	-0.11%	9.82%	0.00	0.03	2.78%	D	R		
6B. Wastewater handling	CH4	20	18	30%	100%	104.4%	0.22%	-0.16%	0.29%	0.00	0.00	0.20%	D	R		
TOTAL	**CH4**	**719**	**927**				**3.28%**					3.53%				
1AA1A. Public electricity and heat production	N2O	4.07	6.92	5%	300%	300.0%	0.24%	0.02%	0.11%	0.00	0.00	0.06%	D	R		
1AA1B. Petroleum refining	N2O	0.24	0.29	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	N2O	1.09	1.54	5%	300%	300.0%	0.05%	0.00%	0.03%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	2.02	5%	300%	300.0%	0.07%	-0.01%	0.03%	0.00	0.00	0.04%	D	R		
1AA3B. Road transport	N2O	3.05	4.54	5%	50%	50.2%	0.03%	0.00%	0.07%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.02%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.10	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	157.15	5%	100%	100.1%	1.84%	-0.37%	2.57%	0.00	0.00	0.41%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	152.92	20%	400%	400.5%	7.14%	-1.00%	2.50%	-0.04	0.01	4.07%	D	R		
4D3. Indirect emissions	N2O	131.96	135.23	20%	50%	53.9%	0.85%	-0.81%	2.21%	0.00	0.01	0.75%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	1.59	20%	20%	28.3%	0.01%	-0.17%	0.03%	0.00	0.00	0.03%	D	R		
6B. Wastewater handling	N2O	17.15	20.78	5%	10%	11.2%	0.03%	-0.05%	0.34%	0.00	0.00	0.02%	D	R		
TOTAL	**N2O**	**450**	**484**				**7.43%**					0.11%				
2F. Consumption of Halocarbons and SF6	HCFs	25	19	50%	200%	206.2%	0.46%	-0.25%	0.32%	-0.01	0.00	0.55%				
TOTAL	**HCFs**	**24.7**	**19**				**0.0**					0.55%				
TOTAL EMISSIONS		**6116**	**8574**				**14.06%**					**11.93%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**37.50%**				**Trend uncertainty:**	**34.54%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 2001

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	2001 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	2781	5%	5%	7.1%	2.32%	7.53%	45.47%	0.00	0.03	3.24%	D	R		
1AA1B. Petroleum refining	CO2	91	60	5%	5%	7.1%	0.05%	-1.08%	0.99%	0.00	0.00	0.09%	D	R		
1AA2F1. Other	CO2	428	613	5%	5%	7.1%	0.51%	0.33%	10.03%	0.00	0.01	0.71%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	728	5%	5%	7.1%	0.61%	-2.80%	11.90%	0.00	0.01	0.85%	D	R		
1AA3B. Road transport	CO2	1168	1801	5%	5%	7.1%	1.50%	2.99%	29.45%	0.00	0.02	2.09%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	233	5%	5%	7.1%	0.19%	-0.33%	3.81%	0.00	0.00	0.27%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	745	2%	2%	2.8%	0.25%	-2.94%	12.18%	0.00	0.00	0.35%	D	R		
2A2. Lime production	CO2	4	4	2%	2%	2.8%	0.00%	-0.01%	0.07%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	34	2%	2%	2.8%	0.01%	-0.73%	0.56%	0.00	0.00	0.02%	D	R		
TOTAL	**CO2**	**4922**	**7000**				**2.90%**					7.62%				
1AA1A. Public electricity and heat production	CH4	1.4	2.3	5%	100%	100.1%	0.03%	0.01%	0.04%	0.00	0.00	0.01%	D	R		
1AA1B. Petroleum refining	CH4	0.08	0.06	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.5	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.78	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	5.74	4%	40%	40.2%	0.03%	0.00%	0.09%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.5	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1B2A4. Refining / Storage	CH4	1	2	5%	300%	300.0%	0.06%	0.01%	0.03%	0.00	0.00	0.02%	D	R		
4A. Enteric Fermentation	CH4	161	192	5%	30%	30.4%	0.69%	-0.51%	3.13%	0.00	0.00	0.27%	D	R		
4B. Manure Management	CH4	88	128	5%	50%	50.2%	0.76%	0.10%	2.09%	0.00	0.00	0.16%	D	R		
4F. Field burning of agricultural residues	CH4	9	4	5%	20%	20.6%	0.01%	-0.13%	0.06%	0.00	0.00	0.03%	D	R		
6A. Solid waste disposal on land	CH4	433	577	20%	40%	44.7%	3.05%	-0.37%	9.43%	0.00	0.03	2.67%	D	R		
6B. Wastewater handling	CH4	20	19	30%	100%	104.4%	0.23%	-0.15%	0.30%	0.00	0.00	0.20%	D	R		
TOTAL	**CH4**	**719**	**931**				**3.22%**					3.37%				
1AA1A. Public electricity and heat production	N2O	4.07	6.75	5%	300%	300.0%	0.24%	0.02%	0.11%	0.00	0.00	0.06%	D	R		
1AA1B. Petroleum refining	N2O	0.24	0.17	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
1AA2F1. Other	N2O	1.09	1.56	5%	300%	300.0%	0.06%	0.00%	0.03%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	1.97	5%	300%	300.0%	0.07%	-0.01%	0.03%	0.00	0.00	0.04%	D	R		
1AA3B. Road transport	N2O	3.05	4.69	5%	50%	50.2%	0.03%	0.01%	0.08%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.02%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.10	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	171.32	5%	100%	100.1%	2.03%	-0.10%	2.80%	0.00	0.00	0.22%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	165.31	20%	400%	400.5%	7.82%	-0.76%	2.70%	-0.03	0.01	3.13%	D	R		
4D3. Indirect emissions	N2O	131.96	145.32	20%	50%	53.9%	0.92%	-0.61%	2.38%	0.00	0.01	0.74%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	2.01	20%	20%	28.3%	0.01%	-0.16%	0.03%	0.00	0.00	0.03%	D	R		
6B. Wastewater handling	N2O	17.15	21.03	5%	10%	11.2%	0.03%	-0.04%	0.34%	0.00	0.00	0.02%	D	R		
TOTAL	**N2O**	**450**	**521**				**8.13%**					0.12%				
2F. Consumption of Halocarbons and SF6	HCFs	25	18	50%	200%	206.2%	0.45%	-0.26%	0.30%	-0.01	0.00	0.56%				
TOTAL	**HCFs**	**24.7**	**18**				**0.0**					0.56%				
TOTAL EMISSIONS		**6116**	**8470**				**14.70%**					**11.67%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**38.34%**				**Trend uncertainty:**	**34.16%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 2002

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	2002 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	2889	5%	5%	7.1%	2.34%	8.17%	47.23%	0.00	0.03	3.36%	D	R		
1AA1B. Petroleum refining	CO2	91	113	5%	5%	7.1%	0.09%	-0.27%	1.86%	0.00	0.00	0.13%	D	R		
1AA2F1. Other	CO2	428	588	5%	5%	7.1%	0.48%	-0.37%	9.61%	0.00	0.01	0.68%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	747	5%	5%	7.1%	0.61%	-2.91%	12.22%	0.00	0.01	0.88%	D	R		
1AA3B. Road transport	CO2	1168	1784	5%	5%	7.1%	1.45%	1.93%	29.17%	0.00	0.02	2.07%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	258	5%	5%	7.1%	0.21%	-0.04%	4.22%	0.00	0.00	0.30%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	766	2%	2%	2.8%	0.25%	-3.04%	12.53%	0.00	0.00	0.36%	D	R		
2A2. Lime production	CO2	4	4	2%	2%	2.8%	0.00%	-0.01%	0.07%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	42	2%	2%	2.8%	0.01%	-0.64%	0.68%	0.00	0.00	0.02%	D	R		
TOTAL	**CO2**	**4922**	**7192**				**2.88%**					7.80%				
1AA1A. Public electricity and heat production	CH4	1.4	2.4	5%	100%	100.1%	0.03%	0.01%	0.04%	0.00	0.00	0.01%	D	R		
1AA1B. Petroleum refining	CH4	0.08	0.10	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.5	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.80	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	5.84	4%	40%	40.2%	0.03%	0.00%	0.10%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.5	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1B2A4. Refining / Storage	CH4	1	2	5%	300%	300.0%	0.05%	0.00%	0.03%	0.00	0.00	0.01%	D	R		
4A. Enteric Fermentation	CH4	161	203	5%	30%	30.4%	0.71%	-0.43%	3.32%	0.00	0.00	0.27%	D	R		
4B. Manure Management	CH4	88	139	5%	50%	50.2%	0.80%	0.21%	2.27%	0.00	0.00	0.19%	D	R		
4F. Field burning of agricultural residues	CH4	9	4	5%	20%	20.6%	0.01%	-0.14%	0.06%	0.00	0.00	0.03%	D	R		
6A. Solid waste disposal on land	CH4	433	587	20%	40%	44.7%	3.01%	-0.50%	9.60%	0.00	0.03	2.72%	D	R		
6B. Wastewater handling	CH4	20	19	30%	100%	104.4%	0.23%	-0.15%	0.31%	0.00	0.00	0.20%	D	R		
TOTAL	**CH4**	**719**	**964**				**3.20%**					3.46%				
1AA1A. Public electricity and heat production	N2O	4.07	7.02	5%	300%	300.0%	0.24%	0.02%	0.11%	0.00	0.00	0.06%	D	R		
1AA1B. Petroleum refining	N2O	0.24	0.31	5%	300%	300.0%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	N2O	1.09	1.49	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	2.01	5%	300%	300.0%	0.07%	-0.01%	0.03%	0.00	0.00	0.04%	D	R		
1AA3B. Road transport	N2O	3.05	4.65	5%	50%	50.2%	0.03%	0.00%	0.08%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.03%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.09	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	180.54	5%	100%	100.1%	2.07%	-0.04%	2.95%	0.00	0.00	0.21%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	174.85	20%	400%	400.5%	8.03%	-0.71%	2.86%	-0.03	0.01	2.93%	D	R		
4D3. Indirect emissions	N2O	131.96	153.40	20%	50%	53.9%	0.95%	-0.57%	2.51%	0.00	0.01	0.76%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	1.92	20%	20%	28.3%	0.01%	-0.16%	0.03%	0.00	0.00	0.03%	D	R		
6B. Wastewater handling	N2O	17.15	20.86	5%	10%	11.2%	0.03%	-0.06%	0.34%	0.00	0.00	0.02%	D	R		
TOTAL	**N2O**	**450**	**548**				**8.35%**					0.12%				
2F. Consumption of Halocarbons and SF6	HCFs	25	19	50%	200%	206.2%	0.44%	-0.27%	0.31%	-0.01	0.00	0.58%				
TOTAL	**HCFs**	**24.7**	**19**				**0.0**					0.58%				
TOTAL EMISSIONS		**6116**	**8722**				**14.87%**					**11.96%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**38.56%**				**Trend uncertainty:**	**34.58%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 2003

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	2003 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	3115	5%	5%	7.1%	2.42%	10.18%	50.94%	0.01	0.04	3.64%	D	R		
1AA1B. Petroleum refining	CO2	91	113	5%	5%	7.1%	0.09%	-0.36%	1.86%	0.00	0.00	0.13%	D	R		
1AA2F1. Other	CO2	428	610	5%	5%	7.1%	0.47%	-0.44%	9.97%	0.00	0.01	0.71%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	764	5%	5%	7.1%	0.59%	-3.29%	12.50%	0.00	0.01	0.90%	D	R		
1AA3B. Road transport	CO2	1168	1890	5%	5%	7.1%	1.47%	2.47%	30.90%	0.00	0.02	2.19%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	270	5%	5%	7.1%	0.21%	-0.04%	4.42%	0.00	0.00	0.31%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	751	2%	2%	2.8%	0.23%	-3.96%	12.28%	0.00	0.00	0.36%	D	R		
2A2. Lime production	CO2	4	10	2%	2%	2.8%	0.00%	0.07%	0.16%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	60	2%	2%	2.8%	0.02%	-0.39%	0.99%	0.00	0.00	0.03%	D	R		
TOTAL	**CO2**	**4922**	**7584**				**2.95%**					8.27%				
1AA1A. Public electricity and heat production	CH4	1.4	2.6	5%	100%	100.1%	0.03%	0.01%	0.04%	0.00	0.00	0.01%	D	R		
1AA1B. Petroleum refining	CH4	0.08	0.10	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.5	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.90	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	6.34	4%	40%	40.2%	0.03%	0.01%	0.10%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.4	5%	100%	100.1%	0.00%	-0.02%	0.01%	0.00	0.00	0.02%	D	R		
1B2A4. Refining / Storage	CH4	1	1	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.00%	D	R		
4A. Enteric Fermentation	CH4	161	190	5%	30%	30.4%	0.63%	-0.81%	3.10%	0.00	0.00	0.33%	D	R		
4B. Manure Management	CH4	88	137	5%	50%	50.2%	0.76%	0.10%	2.24%	0.00	0.00	0.17%	D	R		
4F. Field burning of agricultural residues	CH4	9	4	5%	20%	20.6%	0.01%	-0.15%	0.06%	0.00	0.00	0.03%	D	R		
6A. Solid waste disposal on land	CH4	433	598	20%	40%	44.7%	2.94%	-0.75%	9.78%	0.00	0.03	2.78%	D	R		
6B. Wastewater handling	CH4	20	19	30%	100%	104.4%	0.22%	-0.18%	0.31%	0.00	0.00	0.22%	D	R		
TOTAL	**CH4**	**719**	**961**				**3.11%**					3.57%				
1AA1A. Public electricity and heat production	N2O	4.07	7.57	5%	300%	300.0%	0.25%	0.02%	0.12%	0.00	0.00	0.07%	D	R		
1AA1B. Petroleum refining	N2O	0.24	0.31	5%	300%	300.0%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	N2O	1.09	1.55	5%	300%	300.0%	0.05%	0.00%	0.03%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	2.22	5%	300%	300.0%	0.07%	-0.01%	0.04%	0.00	0.00	0.04%	D	R		
1AA3B. Road transport	N2O	3.05	4.93	5%	50%	50.2%	0.03%	0.01%	0.08%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.03%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.08	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	167.83	5%	100%	100.1%	1.85%	-0.38%	2.74%	0.00	0.00	0.42%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	175.68	20%	400%	400.5%	7.73%	-0.85%	2.87%	-0.03	0.01	3.48%	D	R		
4D3. Indirect emissions	N2O	131.96	151.53	20%	50%	53.9%	0.90%	-0.73%	2.48%	0.00	0.01	0.79%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	2.57	20%	20%	28.3%	0.01%	-0.16%	0.04%	0.00	0.00	0.03%	D	R		
6B. Wastewater handling	N2O	17.15	20.69	5%	10%	11.2%	0.03%	-0.08%	0.34%	0.00	0.00	0.03%	D	R		
TOTAL	**N2O**	**450**	**536**				**8.00%**					0.13%				
2F. Consumption of Halocarbons and SF6	HCFs	25	19	50%	200%	206.2%	0.43%	-0.29%	0.31%	-0.01	0.00	0.62%				
TOTAL	**HCFs**	**24.7**	**19**				**0.0**					0.62%				
TOTAL EMISSIONS		**6116**	**9099**				**14.50%**					**12.58%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**38.07%**				**Trend uncertainty:**	**35.47%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 2004

