

# REPUBLIC OF CYPRUS



## MINISTRY OF AGRICULTURE, NATURAL RESOURCES AND ENVIRONMENT

Environment Service

### EMISSIONS INVENTORY

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Decision No 280/2004/EC Article 3(1):  
Reporting by Member States

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Nicosia, March 2007

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# 1. Introduction

## **Decision No 280/2004/EC of the European Parliament and of the Council concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol**

### **Article 3(1)**

Member States shall, for the assessment of actual progress and to enable the preparation of annual reports by the Community, in accordance with obligations under the UNFCCC and the Kyoto Protocol, determine and report to the Commission by 15 January each year (year X):

- (a) their anthropogenic emissions of greenhouse gases listed in Annex A to the Kyoto Protocol (carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>)) during the year before last (year X-2);
- (b) provisional data on their emissions of carbon monoxide (CO), sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOC) during the year before last (year X-2), together with final data for the year three-years previous (year X-3);
- (c) their anthropogenic greenhouse gas emissions by sources and removals of carbon dioxide by sinks resulting from land-use, land-use change and forestry during the year before last (year X-2);
- (d) information with regard to the accounting of emissions and removals from land-use, land-use change and forestry, in accordance with Article 3(3) and, where a Member State decides to make use of it, Article 3(4) of the Kyoto Protocol, and the relevant decisions there-under, for the years between 1990 and the year before last (year X-2);
- (e) any changes to the information referred to in points (a) to (d) relating to the years between 1990 and the year three-years previous (year X-3);
- (f) the elements of the national inventory report necessary for the preparation of the Community greenhouse gas inventory report, such as information on the Member State's quality assurance/quality control plan, a general uncertainty evaluation, a general assessment of completeness, and information on recalculations performed;
- (g) information from the national registry, once established, on the issue, acquisition, holding, transfer, cancellation, withdrawal and carryover of assigned amount units, removal units, emission reduction units and certified emission reductions during the previous year (year X-1);
- (h) information on legal entities authorised to participate in mechanisms under Articles 6, 12 and 17 of the Kyoto Protocol, in compliance with relevant national or Community provisions;

- (i) steps taken to improve estimates, for example where areas of the inventory have been subject to adjustments;
- (j) information on indicators for the year before last (year X-2); and
- (k) any changes to the national inventory system.

The European Union is an Annex I signatory to the United Nations Framework Convention on Climate Change (UNFCCC) and an Annex B signatory to its Kyoto Protocol (KP). The KP sets quantified targets for reducing greenhouse gas emissions for those signatories that are included in its Annex B. Cyprus ratified the UNFCCC as a non-Annex I party on 15th October 1997, and on the same basis, subsequently ratified the Kyoto Protocol on 16th July 1999; i.e. Cyprus has no emissions limitation commitments. This report has been prepared by the Environment Service of the Ministry of Agriculture, Natural Resources and Environment on behalf of the Republic of Cyprus, as required by the *Decision No 280/2004/EC of the European Parliament and of the Council of 11 February 2004 concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol*.

Nevertheless, under the Decision No 280/2004/EC Cyprus voluntarily reports to the EU. The requirements of the Article 3(1) of Decision 280/2004/EC, in comparison to the information submitted by Cyprus through this report are illustrated in **Table 1.1**.

**Table 1.1. Information required under Article 3(1) and information submitted by Cyprus**

<b>Requirements of Decision 280/2004/EC</b>	<b>Information Submitted</b>
Article 3(1)a	Chapter 3; CRF files
Article 3(1)b	Chapter 4; CRF files
Article 3(1)c	Chapter 5; CRF files
Article 3(1)d	Chapter 6; CRF files
Article 3(1)e	Chapter 8.1; CY_CRF_1990.xls upto CY_CRF_2005.xls
Article 3(1)f	Chapter 7
Article 3(1)g	Chapter 8.2
Article 3(1)h	Not included
Article 3(1)i	Chapter 3 & Section 8.3
Article 3(1)j	Section 8.4
Article 3(1)k	Section 8.5

*After the Turkish invasion in 1974, approximately 40% of the island territory is under Turkish occupation. The data presented in this report concerns only the areas under the effective control of the Government of the Republic of Cyprus.*

## 2. National Conditions for 2005

**Table 2.1** summarises the most important data for national conditions of 2005, associated with greenhouse gases emissions and climate change, in comparison to 2004 and 1990 (base year).