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	2004 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	3255	5%	5%	7.1%	2.47%	11.50%	53.23%	0.01	0.04	3.81%	D	R		
1AA1B. Petroleum refining	CO2	91	29	5%	5%	7.1%	0.02%	-1.80%	0.47%	0.00	0.00	0.10%	D	R		
1AA2F1. Other	CO2	428	576	5%	5%	7.1%	0.44%	-1.24%	9.42%	0.00	0.01	0.67%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	828	5%	5%	7.1%	0.63%	-2.62%	13.54%	0.00	0.01	0.97%	D	R		
1AA3B. Road transport	CO2	1168	1991	5%	5%	7.1%	1.51%	3.46%	32.56%	0.00	0.02	2.31%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	242	5%	5%	7.1%	0.18%	-0.60%	3.95%	0.00	0.00	0.28%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	808	2%	2%	2.8%	0.25%	-3.42%	13.21%	0.00	0.00	0.38%	D	R		
2A2. Lime production	CO2	4	9	2%	2%	2.8%	0.00%	0.06%	0.15%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	66	2%	2%	2.8%	0.02%	-0.33%	1.09%	0.00	0.00	0.03%	D	R		
TOTAL	**CO2**	**4922**	**7805**				**3.01%**					8.54%				
1AA1A. Public electricity and heat production	CH4	1.4	2.7	5%	100%	100.1%	0.03%	0.01%	0.04%	0.00	0.00	0.01%	D	R		
1AA1B. Petroleum refining	CH4	0.08	0.03	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.5	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.94	5%	100%	100.1%	0.01%	-0.01%	0.02%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	6.92	4%	40%	40.2%	0.03%	0.01%	0.11%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.01%	0.00%	0.01%	0.00	0.00	0.00%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.4	5%	100%	100.1%	0.00%	-0.02%	0.01%	0.00	0.00	0.02%	D	R		
1B2A4. Refining / Storage	CH4	1	0	5%	300%	300.0%	0.01%	-0.02%	0.01%	0.00	0.00	0.05%	D	R		
4A. Enteric Fermentation	CH4	161	193	5%	30%	30.4%	0.63%	-0.85%	3.16%	0.00	0.00	0.34%	D	R		
4B. Manure Management	CH4	88	133	5%	50%	50.2%	0.72%	-0.01%	2.18%	0.00	0.00	0.15%	D	R		
4F. Field burning of agricultural residues	CH4	9	3	5%	20%	20.6%	0.01%	-0.18%	0.04%	0.00	0.00	0.04%	D	R		
6A. Solid waste disposal on land	CH4	433	616	20%	40%	44.7%	2.96%	-0.72%	10.07%	0.00	0.03	2.86%	D	R		
6B. Wastewater handling	CH4	20	21	30%	100%	104.4%	0.24%	-0.15%	0.34%	0.00	0.00	0.21%	D	R		
TOTAL	**CH4**	**719**	**978**				**3.12%**					3.70%				
1AA1A. Public electricity and heat production	N2O	4.07	7.91	5%	300%	300.0%	0.25%	0.03%	0.13%	0.00	0.00	0.08%	D	R		
1AA1B. Petroleum refining	N2O	0.24	0.08	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
1AA2F1. Other	N2O	1.09	1.46	5%	300%	300.0%	0.05%	0.00%	0.02%	0.00	0.00	0.01%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	2.33	5%	300%	300.0%	0.08%	-0.01%	0.04%	0.00	0.00	0.04%	D	R		
1AA3B. Road transport	N2O	3.05	5.20	5%	50%	50.2%	0.03%	0.01%	0.09%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.02%	0.00%	0.01%	0.00	0.00	0.01%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.08	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	164.29	5%	100%	100.1%	1.77%	-0.51%	2.69%	-0.01	0.00	0.54%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	164.63	20%	400%	400.5%	7.08%	-1.11%	2.69%	-0.04	0.01	4.52%	D	R		
4D3. Indirect emissions	N2O	131.96	143.12	20%	50%	53.9%	0.83%	-0.95%	2.34%	0.00	0.01	0.81%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	1.95	20%	20%	28.3%	0.01%	-0.18%	0.03%	0.00	0.00	0.04%	D	R		
6B. Wastewater handling	N2O	17.15	20.95	5%	10%	11.2%	0.03%	-0.08%	0.34%	0.00	0.00	0.03%	D	R		
TOTAL	**N2O**	**450**	**513**				**7.35%**					0.16%				
2F. Consumption of Halocarbons and SF6	HCFs	25	20	50%	200%	206.2%	0.43%	-0.29%	0.32%	-0.01	0.00	0.63%				
TOTAL	**HCFs**	**24.7**	**20**				**0.0**					0.63%				
TOTAL EMISSIONS		**6116**	**9315**				**13.91%**					**13.03%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**37.30%**				**Trend uncertainty:**	**36.10%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 2005

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	2005 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	3472	5%	5%	7.1%	2.64%	15.05%	56.77%	0.01	0.04	4.08%	D	R		
1AA1B. Petroleum refining	CO2	91		5%	5%	7.1%	0.00%	-2.27%	0.00%	0.00	0.00	0.11%	D	R		
1AA2F1. Other	CO2	428	243	5%	5%	7.1%	0.18%	-6.68%	3.97%	0.00	0.00	0.44%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	661	5%	5%	7.1%	0.50%	-5.34%	10.81%	0.00	0.01	0.81%	D	R		
1AA3B. Road transport	CO2	1168	2031	5%	5%	7.1%	1.54%	4.11%	33.20%	0.00	0.02	2.36%	D	R		
1AA4A. Commercial/ Institutional	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CO2	183	471	5%	5%	7.1%	0.36%	3.15%	7.71%	0.00	0.01	0.57%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2		86	5%	5%	7.1%	0.07%	1.40%	1.40%	0.00	0.00	0.12%	D	R		
1AA5A. Other Stationary	CO2			5%	5%	7.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
2A1. Cement Production	CO2	668	822	2%	2%	2.8%	0.25%	-3.18%	13.44%	0.00	0.00	0.39%	D	R		
2A2. Lime production	CO2	4	12	2%	2%	2.8%	0.00%	0.10%	0.19%	0.00	0.00	0.01%	D	R		
2A7.2. Ceramics Production	CO2	57	60	2%	2%	2.8%	0.02%	-0.44%	0.97%	0.00	0.00	0.03%	D	R		
TOTAL	**CO2**	**4922**	**7857**				**3.13%**					8.91%				
1AA1A. Public electricity and heat production	CH4	1.4	2.9	5%	100%	100.1%	0.03%	0.01%	0.05%	0.00	0.00	0.01%	D	R		
1AA1B. Petroleum refining	CH4	0.08		5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.2	5%	100%	100.1%	0.00%	-0.01%	0.00%	0.00	0.00	0.01%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.80	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	7.28	4%	40%	40.2%	0.03%	0.02%	0.12%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	CH4			5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	1	5%	100%	100.1%	0.02%	0.01%	0.02%	0.00	0.00	0.01%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4		0	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.4	5%	100%	100.1%	0.00%	-0.02%	0.01%	0.00	0.00	0.02%	D	R		
1B2A4. Refining / Storage	CH4	1	0	5%	300%	300.0%	0.00%	-0.02%	0.00%	0.00	0.00	0.07%	D	R		
4A. Enteric Fermentation	CH4	161	180	5%	30%	30.4%	0.59%	-1.05%	2.95%	0.00	0.00	0.38%	D	R		
4B. Manure Management	CH4	88	123	5%	50%	50.2%	0.66%	-0.18%	2.01%	0.00	0.00	0.17%	D	R		
4F. Field burning of agricultural residues	CH4	9	1	5%	20%	20.6%	0.00%	-0.19%	0.02%	0.00	0.00	0.04%	D	R		
6A. Solid waste disposal on land	CH4	433	621	20%	40%	44.7%	2.98%	-0.62%	10.16%	0.00	0.03	2.88%	D	R		
6B. Wastewater handling	CH4	20	20	30%	100%	104.4%	0.23%	-0.16%	0.33%	0.00	0.00	0.21%	D	R		
TOTAL	**CH4**	**719**	**960**				**3.12%**					3.82%				
1AA1A. Public electricity and heat production	N2O	4.07	8.43	5%	300%	300.0%	0.27%	0.04%	0.14%	0.00	0.00	0.11%	D	R		
1AA1B. Petroleum refining	N2O	0.24		5%	300%	300.0%	0.00%	-0.01%	0.00%	0.00	0.00	0.02%	D	R		
1AA2F1. Other	N2O	1.09	0.57	5%	300%	300.0%	0.02%	-0.02%	0.01%	0.00	0.00	0.05%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	1.94	5%	300%	300.0%	0.06%	-0.02%	0.03%	0.00	0.00	0.06%	D	R		
1AA3B. Road transport	N2O	3.05	5.31	5%	50%	50.2%	0.03%	0.01%	0.09%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	N2O			5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.04%	0.01%	0.02%	0.00	0.00	0.02%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O		0	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.07	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	152.62	5%	100%	100.1%	1.64%	-0.70%	2.50%	-0.01	0.00	0.72%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	148.94	20%	400%	400.5%	6.41%	-1.37%	2.44%	-0.05	0.01	5.52%	D	R		
4D3. Indirect emissions	N2O	131.96	130.74	20%	50%	53.9%	0.76%	-1.15%	2.14%	-0.01	0.01	0.83%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	0.89	20%	20%	28.3%	0.00%	-0.20%	0.01%	0.00	0.00	0.04%	D	R		
6B. Wastewater handling	N2O	17.15	21.24	5%	10%	11.2%	0.03%	-0.08%	0.35%	0.00	0.00	0.03%	D	R		
TOTAL	**N2O**	**450**	**472**				**6.66%**					0.27%				
2F. Consumption of Halocarbons and SF6	HCFs	25	22	50%	200%	206.2%	0.49%	-0.25%	0.36%	-0.01	0.00	0.57%				
TOTAL	**HCFs**	**24.7**	**22**				**0.0**					0.57%				
TOTAL EMISSIONS		**6116**	**9311**				**13.41%**					**13.57%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**36.62%**				**Trend uncertainty:**	**36.83%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 2006

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	2006 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	3653	5%	5%	7.1%	2.70%	16.91%	59.74%	0.01	0.04	4.31%	D	R		
1AA1B. Petroleum refining	CO2	91		5%	5%	7.1%	0.00%	-2.33%	0.00%	0.00	0.00	0.12%	D	R		
1AA2F1. Other	CO2	428	210	5%	5%	7.1%	0.16%	-7.51%	3.43%	0.00	0.00	0.45%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	652	5%	5%	7.1%	0.48%	-5.92%	10.66%	0.00	0.01	0.81%	D	R		
1AA3B. Road transport	CO2	1168	2019	5%	5%	7.1%	1.49%	3.15%	33.01%	0.00	0.02	2.34%	D	R		
1AA4A. Commercial/ Institutional	CO2		67	5%	5%	7.1%	0.05%	1.09%	1.09%	0.00	0.00	0.09%	D	R		
1AA4B. Residential	CO2	183	522	5%	5%	7.1%	0.39%	3.86%	8.53%	0.00	0.01	0.63%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2		89	5%	5%	7.1%	0.07%	1.45%	1.45%	0.00	0.00	0.13%	D	R		
1AA5A. Other Stationary	CO2		13	5%	5%	7.1%	0.01%	0.21%	0.21%	0.00	0.00	0.02%	D	R		
2A1. Cement Production	CO2	668	821	2%	2%	2.8%	0.24%	-3.63%	13.42%	0.00	0.00	0.39%	D	R		
2A2. Lime production	CO2	4	10	2%	2%	2.8%	0.00%	0.07%	0.17%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	72	2%	2%	2.8%	0.02%	-0.28%	1.17%	0.00	0.00	0.03%	D	R		
TOTAL	**CO2**	**4922**	**8127**				**3.16%**					9.32%				
1AA1A. Public electricity and heat production	CH4	1.4	2.9	5%	100%	100.1%	0.03%	0.01%	0.05%	0.00	0.00	0.01%	D	R		
1AA1B. Petroleum refining	CH4	0.08		5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.2	5%	100%	100.1%	0.00%	-0.01%	0.00%	0.00	0.00	0.01%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.77	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	7.55	4%	40%	40.2%	0.03%	0.02%	0.12%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	CH4		0.19	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	2	5%	100%	100.1%	0.02%	0.02%	0.03%	0.00	0.00	0.02%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4		0	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.0	5%	100%	100.1%	0.00%	-0.02%	0.00%	0.00	0.00	0.02%	D	R		
1B2A4. Refining / Storage	CH4	1	0	5%	300%	300.0%	0.00%	-0.02%	0.00%	0.00	0.00	0.07%	D	R		
4A. Enteric Fermentation	CH4	161	174	5%	30%	30.4%	0.55%	-1.27%	2.84%	0.00	0.00	0.43%	D	R		
4B. Manure Management	CH4	88	126	5%	50%	50.2%	0.66%	-0.19%	2.05%	0.00	0.00	0.17%	D	R		
4F. Field burning of agricultural residues	CH4	9	2	5%	20%	20.6%	0.00%	-0.19%	0.03%	0.00	0.00	0.04%	D	R		
6A. Solid waste disposal on land	CH4	433	619	20%	40%	44.7%	2.89%	-0.95%	10.12%	0.00	0.03	2.89%	D	R		
6B. Wastewater handling	CH4	20	23	30%	100%	104.4%	0.26%	-0.13%	0.38%	0.00	0.00	0.21%	D	R		
TOTAL	**CH4**	**719**	**957**				**3.03%**					3.90%				
1AA1A. Public electricity and heat production	N2O	4.07	8.61	5%	300%	300.0%	0.27%	0.04%	0.14%	0.00	0.00	0.11%	D	R		
1AA1B. Petroleum refining	N2O	0.24		5%	300%	300.0%	0.00%	-0.01%	0.00%	0.00	0.00	0.02%	D	R		
1AA2F1. Other	N2O	1.09	0.51	5%	300%	300.0%	0.02%	-0.02%	0.01%	0.00	0.00	0.06%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	1.90	5%	300%	300.0%	0.06%	-0.02%	0.03%	0.00	0.00	0.06%	D	R		
1AA3B. Road transport	N2O	3.05	5.29	5%	50%	50.2%	0.03%	0.01%	0.09%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	N2O		0	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.05%	0.01%	0.02%	0.00	0.00	0.03%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O		0	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.03	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	139.35	5%	100%	100.1%	1.46%	-1.00%	2.28%	-0.01	0.00	1.01%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	145.19	20%	400%	400.5%	6.08%	-1.53%	2.37%	-0.06	0.01	6.16%	D	R		
4D3. Indirect emissions	N2O	131.96	125.65	20%	50%	53.9%	0.71%	-1.32%	2.05%	-0.01	0.01	0.88%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	0.91	20%	20%	28.3%	0.00%	-0.20%	0.01%	0.00	0.00	0.04%	D	R		
6B. Wastewater handling	N2O	17.15	20.97	5%	10%	11.2%	0.02%	-0.10%	0.34%	0.00	0.00	0.03%	D	R		
TOTAL	**N2O**	**450**	**450**				**6.30%**					0.30%				
2F. Consumption of Halocarbons and SF6	HCFs	25	24	50%	200%	206.2%	0.52%	-0.24%	0.39%	0.00	0.00	0.55%				
TOTAL	**HCFs**	**24.7**	**24**				**0.0**					0.55%				
TOTAL EMISSIONS		**6116**	**9558**				**13.01%**					**14.07%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**36.07%**				**Trend uncertainty:**	**37.51%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 2007