**Table 2.1. Summary of national conditions data for 1990 (base year), 2004 and 2005**

Parameter	1990	2004	2005
<b>Climate</b>			
Temperature (°C)			
Mean annual Rainfall (mm)	363	545	412
<b>Demographic Indicators</b>			
Total Population (end of year)	587,100	749,200	766,400
Nicosia		296,100	302,600
Famagusta		41,200	42,200
Larnaca		125,200	128,100
Limassol		214,800	219,900
Pafos		71,900	73,600
Urban Population		69.4%	69.6%
Average household size (end of year)		3.01	2.97
Migration (for 1 year or more)		22,003	24,419
<b>Industry</b>			
Production of sand, gravel and road aggregate (million tonnes)		12,360	12,850
Quarrying and mining Gross Output per person (C£000's)	18,895	70,183	76,692
Manufacturing Gross Output per person (C£000's)	20,615	46,396	47,853
Industrial Production index (1990=100)	100	105.4	104.0
Collection, Purification and Distribution of Water Gross Output (C£000's)	16,850	60,403	66,235
<b>Electricity production/consumption</b>			
Total Gross Production (million kWh)	1,974.5	4,209.4	4,348.0
Billed Consumption of electricity (million kWh)	1,445.4	3,729.3	3,930.7
Installed capacity of electric generators (MW)	470.6	1,009.9	1,001.5
Production and Distribution of Electricity Gross Output (C£000's)	65,200	213,034	252,872
Domestic electricity consumption (million kWh)	450.0	1,316.0	1,432.8
Commercial electricity consumption (million kWh)	539.0	1,515.7	1,585.9
Industrial (with construction) electricity consumption (million kWh)	341.3	722.4	725.4
Irrigation electricity consumption (million kWh)	91.5	117.3	120.7
Public lighting electricity consumption (million kWh)	23.7	57.9	65.9
<b>Petroleum Products Sales</b>			
Benzene (tonnes)	162,699	281,779	302,525
Light Fuel Oil (tonnes)	102,906	81,536	65,948
Heavy Fuel Oil (tonnes)	610,311	1,015,908	1,374,863
Light Petroleum Gas (tonnes)	48,829	55,757	53,185
<b>Travelling</b>			

Travellers Arriving		3,381,159	3,620,235
Travellers Departing		3,385,060	3,621,908
<b>Transport</b>			
Motor vehicles (end of year)	274,456	600,942	644,403
Private saloon cars	182,718	367,473	402,435
Taxis		1,883	1,961
Buses		3,704	3,727
Goods conveyance vehicles		138,914	141,966
Motorcycles		56,598	61,738
Tractors		14,691	14,976
<b>Agriculture</b>			
Temporary Crops (000's hectares)	90.6	102.1	89.5
Permanent Crops (000's hectares)	50.9	41.8	43.4
Fallow land (000's hectares)	15.0	10.5	20.5
Grazing land (000's hectares)	4.2	0.4	0.4
Uncultivated and deserted land (000's hectares)	47.9	42.2	38.2
TOTAL AGRICULTURAL LAND (000's hectares)	208.6	197.0	192.0
<b>Animal Population (000's)</b>			
Cattle	54.6	60.3	57.6
Sheep and Lambs	290.0	279.0	268.9
Goats and kids	205.0	378.0	329.3
Pigs	277.9	470.5	429.7
Poultry	2,900	3,068	3,007

## 2.1. Energy

The total generation of electricity in 2005 was 4,348 million kWh, in comparison to 4,176 in 2004. The total 2005 fuel consumption was 1,118,614 tonnes. From the electrical energy produced 5.6% (245,459 MWh) were consumed by the power stations, whereas 4% were lost through transmission and distribution (162,931.8 MWh). The consumption of electricity by sector is illustrated in **Table 2.2**.

**Table 2.2. Energy consumption by sector, 2005 data**

Sector	Actual amount (MWh)	
Domestic	1,431,792	(36.4%)
Commercial	1,587,196	(40.3%)
Industrial	726,059	(18.5%)
Agriculture	120,062	(3.1%)
Street lighting	67,793	(1.7%)

The contribution of renewable energy sources for Cyprus during 2005 was 115 ktoe, corresponding to 4.2% of the total energy consumption.



### 3. Article 3(1)a: Anthropogenic emissions of GHG

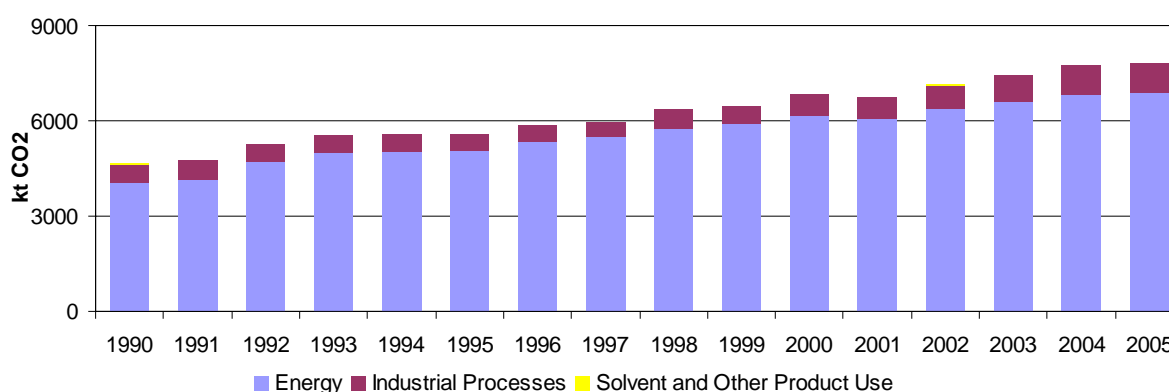
(a) their anthropogenic emissions of greenhouse gases listed in Annex A to the Kyoto Protocol (carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF<sub>6</sub>)) during the year before last (year X-2);

HFCs, PFCs and SF<sub>6</sub> are not produced in Cyprus, while the emissions of these gases at the final consumption level have not been estimated yet due to lack of relevant data. It should also be taken into consideration that emissions from international air and sea transportation are not included in the national inventory, but listed separately. Moreover, it should also be noted that the team by which the inventory is performed changed in 1999.

The GHG emissions calculated for 1990 to 2005 are listed in **Table 3.1** in the actual amounts emitted per gas, and in **Table 3.2** in carbon dioxide equivalents. Moreover, **Table 3.3** shows the development in emissions originating from international transport, emissions that are not included in the inventory of the country, but should be reported.

#### 3.1. Carbon Dioxide emissions

The emissions of Carbon Dioxide varied between 1990 and 2005 as shown in **Figure 3.1**. For 2005, the emissions of Carbon Dioxide correspond to the 80% of the total GHG emissions, which is the same as 2004. The actual carbon dioxide emissions for 2005 were 7.79 Mt in comparison to 7.74 Mt in 2004, corresponding to only 0.6% increase.



**Figure 3.1. Carbon Dioxide emissions for 1990 to 2005.**

**Table 3.1. GHG emissions in kt for the period 1990-2005**

<b>GAS</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>90-05</b>
<b>CO<sub>2</sub></b>	4640.2	4737.9	5265.2	5556.2	5575.9	5575.7	5866.0	5933.5	6387.2	6465.0	6835.5	6740.2	7131.9	7448.5	7742.5	7787.2	67.8%
<b>CH<sub>4</sub></b>	33.9	34.4	36.2	37.2	37.7	38.6	38.7	38.7	38.8	41.3	42.1	44.3	45.9	47.3	45.6	46.7	37.8%
<b>N<sub>2</sub>O</b>	2.2	2.2	2.5	2.7	2.7	2.6	2.8	2.8	3.0	3.1	3.2	3.1	3.4	3.5	3.6	3.4	55.2%
<b>GHG emissions in carbon dioxide equivalents for the period 1990-2005</b>																	
<b>CO<sub>2</sub></b>	4617.7	4688.6	5204.2	5500.4	5503.8	5499.8	5779.4	5830.0	6267.4	6345.2	6715.7	6620.4	7012.2	7328.7	7622.7	7667.4	0.6%
<b>CH<sub>4</sub></b>	711.3	722.9	760.7	781.5	792.1	811.3	812.5	813.0	814.2	866.8	884.1	930.4	963.6	993.2	958.0	979.8	2.3%
<b>N<sub>2</sub>O</b>	681.6	693.4	783.5	828.6	840.5	820.4	864.9	876.4	934.6	962.4	987.1	969.6	1039.8	1076.1	1113.5	1057.2	-5.1%
<b>SUM</b>	6010.6	6104.9	6748.4	7110.4	7136.4	7131.5	7456.8	7519.4	8016.2	8174.4	8586.9	8520.4	9015.6	9398.0	9694.2	9704.4	0.1%
<b>(1990=100)</b>	100.0	101.6	112.3	118.3	118.7	118.6	124.1	125.1	133.4	136.0	142.9	141.8	150.0	156.4	161.3	161.5	

**Table 3.2. GHG emissions kt for the exceptions of the period 1990-2005**

<b>GAS</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>90-05</b>	<b>04-05</b>
<b>CO<sub>2</sub></b>	933.5	752.1	962.3	886.4	939.2	1034.5	1062.3	1079.1	1115.3	1307.7	1444.7	1582.5	1380.5	1429.0	1094.7	1576.9	68.9%	44.1%
<b>CH<sub>4</sub></b>	1.7	1.5	1.7	1.5	1.5	1.9	2.1	2.1	2.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-93.9%	13.4%
<b>N<sub>2</sub>O</b>	6.2	3.1	6.2	6.2	6.2	6.2	9.3	9.3	9.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-99.5%	22.8%

### 3.2. Methane emissions

Methane emissions increased from 45.61kt in 2004 to 46.66 kt in 2005, corresponding to an increase of 2%. The variation between the years is illustrated in **Figure 3.2**. In 2005 methane contributed by 10% to the total GHG emissions. The largest contribution of emissions originates from waste with 66.6%, whereas the second largest contribution is the sector of agriculture, with 31.7%.