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	2007 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	3802	5%	5%	7.1%	2.74%	18.21%	62.16%	0.01	0.04	4.49%	D	R		
1AA1B. Petroleum refining	CO2	91		5%	5%	7.1%	0.00%	-2.39%	0.00%	0.00	0.00	0.12%	D	R		
1AA2F1. Other	CO2	428	205	5%	5%	7.1%	0.15%	-7.87%	3.35%	0.00	0.00	0.46%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	649	5%	5%	7.1%	0.47%	-6.40%	10.61%	0.00	0.01	0.82%	D	R		
1AA3B. Road transport	CO2	1168	2156	5%	5%	7.1%	1.55%	4.61%	35.25%	0.00	0.02	2.50%	D	R		
1AA4A. Commercial/ Institutional	CO2		63	5%	5%	7.1%	0.05%	1.04%	1.04%	0.00	0.00	0.09%	D	R		
1AA4B. Residential	CO2	183	496	5%	5%	7.1%	0.36%	3.31%	8.11%	0.00	0.01	0.60%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2		89	5%	5%	7.1%	0.06%	1.45%	1.45%	0.00	0.00	0.13%	D	R		
1AA5A. Other Stationary	CO2		19	5%	5%	7.1%	0.01%	0.31%	0.31%	0.00	0.00	0.03%	D	R		
2A1. Cement Production	CO2	668	812	2%	2%	2.8%	0.23%	-4.22%	13.28%	0.00	0.00	0.39%	D	R		
2A2. Lime production	CO2	4	10	2%	2%	2.8%	0.00%	0.06%	0.16%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	71	2%	2%	2.8%	0.02%	-0.33%	1.16%	0.00	0.00	0.03%	D	R		
TOTAL	**CO2**	**4922**	**8372**				**3.22%**					9.65%				
1AA1A. Public electricity and heat production	CH4	1.4	3.0	5%	100%	100.1%	0.03%	0.01%	0.05%	0.00	0.00	0.01%	D	R		
1AA1B. Petroleum refining	CH4	0.08		5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.2	5%	100%	100.1%	0.00%	-0.01%	0.00%	0.00	0.00	0.01%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.80	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	8.16	4%	40%	40.2%	0.03%	0.03%	0.13%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	CH4		0.27	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	2	5%	100%	100.1%	0.02%	0.02%	0.03%	0.00	0.00	0.02%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4		0	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.1	5%	100%	100.1%	0.00%	-0.02%	0.00%	0.00	0.00	0.02%	D	R		
1B2A4. Refining / Storage	CH4	1	0	5%	300%	300.0%	0.00%	-0.02%	0.00%	0.00	0.00	0.07%	D	R		
4A. Enteric Fermentation	CH4	161	176	5%	30%	30.4%	0.55%	-1.33%	2.88%	0.00	0.00	0.45%	D	R		
4B. Manure Management	CH4	88	125	5%	50%	50.2%	0.64%	-0.26%	2.05%	0.00	0.00	0.19%	D	R		
4F. Field burning of agricultural residues	CH4	9	1	5%	20%	20.6%	0.00%	-0.22%	0.01%	0.00	0.00	0.04%	D	R		
6A. Solid waste disposal on land	CH4	433	615	20%	40%	44.7%	2.80%	-1.30%	10.06%	-0.01	0.03	2.89%	D	R		
6B. Wastewater handling	CH4	20	23	30%	100%	104.4%	0.24%	-0.15%	0.37%	0.00	0.00	0.22%	D	R		
TOTAL	**CH4**	**719**	**955**				**2.94%**					3.96%				
1AA1A. Public electricity and heat production	N2O	4.07	8.97	5%	300%	300.0%	0.27%	0.04%	0.15%	0.00	0.00	0.12%	D	R		
1AA1B. Petroleum refining	N2O	0.24		5%	300%	300.0%	0.00%	-0.01%	0.00%	0.00	0.00	0.02%	D	R		
1AA2F1. Other	N2O	1.09	0.51	5%	300%	300.0%	0.02%	-0.02%	0.01%	0.00	0.00	0.06%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	1.96	5%	300%	300.0%	0.06%	-0.02%	0.03%	0.00	0.00	0.06%	D	R		
1AA3B. Road transport	N2O	3.05	5.66	5%	50%	50.2%	0.03%	0.01%	0.09%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	N2O		0	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.04%	0.01%	0.02%	0.00	0.00	0.03%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O		0	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.05	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	147.57	5%	100%	100.1%	1.51%	-0.95%	2.41%	-0.01	0.00	0.97%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	141.73	20%	400%	400.5%	5.79%	-1.69%	2.32%	-0.07	0.01	6.79%	D	R		
4D3. Indirect emissions	N2O	131.96	124.88	20%	50%	53.9%	0.69%	-1.42%	2.04%	-0.01	0.01	0.91%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	0.54	20%	20%	28.3%	0.00%	-0.21%	0.01%	0.00	0.00	0.04%	D	R		
6B. Wastewater handling	N2O	17.15	21.48	5%	10%	11.2%	0.02%	-0.10%	0.35%	0.00	0.00	0.03%	D	R		
TOTAL	**N2O**	**450**	**455**				**6.03%**					0.31%				
2F. Consumption of Halocarbons and SF6	HCFs	25	26	50%	200%	206.2%	0.54%	-0.23%	0.42%	0.00	0.00	0.55%				
TOTAL	**HCFs**	**24.7**	**26**				**0.0**					0.55%				
TOTAL EMISSIONS		**6116**	**9808**				**12.72%**					**14.47%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**35.67%**				**Trend uncertainty:**	**38.04%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 2008

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	2008 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	3967	5%	5%	7.1%	2.79%	19.76%	64.87%	0.01	0.05	4.69%	D	R		
1AA1B. Petroleum refining	CO2	91		5%	5%	7.1%	0.00%	-2.45%	0.00%	0.00	0.00	0.12%	D	R		
1AA2F1. Other	CO2	428	219	5%	5%	7.1%	0.15%	-7.94%	3.57%	0.00	0.00	0.47%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	661	5%	5%	7.1%	0.46%	-6.64%	10.82%	0.00	0.01	0.83%	D	R		
1AA3B. Road transport	CO2	1168	2246	5%	5%	7.1%	1.58%	5.27%	36.72%	0.00	0.03	2.61%	D	R		
1AA4A. Commercial/ Institutional	CO2		70	5%	5%	7.1%	0.05%	1.14%	1.14%	0.00	0.00	0.10%	D	R		
1AA4B. Residential	CO2	183	449	5%	5%	7.1%	0.32%	2.42%	7.34%	0.00	0.01	0.53%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2		83	5%	5%	7.1%	0.06%	1.35%	1.35%	0.00	0.00	0.12%	D	R		
1AA5A. Other Stationary	CO2		41	5%	5%	7.1%	0.03%	0.68%	0.68%	0.00	0.00	0.06%	D	R		
2A1. Cement Production	CO2	668	818	2%	2%	2.8%	0.23%	-4.58%	13.38%	0.00	0.00	0.39%	D	R		
2A2. Lime production	CO2	4	10	2%	2%	2.8%	0.00%	0.07%	0.17%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	66	2%	2%	2.8%	0.02%	-0.45%	1.08%	0.00	0.00	0.03%	D	R		
TOTAL	**CO2**	**4922**	**8630**				**3.26%**					9.96%				
1AA1A. Public electricity and heat production	CH4	1.4	3.2	5%	100%	100.1%	0.03%	0.02%	0.05%	0.00	0.00	0.02%	D	R		
1AA1B. Petroleum refining	CH4	0.08		5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.2	5%	100%	100.1%	0.00%	-0.01%	0.00%	0.00	0.00	0.01%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.85	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	8.65	4%	40%	40.2%	0.03%	0.03%	0.14%	0.00	0.00	0.02%	D	R		
1AA4A. Commercial/ Institutional	CH4		0.29	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	2	5%	100%	100.1%	0.02%	0.02%	0.04%	0.00	0.00	0.02%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4		0	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.1	5%	100%	100.1%	0.00%	-0.02%	0.00%	0.00	0.00	0.02%	D	R		
1B2A4. Refining / Storage	CH4	1	0	5%	300%	300.0%	0.00%	-0.02%	0.00%	0.00	0.00	0.07%	D	R		
4A. Enteric Fermentation	CH4	161	177	5%	30%	30.4%	0.54%	-1.42%	2.90%	0.00	0.00	0.47%	D	R		
4B. Manure Management	CH4	88	129	5%	50%	50.2%	0.64%	-0.26%	2.10%	0.00	0.00	0.20%	D	R		
4F. Field burning of agricultural residues	CH4	9	0	5%	20%	20.6%	0.00%	-0.23%	0.00%	0.00	0.00	0.05%	D	R		
6A. Solid waste disposal on land	CH4	433	621	20%	40%	44.7%	2.76%	-1.50%	10.15%	-0.01	0.03	2.93%	D	R		
6B. Wastewater handling	CH4	20	23	30%	100%	104.4%	0.24%	-0.16%	0.37%	0.00	0.00	0.23%	D	R		
TOTAL	**CH4**	**719**	**966**				**2.89%**					4.05%				
1AA1A. Public electricity and heat production	N2O	4.07	9.40	5%	300%	300.0%	0.28%	0.04%	0.15%	0.00	0.00	0.13%	D	R		
1AA1B. Petroleum refining	N2O	0.24		5%	300%	300.0%	0.00%	-0.01%	0.00%	0.00	0.00	0.02%	D	R		
1AA2F1. Other	N2O	1.09	0.54	5%	300%	300.0%	0.02%	-0.02%	0.01%	0.00	0.00	0.06%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	2.07	5%	300%	300.0%	0.06%	-0.02%	0.03%	0.00	0.00	0.06%	D	R		
1AA3B. Road transport	N2O	3.05	6.01	5%	50%	50.2%	0.03%	0.02%	0.10%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	N2O		0	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.04%	0.01%	0.02%	0.00	0.00	0.02%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O		0	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.10	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	144.95	5%	100%	100.1%	1.44%	-1.08%	2.37%	-0.01	0.00	1.10%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	135.06	20%	400%	400.5%	5.37%	-1.90%	2.21%	-0.08	0.01	7.64%	D	R		
4D3. Indirect emissions	N2O	131.96	121.39	20%	50%	53.9%	0.65%	-1.57%	1.98%	-0.01	0.01	0.96%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	0.23	20%	20%	28.3%	0.00%	-0.22%	0.00%	0.00	0.00	0.04%	D	R		
6B. Wastewater handling	N2O	17.15	22.07	5%	10%	11.2%	0.02%	-0.10%	0.36%	0.00	0.00	0.03%	D	R		
TOTAL	**N2O**	**450**	**444**				**5.61%**					0.32%				
2F. Consumption of Halocarbons and SF6	HCFs	25	26	50%	200%	206.2%	0.54%	-0.23%	0.43%	0.00	0.00	0.56%				
TOTAL	**HCFs**	**24.7**	**26**				**0.0**					0.56%				
TOTAL EMISSIONS		**6116**	**10065**				**12.31%**					**14.90%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**35.08%**				**Trend uncertainty:**	**38.60%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 2009

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	2009 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	3992	5%	5%	7.1%	2.88%	21.34%	65.28%	0.01	0.05	4.74%	D	R		
1AA1B. Petroleum refining	CO2	91		5%	5%	7.1%	0.00%	-2.39%	0.00%	0.00	0.00	0.12%	D	R		
1AA2F1. Other	CO2	428	156	5%	5%	7.1%	0.11%	-8.67%	2.55%	0.00	0.00	0.47%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	585	5%	5%	7.1%	0.42%	-7.44%	9.56%	0.00	0.01	0.77%	D	R		
1AA3B. Road transport	CO2	1168	2251	5%	5%	7.1%	1.62%	6.18%	36.81%	0.00	0.03	2.62%	D	R		
1AA4A. Commercial/ Institutional	CO2		67	5%	5%	7.1%	0.05%	1.09%	1.09%	0.00	0.00	0.09%	D	R		
1AA4B. Residential	CO2	183	487	5%	5%	7.1%	0.35%	3.16%	7.96%	0.00	0.01	0.58%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2		76	5%	5%	7.1%	0.05%	1.25%	1.25%	0.00	0.00	0.11%	D	R		
1AA5A. Other Stationary	CO2		16	5%	5%	7.1%	0.01%	0.26%	0.26%	0.00	0.00	0.02%	D	R		
2A1. Cement Production	CO2	668	673	2%	2%	2.8%	0.19%	-6.49%	11.01%	0.00	0.00	0.34%	D	R		
2A2. Lime production	CO2	4	8	2%	2%	2.8%	0.00%	0.04%	0.14%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	41	2%	2%	2.8%	0.01%	-0.82%	0.67%	0.00	0.00	0.03%	D	R		
TOTAL	**CO2**	**4922**	**8352**				**3.36%**					9.89%				
1AA1A. Public electricity and heat production	CH4	1.4	3.2	5%	100%	100.1%	0.03%	0.02%	0.05%	0.00	0.00	0.02%	D	R		
1AA1B. Petroleum refining	CH4	0.08		5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.1	5%	100%	100.1%	0.00%	-0.01%	0.00%	0.00	0.00	0.01%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.74	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	8.81	4%	40%	40.2%	0.04%	0.04%	0.14%	0.00	0.00	0.02%	D	R		
1AA4A. Commercial/ Institutional	CH4		0.28	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA4B. Residential	CH4	1	3	5%	100%	100.1%	0.03%	0.03%	0.04%	0.00	0.00	0.03%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4		0	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.0	5%	100%	100.1%	0.00%	-0.02%	0.00%	0.00	0.00	0.02%	D	R		
1B2A4. Refining / Storage	CH4	1	0	5%	300%	300.0%	0.00%	-0.02%	0.00%	0.00	0.00	0.07%	D	R		
4A. Enteric Fermentation	CH4	161	177	5%	30%	30.4%	0.55%	-1.32%	2.89%	0.00	0.00	0.44%	D	R		
4B. Manure Management	CH4	88	128	5%	50%	50.2%	0.65%	-0.22%	2.09%	0.00	0.00	0.18%	D	R		
4F. Field burning of agricultural residues	CH4	9	0	5%	20%	20.6%	0.00%	-0.22%	0.01%	0.00	0.00	0.04%	D	R		
6A. Solid waste disposal on land	CH4	433	631	20%	40%	44.7%	2.88%	-1.04%	10.31%	0.00	0.03	2.95%	D	R		
6B. Wastewater handling	CH4	20	24	30%	100%	104.4%	0.26%	-0.13%	0.39%	0.00	0.00	0.21%	D	R		
TOTAL	**CH4**	**719**	**976**				**3.01%**					4.01%				
1AA1A. Public electricity and heat production	N2O	4.07	9.55	5%	300%	300.0%	0.29%	0.05%	0.16%	0.00	0.00	0.15%	D	R		
1AA1B. Petroleum refining	N2O	0.24		5%	300%	300.0%	0.00%	-0.01%	0.00%	0.00	0.00	0.02%	D	R		
1AA2F1. Other	N2O	1.09	0.39	5%	300%	300.0%	0.01%	-0.02%	0.01%	0.00	0.00	0.07%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	1.82	5%	300%	300.0%	0.06%	-0.02%	0.03%	0.00	0.00	0.07%	D	R		
1AA3B. Road transport	N2O	3.05	6.03	5%	50%	50.2%	0.03%	0.02%	0.10%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	N2O		0	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
1AA4B. Residential	N2O	1	2	5%	300%	300.0%	0.05%	0.01%	0.02%	0.00	0.00	0.03%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O		0	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.04	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	141.21	5%	100%	100.1%	1.44%	-1.05%	2.31%	-0.01	0.00	1.07%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	133.19	20%	400%	400.5%	5.44%	-1.83%	2.18%	-0.07	0.01	7.34%	D	R		
4D3. Indirect emissions	N2O	131.96	118.50	20%	50%	53.9%	0.65%	-1.52%	1.94%	-0.01	0.01	0.94%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	0.31	20%	20%	28.3%	0.00%	-0.22%	0.01%	0.00	0.00	0.04%	D	R		
6B. Wastewater handling	N2O	17.15	22.66	5%	10%	11.2%	0.03%	-0.08%	0.37%	0.00	0.00	0.03%	D	R		
TOTAL	**N2O**	**450**	**436**				**5.67%**					0.36%				
2F. Consumption of Halocarbons and SF6	HCFs	25	40	50%	200%	206.2%	0.85%	0.01%	0.66%	0.00	0.00	0.47%				
TOTAL	**HCFs**	**24.7**	**40**				**0.0**					0.47%				
TOTAL EMISSIONS		**6116**	**9803**				**12.89%**					**14.74%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**35.91%**				**Trend uncertainty:**	**38.39%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 2010