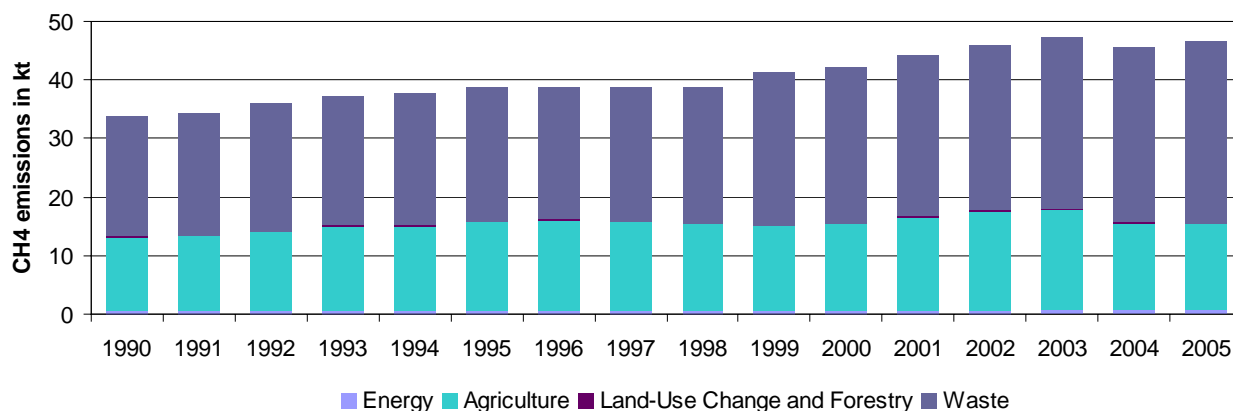


Figure 3.2. Methane emissions for 1990 to 2005.

### 3.3. Nitrous Oxide emissions

Nitrous oxide emissions correspond to 11% of the total GHG emissions. In 2005 (**Figure 3.3**) energy causes the emissions of 2.24 kt nitrous oxide corresponding to 66%, whereas the remaining 33% is originating from agriculture. Between 2004 and 2005, there is a decrease 5% in the emissions; from 3.59 kt in 2004 to 3.41 kt in 2005.

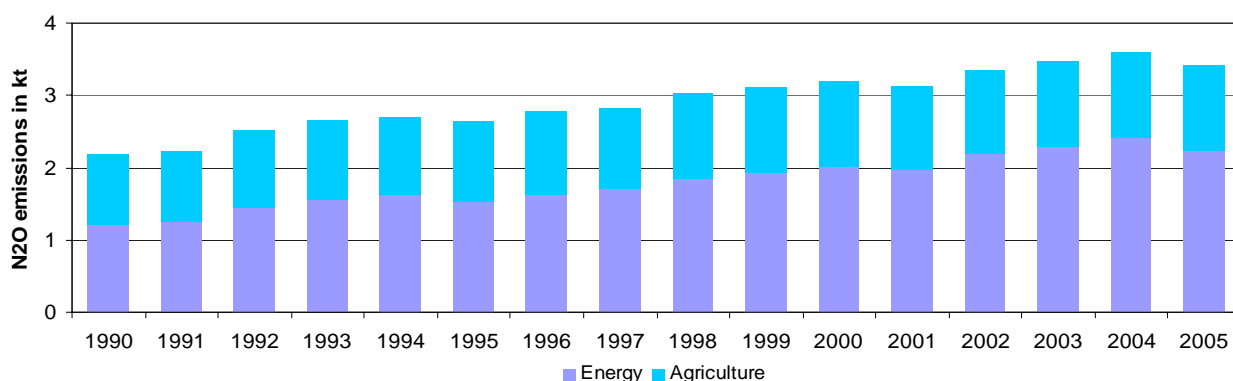


Figure 3.3. Nitrous oxide emissions for 1990 to 2005.

### 3.4. HFCs, PFCs and SF<sub>6</sub> emissions

HFCs, PFCs and SF<sub>6</sub> are not produced in Cyprus. Regarding emissions from the use of the above gases, these were not estimated due to lack of relevant statistical data.

## 4. Article 3(1)b: Emissions of CO, SO<sub>2</sub>, NO<sub>x</sub> and VOCs

(b) provisional data on their emissions of carbon monoxide (CO), sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOC) during the year before last (year X-2), together with final data for the year three-years previous (year X-3);

The Department of Labour Inspection (Ministry of Labour and Social Insurance) is the competent authority for the Control of Atmospheric Pollution and for the safeguarding of the air quality in Cyprus, and for the implementation of the European Union NEC Directive. In February 2007, the Department of Labour Inspection, submitted the “LRTAP informative inventory report of Cyprus” (Appendix I), which describes among others the trends for CO, NO<sub>x</sub>, NMVOCs and SO<sub>2</sub> for the period 1990 to 2005. Presented in this section are the results obtained by the pre-mentioned study.

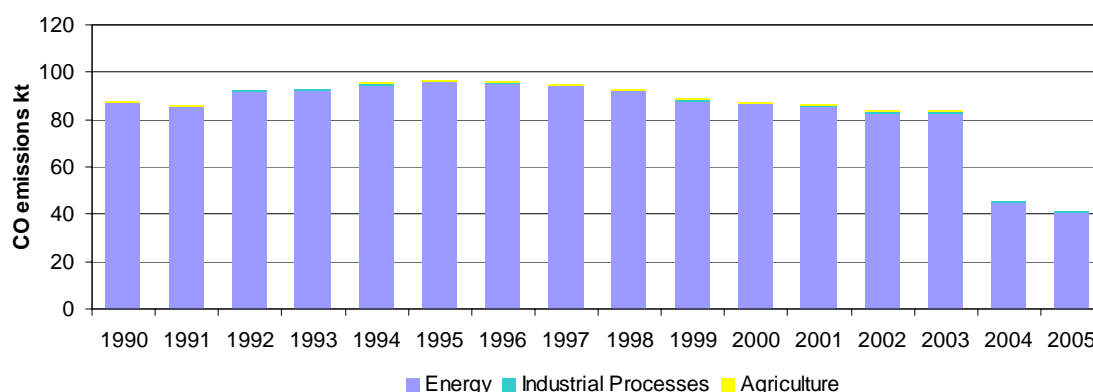


Figure 4.1. Carbon monoxide emissions for 1990 to 2005.

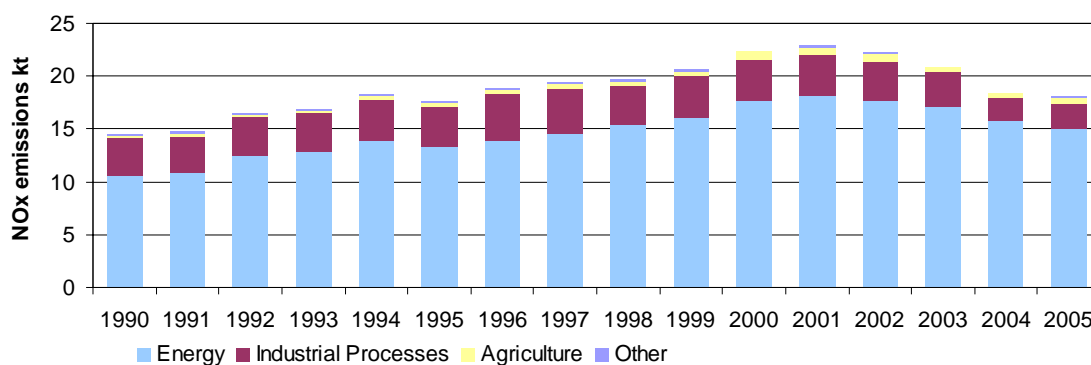


Figure 4.2. Nitrogen oxides emissions for 1990 to 2005.

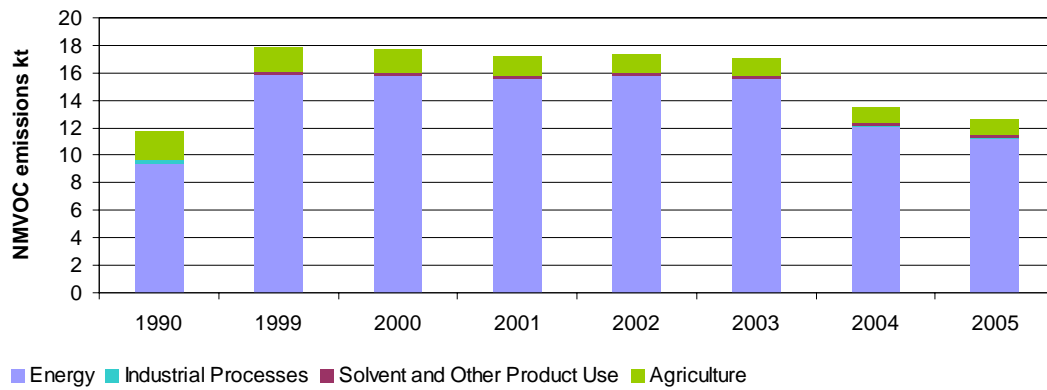


Figure 4.3. Non-Methane Volatile Organic compounds emissions for 1990 to 2005.