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	2010 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	3868	5%	5%	7.1%	2.90%	20.92%	63.25%	0.01	0.04	4.59%	D	R		
1AA1B. Petroleum refining	CO2	91		5%	5%	7.1%	0.00%	-2.30%	0.00%	0.00	0.00	0.12%	D	R		
1AA2F1. Other	CO2	428	148	5%	5%	7.1%	0.11%	-8.39%	2.42%	0.00	0.00	0.45%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	501	5%	5%	7.1%	0.37%	-8.20%	8.18%	0.00	0.01	0.71%	D	R		
1AA3B. Road transport	CO2	1168	2298	5%	5%	7.1%	1.72%	8.06%	37.58%	0.00	0.03	2.69%	D	R		
1AA4A. Commercial/ Institutional	CO2		79	5%	5%	7.1%	0.06%	1.30%	1.30%	0.00	0.00	0.11%	D	R		
1AA4B. Residential	CO2	183	424	5%	5%	7.1%	0.32%	2.31%	6.93%	0.00	0.00	0.50%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2		73	5%	5%	7.1%	0.05%	1.19%	1.19%	0.00	0.00	0.10%	D	R		
1AA5A. Other Stationary	CO2		16	5%	5%	7.1%	0.01%	0.26%	0.26%	0.00	0.00	0.02%	D	R		
2A1. Cement Production	CO2	668	555	2%	2%	2.8%	0.17%	-7.77%	9.08%	0.00	0.00	0.30%	D	R		
2A2. Lime production	CO2	4	9	2%	2%	2.8%	0.00%	0.06%	0.15%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	21	2%	2%	2.8%	0.01%	-1.09%	0.35%	0.00	0.00	0.02%	D	R		
TOTAL	**CO2**	**4922**	**7992**				**3.41%**					9.63%				
1AA1A. Public electricity and heat production	CH4	1.4	3.1	5%	100%	100.1%	0.03%	0.02%	0.05%	0.00	0.00	0.02%	D	R		
1AA1B. Petroleum refining	CH4	0.08		5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.1	5%	100%	100.1%	0.00%	-0.01%	0.00%	0.00	0.00	0.01%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.73	5%	100%	100.1%	0.01%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	8.98	4%	40%	40.2%	0.04%	0.05%	0.15%	0.00	0.00	0.02%	D	R		
1AA4A. Commercial/ Institutional	CH4		0.32	5%	100%	100.1%	0.00%	0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA4B. Residential	CH4	1	2	5%	100%	100.1%	0.02%	0.01%	0.03%	0.00	0.00	0.01%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4		0	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.0	5%	100%	100.1%	0.00%	-0.02%	0.00%	0.00	0.00	0.02%	D	R		
1B2A4. Refining / Storage	CH4	1	0	5%	300%	300.0%	0.00%	-0.02%	0.00%	0.00	0.00	0.07%	D	R		
4A. Enteric Fermentation	CH4	161	186	5%	30%	30.4%	0.60%	-1.02%	3.03%	0.00	0.00	0.37%	D	R		
4B. Manure Management	CH4	88	128	5%	50%	50.2%	0.68%	-0.12%	2.10%	0.00	0.00	0.16%	D	R		
4F. Field burning of agricultural residues	CH4	9	0	5%	20%	20.6%	0.00%	-0.21%	0.01%	0.00	0.00	0.04%	D	R		
6A. Solid waste disposal on land	CH4	433	590	20%	40%	44.7%	2.80%	-1.28%	9.66%	-0.01	0.03	2.78%	D	R		
6B. Wastewater handling	CH4	20	25	30%	100%	104.4%	0.28%	-0.09%	0.41%	0.00	0.00	0.20%	D	R		
TOTAL	**CH4**	**719**	**945**				**2.95%**					3.72%				
1AA1A. Public electricity and heat production	N2O	4.07	9.22	5%	300%	300.0%	0.29%	0.05%	0.15%	0.00	0.00	0.14%	D	R		
1AA1B. Petroleum refining	N2O	0.24		5%	300%	300.0%	0.00%	-0.01%	0.00%	0.00	0.00	0.02%	D	R		
1AA2F1. Other	N2O	1.09	0.37	5%	300%	300.0%	0.01%	-0.02%	0.01%	0.00	0.00	0.06%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	1.75	5%	300%	300.0%	0.06%	-0.02%	0.03%	0.00	0.00	0.07%	D	R		
1AA3B. Road transport	N2O	3.05	6.15	5%	50%	50.2%	0.03%	0.02%	0.10%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	N2O		0	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
1AA4B. Residential	N2O	1	1	5%	300%	300.0%	0.04%	0.01%	0.02%	0.00	0.00	0.02%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O		0	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.04	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	148.59	5%	100%	100.1%	1.58%	-0.81%	2.43%	-0.01	0.00	0.83%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	136.96	20%	400%	400.5%	5.81%	-1.62%	2.24%	-0.06	0.01	6.51%	D	R		
4D3. Indirect emissions	N2O	131.96	122.08	20%	50%	53.9%	0.70%	-1.34%	2.00%	-0.01	0.01	0.87%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	0.32	20%	20%	28.3%	0.00%	-0.21%	0.01%	0.00	0.00	0.04%	D	R		
6B. Wastewater handling	N2O	17.15	23.24	5%	10%	11.2%	0.03%	-0.05%	0.38%	0.00	0.00	0.03%	D	R		
TOTAL	**N2O**	**450**	**450**				**6.07%**					0.34%				
2F. Consumption of Halocarbons and SF6	HCFs	25	56	50%	200%	206.2%	1.23%	0.30%	0.92%	0.01	0.01	0.88%				
TOTAL	**HCFs**	**24.7**	**56**				**0.0**					0.88%				
TOTAL EMISSIONS		**6116**	**9444**				**13.66%**					**14.58%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**36.96%**				**Trend uncertainty:**	**38.18%**				

** for HFCs the base year is 1994*

Tier I UNCERTAINTY CALCULATION AND REPORTING - 2011

IPCC Source category	Gas	Base year emissions (1990*), CO2 equiv. (Gg)	2011 emissions, CO2 equiv. (Gg)	Activity data uncertainty	Emission factor uncertainty	Combined uncertainty	Combined uncertainty as % of total national emissions in year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty introduced into the trend in total national emissions	Emission factor quality indicator	Activity data quality indicator	Expert judgement reference numbers	Footnote reference number
1AA1A. Public electricity and heat production	CO2	1674	3710	5%	5%	7.1%	2.87%	19.64%	60.67%	0.01	0.04	4.40%	D	R		
1AA1B. Petroleum refining	CO2	91		5%	5%	7.1%	0.00%	-2.23%	0.00%	0.00	0.00	0.11%	D	R		
1AA2F1. Other	CO2	428	131	5%	5%	7.1%	0.10%	-8.33%	2.14%	0.00	0.00	0.44%	D	R		
1AA2F2. Non-metallic minerals	CO2	649	378	5%	5%	7.1%	0.29%	-9.69%	6.19%	0.00	0.00	0.65%	D	R		
1AA3B. Road transport	CO2	1168	2235	5%	5%	7.1%	1.73%	7.94%	36.55%	0.00	0.03	2.61%	D	R		
1AA4A. Commercial/ Institutional	CO2		70	5%	5%	7.1%	0.05%	1.14%	1.14%	0.00	0.00	0.10%	D	R		
1AA4B. Residential	CO2	183	479	5%	5%	7.1%	0.37%	3.36%	7.84%	0.00	0.01	0.58%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CO2		79	5%	5%	7.1%	0.06%	1.30%	1.30%	0.00	0.00	0.11%	D	R		
1AA5A. Other Stationary	CO2		19	5%	5%	7.1%	0.01%	0.31%	0.31%	0.00	0.00	0.03%	D	R		
2A1. Cement Production	CO2	668	546	2%	2%	2.8%	0.17%	-7.41%	8.93%	0.00	0.00	0.29%	D	R		
2A2. Lime production	CO2	4	7	2%	2%	2.8%	0.00%	0.02%	0.11%	0.00	0.00	0.00%	D	R		
2A7.2. Ceramics Production	CO2	57	17	2%	2%	2.8%	0.01%	-1.11%	0.28%	0.00	0.00	0.02%	D	R		
TOTAL	**CO2**	**4922**	**7672**				**3.39%**					9.36%				
1AA1A. Public electricity and heat production	CH4	1.4	3.0	5%	100%	100.1%	0.03%	0.02%	0.05%	0.00	0.00	0.02%	D	R		
1AA1B. Petroleum refining	CH4	0.08		5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA2F1. Other	CH4	0.4	0.1	5%	100%	100.1%	0.00%	-0.01%	0.00%	0.00	0.00	0.01%	D	R		
1AA2F2. Non-metallic minerals	CH4	0.87	0.45	5%	100%	100.1%	0.00%	-0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA3B. Road transport	CH4	4.02	8.82	4%	40%	40.2%	0.04%	0.05%	0.14%	0.00	0.00	0.02%	D	R		
1AA4A. Commercial/ Institutional	CH4		0.89	5%	100%	100.1%	0.01%	0.01%	0.01%	0.00	0.00	0.01%	D	R		
1AA4B. Residential	CH4	1	3	5%	100%	100.1%	0.03%	0.03%	0.05%	0.00	0.00	0.03%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	CH4		0	5%	100%	100.1%	0.00%	0.00%	0.00%	0.00	0.00	0.00%	D	R		
1AA5A. Other Stationary	CH4	0.9	0.1	5%	100%	100.1%	0.00%	-0.02%	0.00%	0.00	0.00	0.02%	D	R		
1B2A4. Refining / Storage	CH4	1	0	5%	300%	300.0%	0.00%	-0.02%	0.00%	0.00	0.00	0.07%	D	R		
4A. Enteric Fermentation	CH4	161	190	5%	30%	30.4%	0.63%	-0.82%	3.11%	0.00	0.00	0.33%	D	R		
4B. Manure Management	CH4	88	123	5%	50%	50.2%	0.68%	-0.13%	2.02%	0.00	0.00	0.16%	D	R		
4F. Field burning of agricultural residues	CH4	9	1	5%	20%	20.6%	0.00%	-0.21%	0.01%	0.00	0.00	0.04%	D	R		
6A. Solid waste disposal on land	CH4	433	541	20%	40%	44.7%	2.64%	-1.75%	8.85%	-0.01	0.03	2.60%	D	R		
6B. Wastewater handling	CH4	20	25	30%	100%	104.4%	0.29%	-0.07%	0.41%	0.00	0.00	0.19%	D	R		
TOTAL	**CH4**	**719**	**898**				**2.82%**					3.52%				
1AA1A. Public electricity and heat production	N2O	4.07	8.90	5%	300%	300.0%	0.29%	0.05%	0.15%	0.00	0.00	0.14%	D	R		
1AA1B. Petroleum refining	N2O	0.24		5%	300%	300.0%	0.00%	-0.01%	0.00%	0.00	0.00	0.02%	D	R		
1AA2F1. Other	N2O	1.09	0.34	5%	300%	300.0%	0.01%	-0.02%	0.01%	0.00	0.00	0.06%	D	R		
1AA2F2. Non-metallic minerals	N2O	2.02	1.13	5%	300%	300.0%	0.04%	-0.03%	0.02%	0.00	0.00	0.09%	D	R		
1AA3B. Road transport	N2O	3.05	6.00	5%	50%	50.2%	0.03%	0.02%	0.10%	0.00	0.00	0.01%	D	R		
1AA4A. Commercial/ Institutional	N2O		0	5%	300%	300.0%	0.01%	0.01%	0.01%	0.00	0.00	0.02%	D	R		
1AA4B. Residential	N2O	1	2	5%	300%	300.0%	0.05%	0.01%	0.03%	0.00	0.00	0.04%	D	R		
1AA4C. Agriculture/ Forestry/ Fisheries	N2O		0	5%	300%	300.0%	0.01%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
1AA5A. Other Stationary	N2O	0.18	0.06	5%	300%	300.0%	0.00%	0.00%	0.00%	0.00	0.00	0.01%	D	R		
4B. Manure Management	N2O	128.32	149.74	5%	100%	100.1%	1.64%	-0.69%	2.45%	-0.01	0.00	0.71%	D	R		
4D1. Direct Soil Emissions	N2O	152.84	141.08	20%	400%	400.5%	6.17%	-1.43%	2.31%	-0.06	0.01	5.77%	D	R		
4D3. Indirect emissions	N2O	131.96	124.22	20%	50%	53.9%	0.73%	-1.20%	2.03%	-0.01	0.01	0.83%	D	R		
4F. Field burning of agricultural residues	N2O	8.42	0.48	20%	20%	28.3%	0.00%	-0.20%	0.01%	0.00	0.00	0.04%	D	R		
6B. Wastewater handling	N2O	17.15	23.85	5%	10%	11.2%	0.03%	-0.03%	0.39%	0.00	0.00	0.03%	D	R		
TOTAL	**N2O**	**450**	**458**				**6.43%**					0.38%				
2F. Consumption of Halocarbons and SF6	HCFs	25	127	50%	200%	206.2%	2.85%	1.47%	2.07%	0.03	0.01	3.28%				
TOTAL	**HCFs**	**24.7**	**127**				**0.0**					3.28%				
TOTAL EMISSIONS		**6116**	**9154**				**15.49%**					**16.53%**				
TOTAL UNCERTAINTIES				**Percentage uncertainty in total inventory**			**39.36%**				**Trend uncertainty:**	**40.66%**				

** for HFCs the base year is 1994*

Annex III. CRF Summary tables for 1990-2011

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1990
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 (1)	CH_4	N_2O	HFCs (2)	PFCs (2)	SF_6 (2)	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) (1)	**4,780.07**	**719.67**	**452.21**	**NA,NO**	**NA,NO**	**NA,NO**	**5,951.95**
1. Energy	**4,193.42**	**9.15**	**11.18**				**4,213.76**
A. Fuel Combustion (Sectoral Approach)	4,193.42	8.23	11.18				4,212.84
1. Energy Industries	1,765.16	1.46	4.31				1,770.93
2. Manufacturing Industries and Construction	1,077.11	1.24	3.11				1,081.46
3. Transport	1,168.21	4.02	3.05				1,175.28
4. Other Sectors	182.94	0.60	0.53				184.08
5. Other	NA,NO	0.91	0.18				1.09
B. Fugitive Emissions from Fuels	NA,NE,NO	0.92	NA,NE,NO				0.92
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	0.92	NA,NE,NO				0.92
2. Industrial Processes	**728.15**	**NA,NE,NO**	**NA,NE,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**728.15**
A. Mineral Products	728.15	NA,NE	NA,NE				728.15
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 (2)				NA,NO	NA,NO	NA,NO	NA,NO
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**257.36**	**421.54**				**678.91**
A. Enteric Fermentation		160.67					160.67
B. Manure Management		87.92	128.32				216.24
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils(3)		NA,NE	284.80				284.80
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		8.78	8.42				17.19
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry(1)	**-141.50**	**0.27**	**2.33**				**-138.90**
A. Forest Land	-156.43	0.27	2.33				-153.82
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	14.93	NE					14.93
6. Waste	**NA,NE,NO**	**452.88**	**17.15**				**470.03**
A. Solid Waste Disposal on Land	NA,NE,NO	432.98					432.98
B. Waste-water Handling		19.90	17.15				37.05
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other *(as specified in Summary 1.A)*	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: (4)							
International Bunkers	925.80	0.36	6.97				933.14
Aviation	744.89	0.11	6.52				751.52
Marine	180.91	0.25	0.45				181.61
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**15.74**						**15.74**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	6,090.85
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	5,951.95

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1991
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 (1)	CH_4	N_2O	HFCs (2)	PFCs (2)	SF_6 (2)	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) (1)	**5,005.85**	**742.70**	**449.27**	**NA,NO**	**NA,NO**	**NA,NO**	**6,197.82**
1. Energy	**4,475.87**	**9.48**	**11.82**				**4,497.16**
A. Fuel Combustion (Sectoral Approach)	4,475.87	8.40	11.82				4,496.08
1. Energy Industries	1,827.27	1.51	4.46				1,833.24
2. Manufacturing Industries and Construction	1,301.34	1.41	3.63				1,306.39
3. Transport	1,164.31	4.12	3.04				1,171.47
4. Other Sectors	182.94	0.60	0.53				184.08
5. Other	NA,NO	0.76	0.15				0.90
B. Fugitive Emissions from Fuels	NA,NE,NO	1.08	NA,NE,NO				1.08
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	1.08	NA,NE,NO				1.08
2. Industrial Processes	**687.21**	**NA,NE,NO**	**NA,NE,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**687.21**
A. Mineral Products	687.21	NA,NE	NA,NE				687.21
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 (2)				NA,NO	NA,NO	NA,NO	NA,NO
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**260.28**	**419.62**				**679.90**
A. Enteric Fermentation		163.21					163.21
B. Manure Management		91.26	127.87				219.13
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils(3)		NA,NE	284.88				284.88
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		5.81	6.87				12.68
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry(1)	**-157.22**	**0.03**	**0.24**				**-156.96**
A. Forest Land	-168.92	0.03	0.24				-168.65
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	11.70	NE					11.70
6. Waste	**NA,NE,NO**	**472.90**	**17.60**				**490.50**
A. Solid Waste Disposal on Land	NA,NE,NO	453.74					453.74
B. Waste-water Handling		19.17	17.60				36.77
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other ***(as specified in Summary 1.A)***	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: (4)							
International Bunkers	1,058.13	0.37	8.17				1,066.67
Aviation	883.76	0.13	7.74				891.64
Marine	174.36	0.24	0.43				175.04
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**13.02**						**13.02**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	6,354.78
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	6,197.82