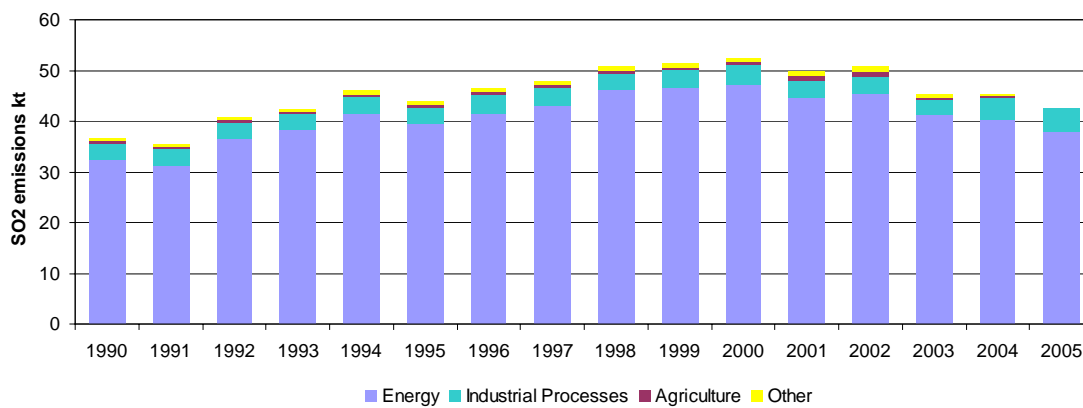


Figure 4.4. Sulphur dioxide emissions for 1990 to 2005.

## 5. Article 3(1)c: Anthropogenic GHG emissions by sources

(c) their anthropogenic greenhouse gas emissions by sources and removals of carbon dioxide by sinks resulting from land-use, land-use change and forestry during the year before last (year X-2);

The results from the calculations made for the GHG emissions by sector are presented in **Table 5.1**, and the by sector contribution to the total GHG emissions for 1990 to 2005 in **Figure 5.1**. The sector with the largest contribution to the GHG emissions is the energy sector with 78.2% in 2005 in comparison to 78.5% in 2005 and 74.1% in 1990.

**Table 5.1. GHG emissions in Mt CO<sub>2</sub> equivalents by sector for the years 1990-2005 (including LUCF).**

	Energy	Industrial Processes	Solvent and Other Product Use	Agriculture	Land-Use Change and Forestry	Waste	TOTAL
1990	4452.9	570.5	2.3	570.6	-18.9	433.2	6010.6
1991	4564.4	570.4	2.4	573.4	-45.6	440.0	6150.5
1992	5153.9	566.6	2.4	621.6	-57.5	461.4	6748.4
1993	5502.0	547.9	2.5	645.2	-52.3	465.2	7110.4
1994	5556.8	530.8	2.5	639.5	-68.6	475.4	7136.4
1995	5541.8	515.0	2.5	663.5	-72.3	481.1	7131.5
1996	5865.3	513.5	2.5	684.6	-83.1	474.0	7456.8
1997	6012.3	458.0	2.6	666.0	-100.0	480.5	7519.4
1998	6364.2	604.6	2.6	671.7	-116.2	489.3	8016.2
1999	6498.9	575.8	2.6	666.9	-116.2	546.5	8174.4
2000	6762.5	707.6	2.6	671.8	-116.2	558.6	8586.9
2001	6664.6	693.1	2.6	695.6	-116.2	580.8	8520.4
2002	7073.4	746.5	2.6	718.4	-116.2	590.8	9015.6
2003	7338.1	836.0	2.6	721.8	-116.2	615.8	9398.0
2004	7612.8	893.3	2.6	671.7	-116.2	630.0	9694.2
2005	7590.6	902.9	2.6	671.7	-116.2	652.8	9704.4
<b>2005 composition</b>	<b>78.2%</b>	<b>9.3%</b>	<b>0.03%</b>	<b>6.9%</b>	<b>-1.2%</b>	<b>6.7%</b>	
<b>90-05% change</b>	70.5%	58.3%	13.1%	17.7%	514.8%	50.7%	<b>61.4%</b>
<b>04-05% change</b>	-0.3%	1.1%	0.0%	0.0%	0.0%	3.6%	<b>0.11%</b>

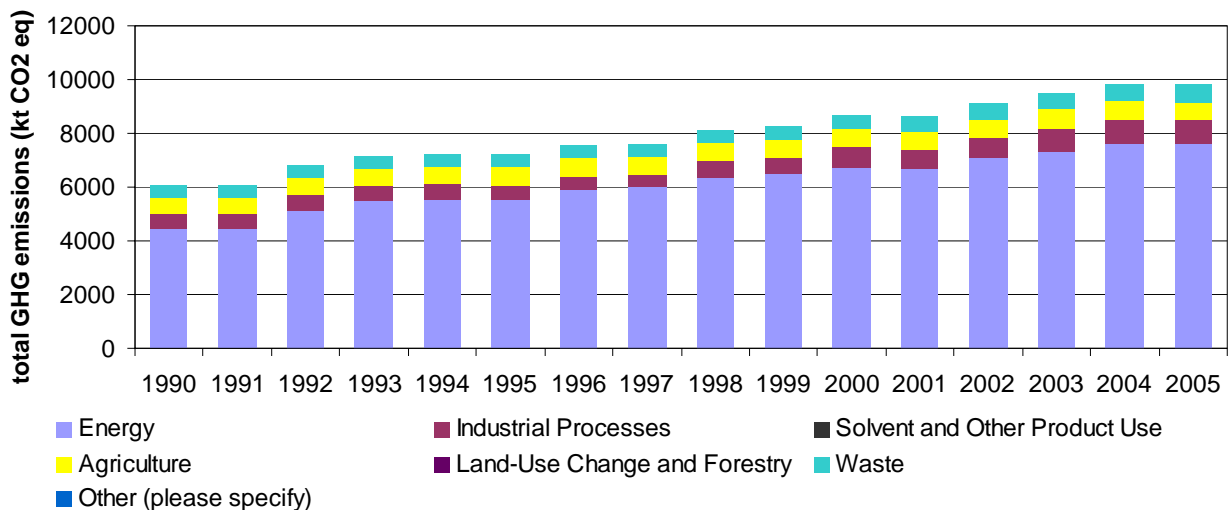


Figure 5.1. GHG emissions by sector for 1990 to 2005.

### 5.1. Energy Sector

53.8% of the emissions released by the sector of energy for 2005 are from the energy industries, corresponding to an increase of 7.7% in comparison to the emissions of 1990 and a reduction of 3.9% in comparison to 2004. Following is the sub-sector of transport with 27.6% in 2005, 26.9% in 2004 and 21.9% in 1990. Other energy sub-sectors contributing to the GHG emissions are the manufacturing industries and construction with 9.9% in 2005 (in comparison to 7.1% and 17.8% for 2004 and 1990 respectively). Fugitive Emissions from Fuels depends only on the consumption of oil and natural gas. These contribute steadily 0.01% since 1990. The comparison between years for all energy sub-sectors is illustrated in Figure 5.2.