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1992
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs [2]	PFCs [2]	SF_6 [2]	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) [1]	**5,345.98**	**781.97**	**494.00**	**NA,NO**	**NA,NO**	**NA,NO**	**6,621.95**
1. Energy	**4,769.63**	**9.60**	**12.14**				**4,791.38**
A. Fuel Combustion (Sectoral Approach)	4,769.63	8.55	12.14				4,790.32
1. Energy Industries	2,124.50	1.76	5.18				2,131.44
2. Manufacturing Industries and Construction	1,118.29	0.99	2.77				1,122.05
3. Transport	1,310.25	4.36	3.42				1,318.02
4. Other Sectors	216.59	0.71	0.63				217.92
5. Other	NA,NO	0.74	0.15				0.89
B. Fugitive Emissions from Fuels	NA,NE,NO	1.06	NA,NE,NO				1.06
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	1.06	NA,NE,NO				1.06
2. Industrial Processes	**736.68**	**NA,NE,NO**	**NA,NE,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**736.68**
A. Mineral Products	736.68	NA,NE	NA,NE				736.68
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 [2]				NA,NO	NA,NO	NA,NO	NA,NO
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**278.00**	**463.72**				**741.72**
A. Enteric Fermentation		164.09					164.09
B. Manure Management		102.16	129.60				231.76
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils [3]		NA,NE	324.80				324.80
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		11.75	9.32				21.07
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry [1]	**-160.32**	**0.01**	**0.07**				**-160.25**
A. Forest Land	-171.07	0.01	0.07				-171.00
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	10.75	NE					10.75
6. Waste	**NA,NE,NO**	**494.36**	**18.07**				**512.43**
A. Solid Waste Disposal on Land	NA,NE,NO	475.05					475.05
B. Waste-water Handling		19.31	18.07				37.38
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other ***(as specified in Summary 1.A)***	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: [4]							
International Bunkers	1,042.21	0.38	7.97				1,050.57
Aviation	858.51	0.13	7.52				866.16
Marine	183.70	0.26	0.45				184.41
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**12.81**						**12.81**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	6,782.20
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	6,621.95

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1993
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 (1)	CH_4	N_2O	HFCs (2)	PFCs (2)	SF_6 (2)	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) (1)	**5,660.03**	**819.63**	**511.65**	**NA,NO**	**NA,NO**	**NA,NO**	**6,991.30**
1. Energy	**4,958.37**	**9.76**	**12.57**				**4,980.71**
A. Fuel Combustion (Sectoral Approach)	4,958.37	8.63	12.57				4,979.57
1. Energy Industries	2,244.68	1.85	5.47				2,252.00
2. Manufacturing Industries and Construction	1,182.47	1.04	2.91				1,186.43
3. Transport	1,329.63	4.34	3.46				1,337.43
4. Other Sectors	201.59	0.66	0.58				202.83
5. Other	NA,NO	0.74	0.15				0.88
B. Fugitive Emissions from Fuels	NA,NE,NO	1.13	NA,NE,NO				1.13
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	1.13	NA,NE,NO				1.13
2. Industrial Processes	**807.88**	**NA,NE,NO**	**NA,NE,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**807.88**
A. Mineral Products	807.88	NA,NE	NA,NE				807.88
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 (2)				NA,NO	NA,NO	NA,NO	NA,NO
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**293.76**	**470.60**				**764.35**
A. Enteric Fermentation		170.30					170.30
B. Manure Management		111.28	135.94				247.21
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils(3)		NA,NE	326.89				326.89
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		12.18	7.77				19.95
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry(1)	**-106.22**	**1.16**	**10.00**				**-95.07**
A. Forest Land	-118.85	1.16	10.00				-107.69
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	12.63	NE					12.63
6. Waste	**NA,NE,NO**	**514.95**	**18.48**				**533.43**
A. Solid Waste Disposal on Land	NA,NE,NO	494.97					494.97
B. Waste-water Handling		19.97	18.48				38.46
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other ***(as specified in Summary 1.A)***	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: (4)							
International Bunkers	884.40	0.32	6.77				891.50
Aviation	729.11	0.11	6.39				735.60
Marine	155.30	0.22	0.38				155.90
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**12.70**						**12.70**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	7,086.37
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	6,991.30

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1994
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 (1)	CH_4	N_2O	HFCs (2)	PFCs (2)	SF_6 (2)	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) (1)	**6,081.44**	**836.89**	**507.35**	**24.70**	**NA,NO**	**NA,NO**	**7,450.38**
1. Energy	**5,364.40**	**10.54**	**13.95**				**5,388.88**
A. Fuel Combustion (Sectoral Approach)	5,364.40	9.22	13.95				5,387.57
1. Energy Industries	2,375.95	1.96	5.80				2,383.72
2. Manufacturing Industries and Construction	1,404.12	1.49	3.86				1,409.47
3. Transport	1,382.50	4.57	3.60				1,390.68
4. Other Sectors	201.82	0.66	0.58				203.06
5. Other	NA,NO	0.54	0.11				0.64
B. Fugitive Emissions from Fuels	NA,NE,NO	1.32	NA,NE,NO				1.32
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	1.32	NA,NE,NO				1.32
2. Industrial Processes	**839.18**	**NA,NE,NO**	**NA,NE,NO**	**24.70**	**NA,NO**	**NA,NO**	**863.88**
A. Mineral Products	839.18	NA,NE	NA,NE				839.18
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 (2)				24.70	NA,NO	NA,NO	24.70
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**291.06**	**466.93**				**757.99**
A. Enteric Fermentation		173.18					173.18
B. Manure Management		108.98	136.44				245.42
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils(3)		NA,NE	324.51				324.51
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		8.90	5.98				14.88
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry(1)	**-122.14**	**0.88**	**7.59**				**-113.67**
A. Forest Land	-133.01	0.88	7.59				-124.54
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	10.87	NE					10.87
6. Waste	**NA,NE,NO**	**534.41**	**18.88**				**553.29**
A. Solid Waste Disposal on Land	NA,NE,NO	513.50					513.50
B. Waste-water Handling		20.92	18.88				39.79
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other ***(as specified in Summary 1.A)***	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: (4)							
International Bunkers	940.08	0.38	7.02				947.48
Aviation	748.04	0.11	6.55				754.71
Marine	192.04	0.27	0.47				192.78
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**9.23**						**9.23**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	7,564.05
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	7,450.38

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1995
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs [(2)]	PFCs [(2)]	SF_6 [(2)]	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) [(1)]	**5,936.80**	**867.80**	**511.90**	**NA,NO**	**NA,NO**	**NA,NO**	**7,316.51**
1. Energy	**5,283.32**	**10.49**	**13.74**				**5,307.55**
A. Fuel Combustion (Sectoral Approach)	5,283.32	9.28	13.74				5,306.35
1. Energy Industries	2,168.11	1.79	5.28				2,175.19
2. Manufacturing Industries and Construction	1,442.46	1.51	3.93				1,447.91
3. Transport	1,467.97	4.74	3.82				1,476.54
4. Other Sectors	204.77	0.67	0.59				206.03
5. Other	NA,NO	0.57	0.11				0.69
B. Fugitive Emissions from Fuels	NA,NE,NO	1.20	NA,NE,NO				1.20
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	1.20	NA,NE,NO				1.20
2. Industrial Processes	**804.85**	**NA,NE,NO**	**NA,NE,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**804.85**
A. Mineral Products	804.85	NA,NE	NA,NE				804.85
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 [(2)]				NA,NO	NA,NO	NA,NO	NA,NO
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**302.46**	**476.67**				**779.12**
A. Enteric Fermentation		179.83					179.83
B. Manure Management		114.37	141.13				255.50
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils[(3)]		NA,NE	329.83				329.83
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		8.25	5.71				13.97
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry[(1)]	**-151.37**	**0.27**	**2.29**				**-148.81**
A. Forest Land	-162.73	0.27	2.29				-160.17
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	11.36	NE					11.36
6. Waste	**NA,NE,NO**	**554.59**	**19.20**				**573.79**
A. Solid Waste Disposal on Land	NA,NE,NO	533.60					533.60
B. Waste-water Handling		20.99	19.20				40.19
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other ***(as specified in Summary 1.A)***	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: [(4)]							
International Bunkers	1,034.52	0.42	7.71				1,042.65
Aviation	820.64	0.12	7.19				827.95
Marine	213.88	0.30	0.52				214.71
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**9.88**						**9.88**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	7,465.32
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	7,316.51

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1996
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 (1)	CH_4	N_2O	HFCs (2)	PFCs (2)	SF_6 (2)	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) (1)	**6,296.50**	**894.50**	**524.48**	**9.70**	**NA,NO**	**NA,NO**	**7,725.18**
1. Energy	**5,588.01**	**10.99**	**14.51**				**5,613.50**
A. Fuel Combustion (Sectoral Approach)	5,588.01	9.89	14.51				5,612.40
1. Energy Industries	2,282.49	1.88	5.56				2,289.94
2. Manufacturing Industries and Construction	1,579.06	1.62	4.23				1,584.90
3. Transport	1,518.50	4.86	3.95				1,527.31
4. Other Sectors	207.96	0.68	0.60				209.23
5. Other	NA,NO	0.86	0.17				1.03
B. Fugitive Emissions from Fuels	NA,NE,NO	1.10	NA,NE,NO				1.10
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	1.10	NA,NE,NO				1.10
2. Industrial Processes	**862.63**	**NA,NE,NO**	**NA,NE,NO**	**9.70**	**NA,NO**	**NA,NO**	**872.32**
A. Mineral Products	862.63	NA,NE	NA,NE				862.63
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 (2)				9.70	NA,NO	NA,NO	9.70
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**311.13**	**488.37**				**799.50**
A. Enteric Fermentation		182.68					182.68
B. Manure Management		120.78	146.18				266.96
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils(3)		NA,NE	336.59				336.59
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		7.67	5.60				13.28
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry(1)	**-154.13**	**0.25**	**2.12**				**-151.77**
A. Forest Land	-164.91	0.25	2.12				-162.55
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	10.78	NE					10.78
6. Waste	**NA,NE,NO**	**572.14**	**19.49**				**591.62**
A. Solid Waste Disposal on Land	NA,NE,NO	549.84					549.84
B. Waste-water Handling		22.29	19.49				41.78
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other ***(as specified in Summary 1.A)***	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: (4)							
International Bunkers	1,068.36	0.51	7.58				1,076.44
Aviation	785.92	0.12	6.88				792.92
Marine	282.44	0.39	0.69				283.52
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**14.76**						**14.76**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	7,876.95
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	7,725.18

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1997
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs [(2)]	PFCs [(2)]	SF_6 [(2)]	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) [(1)]	**6,389.90**	**900.83**	**502.74**	**NA,NO**	**NA,NO**	**NA,NO**	**7,793.47**
1. Energy	**5,712.24**	**11.22**	**14.74**				**5,738.20**
A. Fuel Combustion (Sectoral Approach)	5,712.24	9.71	14.74				5,736.68
1. Energy Industries	2,413.60	1.99	5.88				2,421.48
2. Manufacturing Industries and Construction	1,496.66	1.55	4.02				1,502.23
3. Transport	1,584.70	5.02	4.12				1,593.85
4. Other Sectors	217.28	0.70	0.62				218.61
5. Other	NA,NO	0.44	0.09				0.53
B. Fugitive Emissions from Fuels	NA,NE,NO	1.51	NA,NE,NO				1.51
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	1.51	NA,NE,NO				1.51
2. Industrial Processes	**829.77**	**NA,NE,NO**	**NA,NE,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**829.77**
A. Mineral Products	829.77	NA,NE	NA,NE				829.77
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 [(2)]				NA,NO	NA,NO	NA,NO	NA,NO
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**303.46**	**465.10**				**768.56**
A. Enteric Fermentation		178.78					178.78
B. Manure Management		122.02	150.61				272.63
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils[(3)]		NA,NE	310.88				310.88
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		2.67	3.61				6.28
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry[(1)]	**-152.11**	**0.34**	**2.95**				**-148.81**
A. Forest Land	-161.65	0.34	2.95				-158.36
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	9.54	NE					9.54
6. Waste	**NA,NE,NO**	**585.81**	**19.95**				**605.76**
A. Solid Waste Disposal on Land	NA,NE,NO	563.21					563.21
B. Waste-water Handling		22.60	19.95				42.55
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other ***(as specified in Summary 1.A)***	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: [(4)]							
International Bunkers	1,080.55	0.54	7.53				1,088.62
Aviation	773.29	0.11	6.77				780.18
Marine	307.26	0.43	0.76				308.44
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**7.60**						**7.60**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	7,942.29
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	7,793.47

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1998
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs [(2)]	PFCs [(2)]	SF_6 [(2)]	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) [(1)]	**6,615.77**	**909.74**	**531.63**	**NA,NO**	**NA,NO**	**NA,NO**	**8,057.13**
1. Energy	**5,839.17**	**11.16**	**14.62**				**5,864.96**
A. Fuel Combustion (Sectoral Approach)	5,839.17	9.59	14.62				5,863.39
1. Energy Industries	2,646.05	2.18	6.45				2,654.69
2. Manufacturing Industries and Construction	1,318.03	1.12	3.16				1,322.31
3. Transport	1,660.54	5.19	4.32				1,670.05
4. Other Sectors	214.55	0.69	0.61				215.86
5. Other	NA,NO	0.40	0.08				0.48
B. Fugitive Emissions from Fuels	NA,NE,NO	1.57	NA,NE,NO				1.57
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	1.57	NA,NE,NO				1.57
2. Industrial Processes	**784.71**	**NA,NE,NO**	**NA,NE,NO**	**NA,NO**	**NA,NO**	**NA,NO**	**784.71**
A. Mineral Products	784.71	NA,NE	NA,NE				784.71
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 [(2)]				NA,NO	NA,NO	NA,NO	NA,NO
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**299.21**	**466.68**				**765.89**
A. Enteric Fermentation		172.10					172.10
B. Manure Management		123.71	149.61				273.32
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils[(3)]		NA,NE	313.68				313.68
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		3.40	3.39				6.79
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry[(1)]	**-8.12**	**3.50**	**30.16**				**25.54**
A. Forest Land	-16.52	3.50	30.16				17.15
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	8.39	NE					8.39
6. Waste	**NA,NE,NO**	**595.87**	**20.16**				**616.03**
A. Solid Waste Disposal on Land	NA,NE,NO	575.17					575.17
B. Waste-water Handling		20.70	20.16				40.87
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other ***(as specified in Summary 1.A)***	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: [(4)]							
International Bunkers	1,122.38	0.55	7.89				1,130.82
Aviation	814.33	0.12	7.13				821.58
Marine	308.05	0.43	0.76				309.24
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**6.95**						**6.95**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	8,031.59
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	8,057.13

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 1999
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 (1)	CH_4	N_2O	HFCs (2)	PFCs (2)	SF_6 (2)	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) (1)	**6,722.95**	**911.88**	**504.10**	**19.36**	**NA,NO**	**NA,NO**	**8,158.28**
1. Energy	**6,101.68**	**11.81**	**15.32**				**6,128.82**
A. Fuel Combustion (Sectoral Approach)	6,101.68	10.10	15.32				6,127.10
1. Energy Industries	2,831.61	2.34	6.91				2,840.85
2. Manufacturing Industries and Construction	1,357.47	1.17	3.28				1,361.91
3. Transport	1,704.19	5.37	4.43				1,713.99
4. Other Sectors	208.42	0.67	0.60				209.69
5. Other	NA,NO	0.55	0.11				0.66
B. Fugitive Emissions from Fuels	NA,NE,NO	1.71	NA,NE,NO				1.71
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	1.71	NA,NE,NO				1.71
2. Industrial Processes	**792.45**	**NA,NE,NO**	**NA,NE,NO**	**19.36**	**NA,NO**	**NA,NO**	**811.81**
A. Mineral Products	792.45	NA,NE	NA,NE				792.45
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 (2)				19.36	NA,NO	NA,NO	19.36
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**296.60**	**468.18**				**764.78**
A. Enteric Fermentation		171.16					171.16
B. Manure Management		120.40	150.99				271.38
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils(3)		NA,NE	314.64				314.64
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		5.05	2.55				7.60
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry(1)	**-171.18**	**0.00**	**0.03**				**-171.14**
A. Forest Land	-179.84	0.00	0.03				-179.80
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	8.66	NE					8.66
6. Waste	**NA,NE,NO**	**603.45**	**20.57**				**624.02**
A. Solid Waste Disposal on Land	NA,NE,NO	585.74					585.74
B. Waste-water Handling		17.71	20.57				38.27
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other *(as specified in Summary 1.A)*	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: (4)							
International Bunkers	1,314.79	0.79	8.48				1,324.06
Aviation	833.26	0.12	7.30				840.69
Marine	481.52	0.67	1.19				483.38
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**9.55**						**9.55**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	8,329.42
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	8,158.28

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

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 (2)	PFCs (2)	SF_6 (2)	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) (1)	**6,988.95**	**927.65**	**487.59**	**19.33**	**NA,NO**	**0.00**	**8,423.51**
1. Energy	**6,332.31**	**12.17**	**16.08**				**6,360.55**
A. Fuel Combustion (Sectoral Approach)	6,332.31	10.46	16.08				6,358.85
1. Energy Industries	2,958.63	2.44	7.21				2,968.29
2. Manufacturing Industries and Construction	1,395.53	1.31	3.56				1,400.39
3. Transport	1,745.19	5.47	4.54				1,755.19
4. Other Sectors	232.97	0.75	0.67				234.39
5. Other	NA,NO	0.49	0.10				0.59
B. Fugitive Emissions from Fuels	NA,NE,NO	1.70	NA,NE,NO				1.70
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	1.70	NA,NE,NO				1.70
2. Industrial Processes	**811.23**	**NA,NE,NO**	**NA,NE,NO**	**19.33**	**NA,NO**	**0.00**	**830.56**
A. Mineral Products	811.23	NA,NE	NA,NE				811.23
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 (2)				19.33	NA,NO	0.00	19.33
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**296.69**	**446.88**				**743.58**
A. Enteric Fermentation		176.13					176.13
B. Manure Management		118.48	157.15				275.63
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils(3)		NA,NE	288.15				288.15
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		2.08	1.59				3.67
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry(1)	**-154.59**	**0.45**	**3.84**				**-150.30**
A. Forest Land	-160.56	0.45	3.84				-156.27
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	5.97	NE					5.97
6. Waste	**NA,NE,NO**	**618.35**	**20.78**				**639.13**
A. Solid Waste Disposal on Land	NA,NE,NO	600.37					600.37
B. Waste-water Handling		17.98	20.78				38.76
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other *(as specified in Summary 1.A)*	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: (4)							
International Bunkers	1,447.86	0.96	8.89				1,457.71
Aviation	845.89	0.13	7.41				853.42
Marine	601.97	0.84	1.48				604.29
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**12.92**						**12.92**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	8,573.82
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	8,423.51

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2001
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [1]	CH_4	N_2O	HFCs [2]	PFCs [2]	SF_6 [2]	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) [1]	**6,868.13**	**932.42**	**529.06**	**18.40**	**NA,NO**	**0.00**	**8,348.01**
1. Energy	**6,215.97**	**12.33**	**15.90**				**6,244.19**
A. Fuel Combustion (Sectoral Approach)	6,215.97	10.65	15.90				6,242.51
1. Energy Industries	2,840.98	2.35	6.92				2,850.24
2. Manufacturing Industries and Construction	1,341.00	1.31	3.52				1,345.83
3. Transport	1,801.03	5.74	4.69				1,811.45
4. Other Sectors	232.97	0.75	0.67				234.39
5. Other	NA,NO	0.50	0.10				0.60
B. Fugitive Emissions from Fuels	NA,NE,NO	1.68	NA,NE,NO				1.68
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	1.68	NA,NE,NO				1.68
2. Industrial Processes	**783.63**	**NA,NE,NO**	**NA,NE,NO**	**18.40**	**NA,NO**	**0.00**	**802.04**
A. Mineral Products	783.63	NA,NE	NA,NE				783.63
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 [2]				18.40	NA,NO	0.00	18.40
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**323.64**	**483.96**				**807.60**
A. Enteric Fermentation		191.64					191.64
B. Manure Management		128.05	171.32				299.37
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils [3]		NA,NE	310.64				310.64
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		3.94	2.01				5.95
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry [1]	**-131.47**	**0.95**	**8.17**				**-122.35**
A. Forest Land	-136.79	0.95	8.17				-127.67
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	5.31	NE					5.31
6. Waste	**NA,NE,NO**	**595.51**	**21.03**				**616.54**
A. Solid Waste Disposal on Land	NA,NE,NO	576.95					576.95
B. Waste-water Handling		18.55	21.03				39.58
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other ***(as specified in Summary 1.A)***	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: [4]							
International Bunkers	1,589.68	0.98	10.15				1,600.80
Aviation	991.08	0.15	8.68				999.91
Marine	598.60	0.83	1.47				600.90
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**16.28**						**16.28**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	8,470.36
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	8,348.01

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2002
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 (1)	CH_4	N_2O	HFCs (2)	PFCs (2)	SF_6 (2)	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) (1)	**7,017.33**	**964.03**	**548.38**	**18.70**	**NA,NO**	**0.00**	**8,548.44**
1. Energy	**6,379.77**	**12.50**	**16.30**				**6,408.56**
A. Fuel Combustion (Sectoral Approach)	6,379.77	10.92	16.30				6,406.98
1. Energy Industries	3,002.08	2.48	7.32				3,011.88
2. Manufacturing Industries and Construction	1,335.27	1.30	3.50				1,340.08
3. Transport	1,784.21	5.84	4.65				1,794.70
4. Other Sectors	258.21	0.83	0.73				259.77
5. Other	NA,NO	0.47	0.09				0.56
B. Fugitive Emissions from Fuels	NA,NE,NO	1.58	NA,NE,NO				1.58
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	1.58	NA,NE,NO				1.58
2. Industrial Processes	**812.18**	**NA,NE,NO**	**NA,NE,NO**	**18.70**	**NA,NO**	**0.00**	**830.88**
A. Mineral Products	812.18	NA,NE	NA,NE				812.18
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 (2)				18.70	NA,NO	0.00	18.70
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**345.23**	**510.71**				**855.94**
A. Enteric Fermentation		202.76					202.76
B. Manure Management		138.52	180.54				319.06
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils (3)		NA,NE	328.25				328.25
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		3.95	1.92				5.87
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry (1)	**-174.61**	**0.06**	**0.51**				**-174.04**
A. Forest Land	-178.39	0.06	0.51				-177.81
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	3.77	NE					3.77
6. Waste	**NA,NE,NO**	**606.24**	**20.86**				**627.10**
A. Solid Waste Disposal on Land	NA,NE,NO	587.08					587.08
B. Waste-water Handling		19.16	20.86				40.02
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other *(as specified in Summary 1.A)*	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: (4)							
International Bunkers	1,384.19	0.74	9.41				1,394.33
Aviation	953.20	0.14	8.35				961.69
Marine	430.98	0.60	1.06				432.64
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**17.80**						**17.80**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	8,722.48
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	8,548.44

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2003
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 (1)	CH_4	N_2O	HFCs (2)	PFCs (2)	SF_6 (2)	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) (1)	**7,418.53**	**960.98**	**538.03**	**19.08**	**NA,NO**	**0.00**	**8,936.62**
1. Energy	**6,762.63**	**13.13**	**17.42**				**6,793.18**
A. Fuel Combustion (Sectoral Approach)	6,762.63	11.72	17.42				6,791.77
1. Energy Industries	3,228.56	2.67	7.87				3,239.10
2. Manufacturing Industries and Construction	1,374.30	1.42	3.77				1,379.49
3. Transport	1,889.75	6.34	4.93				1,901.02
4. Other Sectors	270.02	0.87	0.77				271.66
5. Other	NA,NO	0.42	0.08				0.51
B. Fugitive Emissions from Fuels	NA,NE,NO	1.41	NA,NE,NO				1.41
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	1.41	NA,NE,NO				1.41
2. Industrial Processes	**821.29**	**NA,NE,NO**	**NA,NE,NO**	**19.08**	**NA,NO**	**0.00**	**840.37**
A. Mineral Products	821.29	NA,NE	NA,NE				821.29
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 (2)				19.08	NA,NO	0.00	19.08
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**330.54**	**497.60**				**828.14**
A. Enteric Fermentation		189.63					189.63
B. Manure Management		136.98	167.83				304.81
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils(3)		NA,NE	327.20				327.20
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		3.93	2.57				6.50
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry(1)	**-165.39**	**0.27**	**2.31**				**-162.81**
A. Forest Land	-168.34	0.27	2.31				-165.76
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	2.95	NE					2.95
6. Waste	**NA,NE,NO**	**617.04**	**20.69**				**637.73**
A. Solid Waste Disposal on Land	NA,NE,NO	598.24					598.24
B. Waste-water Handling		18.80	20.69				39.50
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other ***(as specified in Summary 1.A)***	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: (4)							
International Bunkers	1,407.67	0.69	9.89				1,418.25
Aviation	1,019.49	0.15	8.93				1,028.57
Marine	388.19	0.54	0.96				389.68
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**30.17**						**30.17**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	9,099.43
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	8,936.62

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2004
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs [(2)]	PFCs [(2)]	SF_6 [(2)]	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) [(1)]	**7,631.59**	**978.08**	**513.69**	**19.64**	**NA,NO**	**0.00**	**9,143.00**
1. Energy	**6,921.28**	**12.63**	**17.75**				**6,951.66**
A. Fuel Combustion (Sectoral Approach)	6,921.28	12.22	17.75				6,951.26
1. Energy Industries	3,283.72	2.71	7.99				3,294.41
2. Manufacturing Industries and Construction	1,404.25	1.43	3.79				1,409.47
3. Transport	1,991.49	6.92	5.20				2,003.61
4. Other Sectors	241.83	0.78	0.69				243.30
5. Other	NA,NO	0.38	0.08				0.46
B. Fugitive Emissions from Fuels	NA,NE,NO	0.40	NA,NE,NO				0.40
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	0.40	NA,NE,NO				0.40
2. Industrial Processes	**883.54**	**NA,NE,NO**	**NA,NE,NO**	**19.64**	**NA,NO**	**0.00**	**903.18**
A. Mineral Products	883.54	NA,NE	NA,NE				883.54
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 [(2)]				19.64	NA,NO	0.00	19.64
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**328.57**	**473.98**				**802.55**
A. Enteric Fermentation		192.96					192.96
B. Manure Management		133.10	164.29				297.39
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils[(3)]		NA,NE	307.74				307.74
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		2.51	1.95				4.46
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry[(1)]	**-173.22**	**0.12**	**1.00**				**-172.10**
A. Forest Land	-175.54	0.12	1.00				-174.42
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	2.32	NE					2.32
6. Waste	**NA,NE,NO**	**636.77**	**20.95**				**657.72**
A. Solid Waste Disposal on Land	NA,NE,NO	615.70					615.70
B. Waste-water Handling		21.07	20.95				42.02
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other ***(as specified in Summary 1.A)***	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: [(4)]							
International Bunkers	1,102.93	0.38	8.58				1,111.89
Aviation	931.11	0.14	8.16				939.40
Marine	171.82	0.24	0.43				172.48
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**20.40**						**20.40**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	9,315.10
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	9,143.00

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2005
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs [(2)]	PFCs [(2)]	SF_6 [(2)]	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) [(1)]	**7,681.90**	**959.90**	**472.94**	**22.18**	**NA,NO**	**0.00**	**9,136.91**
1. Energy	**6,963.85**	**13.16**	**17.81**				**6,994.82**
A. Fuel Combustion (Sectoral Approach)	6,963.85	13.16	17.81				6,994.82
1. Energy Industries	3,471.84	2.86	8.43				3,483.13
2. Manufacturing Industries and Construction	904.40	0.99	2.51				907.89
3. Transport	2,030.62	7.28	5.31				2,043.20
4. Other Sectors	556.99	1.68	1.49				560.15
5. Other	NA,NO	0.37	0.07				0.44
B. Fugitive Emissions from Fuels	NA,NE,NO	NA,NE,NO	NA,NO				NA,NE,NO
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	NA,NE,NO	NA,NO				NA,NE,NO
2. Industrial Processes	**893.02**	**NA,NE,NO**	**NA,NE,NO**	**22.18**	**NA,NO**	**0.00**	**915.20**
A. Mineral Products	893.02	NA,NE	NA,NE				893.02
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 [(2)]				22.18	NA,NO	0.00	22.18
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**304.96**	**433.19**				**738.15**
A. Enteric Fermentation		180.47					180.47
B. Manure Management		123.04	152.62				275.66
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils[(3)]		NA,NE	279.68				279.68
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		1.45	0.89				2.33
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry[(1)]	**-174.98**	**0.08**	**0.71**				**-174.19**
A. Forest Land	-177.29	0.08	0.71				-176.50
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	2.31	NE					2.31
6. Waste	**NA,NE,NO**	**641.70**	**21.24**				**662.93**
A. Solid Waste Disposal on Land	NA,NE,NO	621.29					621.29
B. Waste-water Handling		20.40	21.24				41.64
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other ***(as specified in Summary 1.A)***	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: [(4)]							
International Bunkers	1,826.89	1.39	10.27				1,838.56
Aviation	918.48	0.14	8.04				926.67
Marine	908.40	1.26	2.23				911.89
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**10.29**						**10.29**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	9,311.10
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	9,136.91

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2006
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 [(1)]	CH_4	N_2O	HFCs [(2)]	PFCs [(2)]	SF_6 [(2)]	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) [(1)]	**7,958.48**	**957.28**	**452.23**	**23.92**	**NA,NO**	**0.00**	**9,391.92**
1. Energy	**7,224.33**	**13.94**	**18.23**				**7,256.50**
A. Fuel Combustion (Sectoral Approach)	7,224.33	13.94	18.23				7,256.50
1. Energy Industries	3,653.38	2.92	8.61				3,664.91
2. Manufacturing Industries and Construction	861.93	0.95	2.41				865.28
3. Transport	2,019.01	7.55	5.29				2,031.85
4. Other Sectors	677.30	2.49	1.88				681.68
5. Other	12.71	0.04	0.03				12.78
B. Fugitive Emissions from Fuels	NA,NE,NO	NA,NE,NO	NA,NO				NA,NE,NO
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	NA,NE,NO	NA,NO				NA,NE,NO
2. Industrial Processes	**902.67**	**NA,NE,NO**	**NA,NE,NO**	**23.92**	**NA,NO**	**0.00**	**926.59**
A. Mineral Products	902.67	NA,NE	NA,NE				902.67
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 [(2)]				23.92	NA,NO	0.00	23.92
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**301.00**	**411.09**				**712.09**
A. Enteric Fermentation		173.56					173.56
B. Manure Management		125.60	139.35				264.94
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils[(3)]		NA,NE	270.84				270.84
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		1.85	0.91				2.76
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry[(1)]	**-168.52**	**0.22**	**1.93**				**-166.36**
A. Forest Land	-170.21	0.22	1.93				-168.05
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	1.69	NE					1.69
6. Waste	**NA,NE,NO**	**642.12**	**20.97**				**663.09**
A. Solid Waste Disposal on Land	NA,NE,NO	618.69					618.69
B. Waste-water Handling		23.42	20.97				44.40
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other ***(as specified in Summary 1.A)***	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: [(4)]							
International Bunkers	1,871.47	1.43	10.58				1,883.47
Aviation	946.89	0.14	8.29				955.33
Marine	924.57	1.29	2.28				928.14
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**14.79**						**14.79**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	9,558.28
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	9,391.92

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2007
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 (1)	CH_4	N_2O	HFCs (2)	PFCs (2)	SF_6 (2)	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) (1)	**8,254.18**	**956.37**	**465.59**	**25.62**	**NA,NO**	**0.00**	**9,701.77**
1. Energy	**7,479.20**	**14.86**	**19.01**				**7,513.06**
A. Fuel Combustion (Sectoral Approach)	7,479.20	14.86	19.01				7,513.06
1. Energy Industries	3,801.67	3.04	8.97				3,813.67
2. Manufacturing Industries and Construction	854.18	0.97	2.47				857.62
3. Transport	2,155.80	8.16	5.66				2,169.63
4. Other Sectors	648.48	2.63	1.86				652.97
5. Other	19.06	0.05	0.05				19.17
B. Fugitive Emissions from Fuels	NA,NE,NO	NA,NE,NO	NA,NO				NA,NE,NO
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	NA,NE,NO	NA,NO				NA,NE,NO
2. Industrial Processes	**892.89**	**NA,NE,NO**	**NA,NE,NO**	**25.62**	**NA,NO**	**0.00**	**918.51**
A. Mineral Products	892.89	NA,NE	NA,NE				892.89
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 (2)				25.62	NA,NO	0.00	25.62
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**302.46**	**414.72**				**717.17**
A. Enteric Fermentation		176.31					176.31
B. Manure Management		125.32	147.57				272.90
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils (3)		NA,NE	266.61				266.61
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		0.82	0.54				1.36
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry (1)	**-117.91**	**1.21**	**10.39**				**-106.31**
A. Forest Land	-121.10	1.21	10.39				-109.50
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	3.19	NE					3.19
6. Waste	**NA,NE,NO**	**637.86**	**21.48**				**659.34**
A. Solid Waste Disposal on Land	NA,NE,NO	615.12					615.12
B. Waste-water Handling		22.74	21.48				44.22
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other *(as specified in Summary 1.A)*	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: (4)							
International Bunkers	1,765.59	1.33	10.06				1,776.98
Aviation	905.86	0.13	7.93				913.93
Marine	859.73	1.20	2.12				863.06
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**22.47**						**22.47**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	9,808.08
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	9,701.77

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

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 (2)	PFCs (2)	SF_6 (2)	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) (1)	**8,456.12**	**965.78**	**444.47**	**26.29**	**NA,NO**	**0.00**	**9,892.67**
1. Energy	**7,735.62**	**15.66**	**19.89**				**7,771.17**
A. Fuel Combustion (Sectoral Approach)	7,735.62	15.66	19.89				7,771.17
1. Energy Industries	3,967.29	3.19	9.40				3,979.88
2. Manufacturing Industries and Construction	879.99	1.03	2.61				883.63
3. Transport	2,245.77	8.65	6.01				2,260.43
4. Other Sectors	601.26	2.67	1.77				605.70
5. Other	41.30	0.12	0.10				41.53
B. Fugitive Emissions from Fuels	NA,NE,NO	NA,NE,NO	NA,NO				NA,NE,NO
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	NA,NE,NO	NA,NO				NA,NE,NO
2. Industrial Processes	**894.32**	**NA,NE,NO**	**NA,NE,NO**	**26.29**	**NA,NO**	**0.00**	**920.60**
A. Mineral Products	894.32	NA,NE	NA,NE				894.32
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 (2)				26.29	NA,NO	0.00	26.29
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**306.19**	**401.63**				**707.82**
A. Enteric Fermentation		177.47					177.47
B. Manure Management		128.55	144.95				273.50
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils(3)		NA,NE	256.45				256.45
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		0.17	0.23				0.40
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry(1)	**-173.81**	**0.10**	**0.88**				**-172.82**
A. Forest Land	-176.21	0.10	0.88				-175.22
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	2.40	NE					2.40
6. Waste	**NA,NE,NO**	**643.83**	**22.07**				**665.90**
A. Solid Waste Disposal on Land	NA,NE,NO	621.03					621.03
B. Waste-water Handling		22.80	22.07				44.87
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other *(as specified in Summary 1.A)*	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: (4)							
International Bunkers	1,693.13	1.23	9.86				1,704.22
Aviation	902.70	0.13	7.91				910.74
Marine	790.43	1.10	1.95				793.48
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**82.18**						**82.18**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	10,065.49
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	9,892.67

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2009
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 (1)	CH_4	N_2O	HFCs (2)	PFCs (2)	SF_6 (2)	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) (1)	**8,176.60**	**975.85**	**436.17**	**40.35**	**NA,NO**	**0.00**	**9,628.96**
1. Energy	**7,629.52**	**16.04**	**19.74**				**7,665.30**
A. Fuel Combustion (Sectoral Approach)	7,629.52	16.04	19.74				7,665.30
1. Energy Industries	3,992.47	3.24	9.55				4,005.26
2. Manufacturing Industries and Construction	740.64	0.87	2.21				743.72
3. Transport	2,251.09	8.81	6.03				2,265.93
4. Other Sectors	629.44	3.08	1.91				634.43
5. Other	15.89	0.05	0.04				15.97
B. Fugitive Emissions from Fuels	NA,NE,NO	NA,NE,NO	NA,NO				NA,NE,NO
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	NA,NE,NO	NA,NO				NA,NE,NO
2. Industrial Processes	**722.24**	**NA,NE,NO**	**NA,NE,NO**	**40.35**	**NA,NO**	**0.00**	**762.59**
A. Mineral Products	722.24	NA,NE	NA,NE				722.24
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 (2)				40.35	NA,NO	0.00	40.35
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**305.05**	**393.20**				**698.25**
A. Enteric Fermentation		177.02					177.02
B. Manure Management		127.57	141.21				268.78
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils(3)		NA,NE	251.68				251.68
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		0.46	0.31				0.77
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry(1)	**-175.17**	**0.07**	**0.57**				**-174.53**
A. Forest Land	-178.08	0.07	0.57				-177.44
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	2.92	NE					2.92
6. Waste	**NA,NE,NO**	**654.70**	**22.66**				**677.36**
A. Solid Waste Disposal on Land	NA,NE,NO	630.59					630.59
B. Waste-water Handling		24.11	22.66				46.77
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other ***(as specified in Summary 1.A)***	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: (4)							
International Bunkers	1,517.78	1.07	9.01				1,527.86
Aviation	836.42	0.12	7.33				843.87
Marine	681.36	0.95	1.68				683.99
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**92.82**						**92.82**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	9,803.49
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	9,628.96

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

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 [2]	PFCs [2]	SF_6 [2]	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) [1]	**7,823.74**	**945.45**	**452.43**	**56.40**	**NA,NO**	**0.00**	**9,278.02**
1. Energy	**7,406.01**	**15.36**	**19.18**				**7,440.55**
A. Fuel Combustion (Sectoral Approach)	7,406.01	15.36	19.18				7,440.55
1. Energy Industries	3,868.00	3.12	9.22				3,880.34
2. Manufacturing Industries and Construction	648.26	0.86	2.11				651.23
3. Transport	2,298.02	8.98	6.15				2,313.15
4. Other Sectors	575.84	2.35	1.66				579.85
5. Other	15.89	0.05	0.04				15.97
B. Fugitive Emissions from Fuels	NA,NE,NO	NA,NE,NO	NA,NO				NA,NE,NO
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	NA,NE,NO	NA,NO				NA,NE,NO
2. Industrial Processes	**585.55**	**NA,NE,NO**	**NA,NE,NO**	**56.40**	**NA,NO**	**0.00**	**641.94**
A. Mineral Products	585.55	NA,NE	NA,NE				585.55
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 [2]				56.40	NA,NO	0.00	56.40
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**314.19**	**407.96**				**722.14**
A. Enteric Fermentation		185.57					185.57
B. Manure Management		128.13	148.59				276.72
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils [3]		NA,NE	259.05				259.05
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		0.49	0.32				0.80
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry [1]	**-167.82**	**0.24**	**2.05**				**-165.53**
A. Forest Land	-169.40	0.24	2.05				-167.11
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	1.58	NE					1.58
6. Waste	**NA,NE,NO**	**615.67**	**23.24**				**638.91**
A. Solid Waste Disposal on Land	NA,NE,NO	590.48					590.48
B. Waste-water Handling		25.19	23.24				48.43
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other *(as specified in Summary 1.A)*	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: [4]							
International Bunkers	1,433.08	0.93	8.89				1,442.91
Aviation	852.20	0.13	7.46				859.79
Marine	580.88	0.81	1.43				583.12
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**92.40**						**92.40**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	9,443.54
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	9,278.02

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

SUMMARY 2 SUMMARY REPORT FOR CO_2 EQUIVALENT EMISSIONS
(Sheet 1 of 1)

Inventory 2011
Submission 2013 v1.2
CYPRUS

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	CO_2 (1)	CH_4	N_2O	HFCs (2)	PFCs (2)	SF_6 (2)	Total
	CO_2 equivalent (Gg)						
Total (Net Emissions) (1)	**7,579.44**	**899.26**	**472.58**	**126.63**	**NA,NO**	**0.00**	**9,077.90**
1. Energy	**7,101.95**	**16.54**	**18.53**				**7,137.02**
A. Fuel Combustion (Sectoral Approach)	7,101.95	16.54	18.53				7,137.02
1. Energy Industries	3,710.04	3.02	8.90				3,721.96
2. Manufacturing Industries and Construction	509.33	0.57	1.48				511.37
3. Transport	2,234.99	8.82	6.00				2,249.81
4. Other Sectors	628.53	4.03	2.10				634.65
5. Other	19.06	0.11	0.06				19.23
B. Fugitive Emissions from Fuels	NA,NE,NO	NA,NE,NO	NA,NO				NA,NE,NO
1. Solid Fuels	NA,NO	NA,NO	NA,NO				NA,NO
2. Oil and Natural Gas	NA,NE,NO	NA,NE,NO	NA,NO				NA,NE,NO
2. Industrial Processes	**570.34**	**NA,NE,NO**	**NA,NE,NO**	**126.63**	**NA,NO**	**0.00**	**696.98**
A. Mineral Products	570.34	NA,NE	NA,NE				570.34
B. Chemical Industry	NO	NO	NO	NA	NA	NA	NA,NO
C. Metal Production	NA,NO	NA,NO	NA	NA,NO	NA,NO	NA,NO	NA,NO
D. Other Production	NE						NE
E. Production of Halocarbons and SF_6				NA,NO	NA	NA	NA,NO
F. Consumption of Halocarbons and SF_6 (2)				126.63	NA,NO	0.00	126.63
G. Other	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	**NE**		**NE**				**NE**
4. Agriculture		**314.42**	**415.52**				**729.94**
A. Enteric Fermentation		190.47					190.47
B. Manure Management		123.42	149.74				273.16
C. Rice Cultivation		NA,NO					NA,NO
D. Agricultural Soils(3)		NA,NE	265.29				265.29
E. Prescribed Burning of Savannas		NA	NA				NA
F. Field Burning of Agricultural Residues		0.53	0.48				1.01
G. Other		NA	NA				NA
5. Land Use, Land-Use Change and Forestry(1)	**-92.85**	**1.70**	**14.68**				**-76.47**
A. Forest Land	-94.32	1.70	14.68				-77.94
B. Cropland	NA						NA
C. Grassland							
D. Wetlands							
E. Settlements							
F. Other Land							
G. Other	1.47	NE					1.47
6. Waste	**NA,NE,NO**	**566.59**	**23.85**				**590.44**
A. Solid Waste Disposal on Land	NA,NE,NO	541.32					541.32
B. Waste-water Handling		25.27	23.85				49.12
C. Waste Incineration	NA	NA	NA				NA
D. Other	NA	NA	NA				NA
7. Other ***(as specified in Summary 1.A)***	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

Memo Items: (4)							
International Bunkers	1,546.27	1.00	9.65				1,556.91
Aviation	927.95	0.14	8.13				936.22
Marine	618.31	0.86	1.52				620.70
Multilateral Operations	**NO**	**NO**	**NO**				**NO**
CO_2 Emissions from Biomass	**97.58**						**97.58**

Total CO_2 Equivalent Emissions without Land Use, Land-Use Change and Forestry	9,154.37
Total CO_2 Equivalent Emissions with Land Use, Land-Use Change and Forestry	9,077.90

(1) For CO_2 from Land Use, Land-use Change and Forestry the net emissions/removals are to be reported. For the purposes of reporting, the signs for removals are always negative (-) and for emissions positive (+).

(2) Actual emissions should be included in the national totals. If no actual emissions were reported, potential emissions should be included.

(3) Parties which previously reported CO_2 from soils in the Agriculture sector should note this in the NIR.

(4) See footnote 8 to table Summary 1.A.

Annex IV. CO_2 reference approach and comparison with sectoral approach, and relevant information on the national energy balance

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 [IV1]

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

Apparent consumption = Imports - Exports - International bunkers + Stock change [IV2]

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

All data except solid biomass was available in kt. The values were multiplied by the net calorific values listed in Table IV1 to provide the energy consumed in TJ.

Step 3: Estimation of carbon content

Total carbon included in each fuel is calculated by multiplying energy consumption by an emission factor (Table IV1) 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 revised IPCC 1996 guidelines. The exception is the *tires*, for which the data is according to the ETS report of the cement installation that consumes tires.

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 of1%, 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.

Table IV1 Conversion factor (TJ/kt) and carbon emission factors of fuels consumed in Cyprus used for the reference approach (all except other bit. coal and tyres based on revised IPCC1996 guidelines)

	Conversion factor (TJ/kt)	Carbon emission factor (tC/TJ)
Gasoline	44.8	18.9
Jet kerosene	44.59	19.5
Other kerosene	44.75	19.6
Gas/ diesel oil	43.33	20.2
RFO	40.19	21.1
LPG	47.31	17.2
Petroleum coke	31	27.5
Other oil	40.19	20
Refinery gas	48.15	18.2
Other bituminous coal	29.824*	25.8
Liquid biomass	0.04**	20
Solid biomass	1	29.9
Tires	1	23.18*

*according to data reported in ETS annual reports

** data available in toe: 0.86 toe/t (Eurostat) x 41.868 TJ/ktoe /1000

The data used in the reference and the sectoral approach in the current inventory is presented in Table IV2, in comparison to the Statistical Differences of the energy balance.

As is can be seen from the table, there are issues that have to be resolved for Tyres, solid biomass, liquid biomass (only for 2011), RFO and diesel for 2005. There is also a difference for other bituminous coal and Pet-coke, which most possibly is due to the difference of the calorific values used in the two methods.

All the above need further investigation to improve the estimations and minimise the difference that exists.

Table IV2. Activity data used in reference and sectoral approach in TJ, 1990 - 2011

(a) 1990-2000

		1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Gasoline												
REFERENCE APPROACH												
Apparent consumption	kt	41	49	70	75	59	77	94	53	49	54	59
Fuel Consumption	TJ	1837	2195	3136	3360	2643	3450	4211	2374	2195	2419	2643
SECTORAL APPROACH												
1AA3.b.	TJ	7302	7616	7706	7571	8064	8198	8333	8557	8736	9094	9229
difference												
Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	0	0	0	0	1	-4	3	3	-4	-1	6
Compared to app. Consumption	%											
Jet kerosene												
REFERENCE APPROACH												
International bunkers	kt	236	280	272	231	237	260	249	245	258	264	268
	TJ	10523	12485	12128	10300	10568	11593	11103	10925	11504	11772	11950
Apparent consumption	kt	43	-27	-23	11	172	26	40	2	6	-4	-4
Fuel Consumption	TJ	1917	-1204	-1026	490	7669	1159	1784	89	268	-178	-178
SECTORAL APPROACH												
1C1A.	TJ	10523	12485	12128	10300	10568	11593	11103	10925	11504	11772	11950
difference - bunkers												
difference												
Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	62	0	0	41	206	42	43	7	10	7	14
Compared to app. Consumption	%											
Other kerosene												
REFERENCE APPROACH												
Apparent consumption	kt	0	0	3	0	2	3	0	0	-2	0	5

Fuel Consumption	TJ	0	0	134	0	90	134	0	0	-90	0	224
SECTORAL APPROACH												
1AA4.b.	TJ	537	537	761	716	761	761	806	895	940	895	1074
difference												
Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	0	0	0	-2	0	0	0	0	0	0	0
Compared to app. Consumption	%											
Gas/ diesel oil												
REFERENCE APPROACH												
International bunkers	kt	24	20	21	14	12	15	25	27	35	46	50
	TJ	1040	867	910	607	520	650	1083	1170	1517	1993	2167
Apparent consumption	kt	94	12	161	154	73	137	200	119	140	89	145
Fuel Consumption	TJ	4073	520	6976	6673	3163	5936	8666	5156	6066	3856	6283
SECTORAL APPROACH												
1C1B.	TJ	1040	867	910	607	520	650	1083	1170	1517	1993	2167
difference - bunkers												
1AA1A	TJ	0	0	456	151	85	356	257	249	502	908	809
1AA2.f.4.	TJ	4246	4723	5720	5936	6110	6629	6976	7323	7799	8016	8276
1AA3.b.	TJ	9099	8753	10659	11049	11309	12349	12912	13606	14472	14732	15166
1AA4.a.	TJ	0	0	0	0	0	0	0	0	0	0	0
1AA4.b.	TJ	0	0	0	0	0	0	0	0	0	0	0
1AA4.c.	TJ	0	0	0	0	0	0	0	0	0	0	0
1AA45.a.	TJ	0	0	0	0	0	0	0	0	0	0	0
TOTAL	TJ	13346	13476	16835	17136	17504	19334	20145	21178	22773	23656	24250
difference												
Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	16	-21	24	12	-7	-9	-7	-5	-4	-46	-9
Compared to app. Consumption	%											
RFO												
REFERENCE APPROACH												
International bunkers	kt	34	36	38	36	50	54	65	71	63	108	143

	TJ	1366	1447	1527	1447	2010	2170	2612	2853	2532	4341	5747
Apparent consumption	kt	426	462	512	497	548	422	564	402	462	419	505
Fuel Consumption	TJ	17121	18568	20577	19974	22024	16960	22667	16156	18568	16840	20296
SECTORAL APPROACH												
1C1B.	TJ	1366	1447	1527	1447	2010	2170	2612	2853	2532	4341	5747
difference - bunkers												
1AA1A	TJ	21856	22669	26073	28100	29380	26743	28413	30046	32799	34627	36421
1AA1B	TJ	442	482	522	522	563	683	643	563	603	643	643
1AA2.f.3. (ETS)	TJ	1487	4984	4742	4019	4421	3898	4461	2813	2733	2733	2813
1AA2.f.4. (non-ETS)	TJ	0	0	0	0	0	0	0	0	0	0	0
1AA2.f.4. (ETS)	TJ											
1AA4.a.	TJ	0	0	0	0	0	0	0	0	0	0	0
TOTAL	TJ	23785	28134	31338	32641	34363	31325	33517	33422	36135	38003	39878
difference												
Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	0	0	0	0	13	-37	50	-4	10	-26	8
Compared to app. Consumption	%											
LPG												
REFERENCE APPROACH												
Apparent consumption	kt	24	20	27	24	15	21	23	17	20	10	14
Fuel Consumption	TJ	1135	946	1277	1135	710	994	1088	804	946	473	662
SECTORAL APPROACH												
1AA4.b.	TJ	2318	2318	2602	2413	2366	2413	2413	2460	2366	2318	2507
difference												
-												
Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	0	0	0	0	-3	-3	-2	-3	0	-5	-9
Compared to app. Consumption	%											
-												
Petroleum coke												
REFERENCE APPROACH												
International bunkers	kt	34	36	38	36	50	54	65	71	63	108	143
Apparent consumption	kt	NA	93	63	114	112	125	147	152	150	154	141

Fuel Consumption	TJ	NA	2883	1953	3534	3472	3875	4557	4712	4650	4774	4371
<u>SECTORAL APPROACH</u>												
1AA2.f.3.	TJ	2647	2883	2635	3534	3472	3875	4557	4712	4650	4774	4371
difference												
-												
Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	0	0	-22	0	0	0	0	0	0	0	0
Compared to app. Consumption	%											
Other oil												
<u>REFERENCE APPROACH</u>												
Apparent consumption	kt	35	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Fuel Consumption	TJ	1407	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
<u>SECTORAL APPROACH</u>												
1AA1B	TJ	0	0	0	0	0	0	0	0	0	0	0
1AA2.f.4.	TJ	1608	201	0	0	0	0	0	40	0	0	0
TOTAL		1608	201	0	0	0	0	0	40	0	0	0
difference												
Refinery gas												
<u>REFERENCE</u>												
Apparent consumption	kt	18	17	17	13	24	13	12	16	16	20	19
Fuel Consumption	TJ	867	819	819	626	1156	626	578	770	770	963	915
<u>SECTORAL APPROACH</u>												
1AA1B	TJ	867	819	819	626	1156	626	578	770	770	963	915
difference												
Other bituminous coal												
<u>REFERENCE APPROACH</u>												
Apparent consumption	kt	97	97	26	31	97	97	97	97	26	30	49
Fuel Consumption	TJ	2893	2893	775	925	2893	2893	2893	2893	775	895	1461
<u>SECTORAL APPROACH</u>												
1AA2.f.3. (ETS)	TJ	2893	2893	775	925	2893	2893	2893	2893	775	895	1461
difference												
-												

Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	0	0	0	0	0	0	0	0	0	0	0
Compared to app. Consumption	%											
Liquid biomass												
<u>REFERENCE APPROACH</u>												
Apparent consumption	kt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fuel Consumption	TJ	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
<u>SECTORAL APPROACH</u>												
1AA3.b.	TJ											
difference												
Solid biomass												
<u>REFERENCE APPROACH</u>												
Apparent consumption	TJ	257	232	230	229	490	479	464	358	378	369	367
Fuel Consumption	TJ	257	232	230	229	490	479	464	358	378	369	367
<u>SECTORAL APPROACH</u>												
1AA2.f.3. (ETS)	TJ	0	0	0	0	0	0	0	0	0	0	41
1AA4.a.	TJ	0	0	0	0	0	0	0	0	0	0	0
1AA4.b.	TJ	0	0	0	0	0	0	0	0	0	0	0
1AA5.a.	TJ											
TOTAL		0	0	0	0	0	0	0	0	0	0	41
difference												
Tires												
Apparent consumption	TJ	0	0	0	0	0	0	0	0	0	0	0
Fuel Consumption	TJ	0	0	0	0	0	0	0	0	0	0	0
1AA2.f.3. (ETS)	TJ	0	0	0	0	0	0	0	0	0	0	0
difference												

(b) 2001 - 2011

		2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Gasoline												
REFERENCE APPROACH												
Apparent consumption	kt	84	75	115	245	327	306	345	381	378	393	376
Fuel Consumption	TJ	3763	3360	5152	10976	14650	13709	15456	17069	16934	17606	16845
SECTORAL APPROACH												
1AA3.b.	TJ	9811	10214	11290	12634	13574	14470	15770	16710	17158	17472	17248
difference						*7%*	*-6%*	*-2%*	*2%*	*-1%*	*1%*	*-2%*
Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	15	0	9	3	24	-17	-7	8	-5	3	-9
Compared to app. Consumption	%					7%	-6%	-2%	2%	-1%	1%	-2%
Jet kerosene												
REFERENCE APPROACH												
International bunkers	kt	314	302	323	295	291	300	287	286	265	270	294
	TJ	14001	13466	14403	13154	12976	13377	12797	12753	11816	12039	13109
Apparent consumption	kt	10	-8	-3	2	11	3	-2	-3	20	-1	-5
Fuel Consumption	TJ	446	-357	-134	89	490	134	-89	-134	892	-45	-223
SECTORAL APPROACH												
1C1A.	TJ	14001	13466	14403	13154	12976	13377	12797	12753	11816	12039	13109
difference - bunkers						*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*
difference						*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*
Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	23	-1	-3	2	11	3	-2	-3	19	-2	-7
Compared to app. Consumption	%					100%	100%	100%	100%	95%	200%	140%
Other kerosene												
REFERENCE APPROACH												
Apparent consumption	kt	0	2	-5	3	14	10	14	16	19	8	15
Fuel Consumption	TJ	0	90	-224	134	627	448	627	716	850	358	671
SECTORAL APPROACH												

1AA4.b.	TJ	1074	1387	1387	1074	716	716	716	627	850	627	716
difference						*-14%*	*-60%*	*-14%*	*13%*	*0%*	*-75%*	*-7%*
Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	0	0	2	-10	-2	-6	-2	2	0	-6	-1
Compared to app. Consumption	%					-14%	-60%	-14%	13%	0%	-75%	-7%
Gas/ diesel oil												
REFERENCE APPROACH												
International bunkers	kt	47	33	36	27	67	106	104	88	73	53	58
	TJ	2037	1430	1560	1170	2903	4593	4506	3813	3163	2296	2513
Apparent consumption	kt	149	164	214	469	519	477	521	525	547	604	581
Fuel Consumption	TJ	6456	7106	9273	20322	22488	20668	22575	22748	23702	26171	25175
SECTORAL APPROACH												
1C1B.	TJ	2037	1430	1560	1170	2903	4593	4506	3813	3163	2296	2513
difference - bunkers						*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*
1AA1A	TJ	160	69	220	365	699	294	686	975	3921	6763	4770
1AA2.f.4.	TJ	8363	8016	8233	7409	936	937	1271	1238	1037	838	693
1AA3.b.	TJ	15382	14776	15209	15339	14992	13996	14646	14992	14646	14992	14342
1AA4.a.	TJ	0	0	0	0	0	823	780	867	823	997	867
1AA4.b.	TJ	0	0	0	0	3596	4246	3856	3380	3596	3033	3466
1AA4.c.	TJ	0	0	0	0	1170	1213	1213	1127	1040	997	1083
1AA45.a.	TJ	0	0	0	0	0	173	260	563	217	217	260
TOTAL	TJ	23905	22860	23661	23114	21393	21683	22712	23142	25280	27836	25482
difference						*5%*	*-5%*	*-1%*	*-2%*	*-7%*	*-6%*	*-1%*
Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	-13	-2	-5	24	0	-26	6	17	-15	-35	-5
Compared to app. Consumption	%					0%	-5%	1%	3%	-3%	-6%	-1%
RFO												
REFERENCE APPROACH												
International bunkers	kt	145	105	88	27	225	190	171	165	146	134	141
	TJ	5828	4220	3537	1085	9043	7636	6872	6631	5868	5385	5667
Apparent consumption	kt	462	562	782	878	1024	1203	1242	1318	1247	1117	1097

Fuel Consumption	TJ	18568	22587	31429	35287	41155	48349	49916	52970	50117	44892	44088
<u>SECTORAL APPROACH</u>												
1C1B.	TJ	5828	4220	3537	1085	9043	7636	6872	6631	5868	5385	5667
difference - bunkers						*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*
1AA1A	TJ	36149	37648	40460	42149	44622	46014	47530	49583	47448	42797	43097
1AA1B	TJ	0	0	0	0	NO	NO	NO	NO	NO	NO	NO
1AA2.f.3. (ETS)	TJ	2170	2210	2492	2733	936	937	1271	1238	1037	838	249
1AA2.f.4. (non-ETS)	TJ	0	0	80	201	1397	1007	663	826	485	646	666
1AA2.f.4. (ETS)	TJ					730	802	805	828	558	482	482
1AA4.a.	TJ	0	0	0	0	0	80	80	80	80	80	80
TOTAL	TJ	38319	39858	43032	45083	47684	48839	50349	52555	49609	44843	44574
difference						*-16%*	*-1%*	*-1%*	*1%*	*1%*	*0%*	*-1%*
Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	-7	-2	-15	-129	-152	3	-12	2	14	0	-9
Compared to app. Consumption	%					-15%	0%	-1%	0%	1%	0%	-1%
LPG												
<u>REFERENCE APPROACH</u>												
Apparent consumption	kt	20	20	27	44	51	53	51	52	51	49	55
Fuel Consumption	TJ	946	946	1277	2082	2413	2507	2413	2460	2413	2318	2602
<u>SECTORAL APPROACH</u>												
1AA4.b.	TJ	2507	2555	2744	2649	2507	2555	2602	2507	2602	2507	2791
difference						*-4%*	*-2%*	*-8%*	*-2%*	*-8%*	*-8%*	*-7%*
-												
Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	-2	-1	-3	-3	-2	-1	-4	-1	-4	-4	-4
Compared to app. Consumption	%					-4%	-2%	-8%	-2%	-8%	-8%	-7%
-												
Petroleum coke												
<u>REFERENCE APPROACH</u>												
International bunkers	kt	145	105	88	27	225	190	171	165	146	134	141
Apparent consumption	kt	133	139	137	146	154	146	143	152	144	116	101
Fuel Consumption	TJ	4123	4309	4247	4526	4774	4526	4433	4712	4464	3596	3131
<u>SECTORAL APPROACH</u>												

1AA2.f.3.	TJ	4123	4309	4247	4526	4426	4540	4534	4781	4705	3745	3190
difference						*7%*	*0%*	*-2%*	*-1%*	*-5%*	*-4%*	*-2%*
-												
Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	0	0	0	0	0	0	0	0	0	0	1
Compared to app. Consumption	%					0%	0%	0%	0%	0%	0%	1%
Other oil												
REFERENCE APPROACH												
Apparent consumption	kt	NO		5	5	6	NO	NO	NO	NO	NO	NO	NO
Fuel Consumption	TJ	NO		201	201	241	NO	NO	NO	NO	NO	NO	NO
SECTORAL APPROACH												
1AA1B	TJ	0	643	643	0							
1AA2.f.4.	TJ	0	0	0	241	0	0	0	0	0	0	0
TOTAL		0	643	643	241							
difference												
Refinery gas												
REFERENCE												
Apparent consumption	kt	19	21	21	9							
Fuel Consumption	TJ	915	1011	1011	433							
SECTORAL APPROACH												
1AA1B	TJ	915	1011	1011	433							
difference												
Other bituminous coal												
REFERENCE APPROACH												
Apparent consumption	kt	53	53	53	57	52	54	49	40	21	26	12
Fuel Consumption	TJ	1581	1581	1581	1700	1551	1610	1461	1193	626	775	358
SECTORAL APPROACH												
1AA2.f.3. (ETS)	TJ	1581	1581	1581	1700	1632	1620	1403	1157	613	736	313
difference						*-5%*	*-1%*	*4%*	*3%*	*2%*	*5%*	*13%*
-												
Energy balance statistical difference between Gross Inland Deliveries (Calculated) and (Observed)	kt	0	0	0	0	0	0	0	0	0	0	0

Compared to app. Consumption	%					0%	0%	0%	0%	0%	0%	0%
Liquid biomass												
REFERENCE APPROACH												
Apparent consumption	kt	NA	NA	NA	NA	NA	NA	1	16	17	17	19
Fuel Consumption	TJ	NA	NA	NA	NA	NA	NA	30	587	618	614	670
SECTORAL APPROACH												
1AA3.b.	TJ							30	587	618	614	648
difference								*0%*	*0%*	*0%*	*0%*	*3%*
Solid biomass												
REFERENCE APPROACH												
Apparent consumption	TJ	403	399	487	372	270	275	516	630	684	531	639
Fuel Consumption	TJ	403	399	487	372	270	275	516	630	684	531	639
SECTORAL APPROACH												
1AA2.f.3. (ETS)	TJ	70	90	211	127	39	61	100	249	346	358	235
1AA4.a.	TJ	0	0	0	0	0	0	14	15	15	15	109
1AA4.b.	TJ	0	0	0	0	0	74	95	123	174	84	230
1AA5.a.	TJ											9
TOTAL		70	90	211	127	39	135	209	387	535	457	583
difference								*60%*	*39%*	*22%*	*14%*	*9%*
Tires												
Apparent consumption	TJ	18	0	15	71	138	73	288	239	276	299	
Fuel Consumption	TJ	18	0	15	71	138	73	288	239	276	299	
1AA2.f.3. (ETS)	TJ	18	0	15	71	138	73	114	104	38	99	
difference								*60%*	*56%*	*86%*	*67%*	

Annex V. Additional information

V1 Participation to the EU-ETS

Cyprus fully implements Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowance trading within the Community (EU ETS Directive). The installations situated in the area under the effective control of the Republic of Cyprus falling within the scope of the EU ETS Directive in 2011 were 13: 3 electricity producing units (sector 1A1a), 2 cement producing units (sectors 1A2F and 2A1) and 8 ceramics producing units (sectors 1A2F and 2A7.2).

Allocation of allowances to these two installations for the first two phases of the scheme (2005-2007; 2008-2012) were notified to, and duly approved by, the European Commission via the respective phases' National Allocation Plans.

V2 SEF tables and relevant data

Cyprus, not being an Annex B country to the Kyoto Protocol and not operating a Kyoto registry does not generate, trade or surrender Kyoto units thus it is not considered relevant to compile SEF tables.