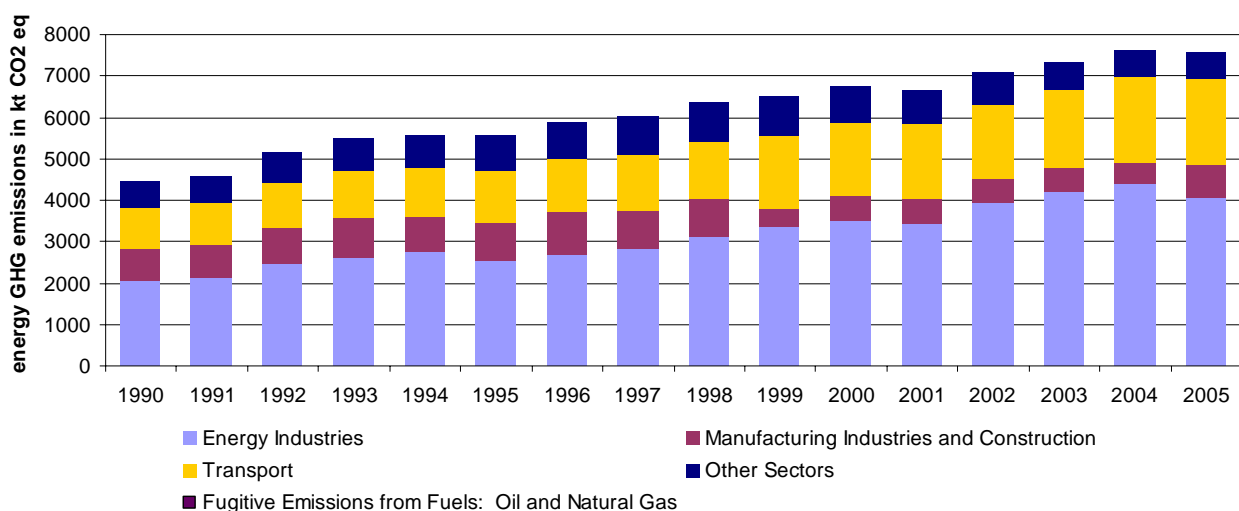
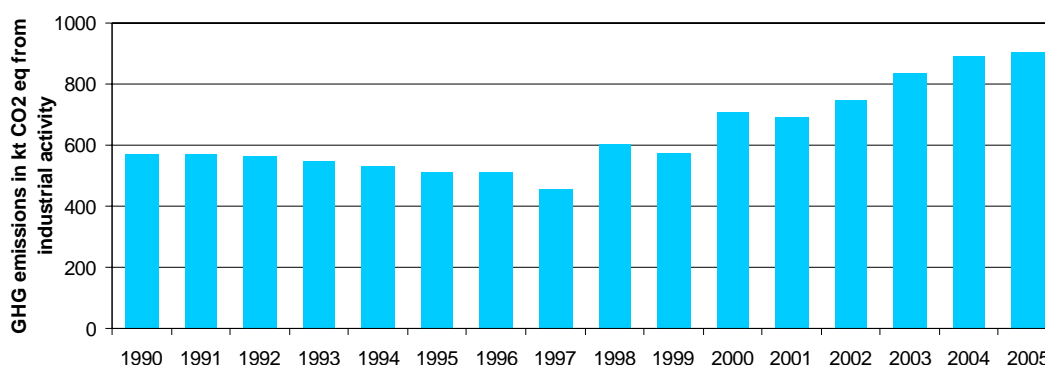


Figure 5.2. GHG emissions from the energy sector and sub-sectors for 1990 to 2005.

## 5.2. Industrial processes and construction

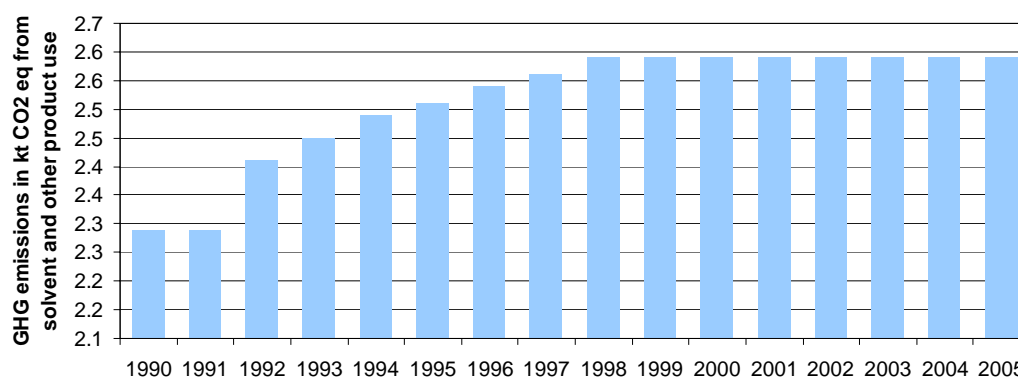
The emissions of industrial processes in Cyprus mainly originate from the production of mineral products, cement and lime. The contribution to the total GHG emissions in 2005 was 9.3% (corresponding to an actual amount of 902.9 kt CO<sub>2</sub> eq) showing an increase of 58.3% in comparison to 1990 and 1.1% compared to 2004. The trend from 1990 to 2005 is displayed in **Figure 5.3**.



**Figure 5.3. GHG emissions from the industry sector for 1990 to 2005.**

## 5.3. Solvent and other product use

The emissions caused by the solvents and other products' use contribute by 0.03% to the total emissions of 2005 and 2004 in comparison to 0.04% of the emissions in 1990. The actual amount of the total GHG emissions caused by this sector is 2.59 kt CO<sub>2</sub> eq for 2005 in comparison to 2.29 kt CO<sub>2</sub> eq in 1990.



**Figure 5.4. GHG emissions from the solvent and other product use for 1990 to 2005.**

## 5.4. Agriculture

In 2005, the GHG emissions from agriculture were produced by the sub-sectors of enteric fermentation (25%), manure management (35%) and agricultural soils (39%). There were no changes in comparison to 2004. In comparison to 1990, the 2005 emissions were 17.72% greater. **Figure 5.5** shows the emissions from 1990 to 2005.



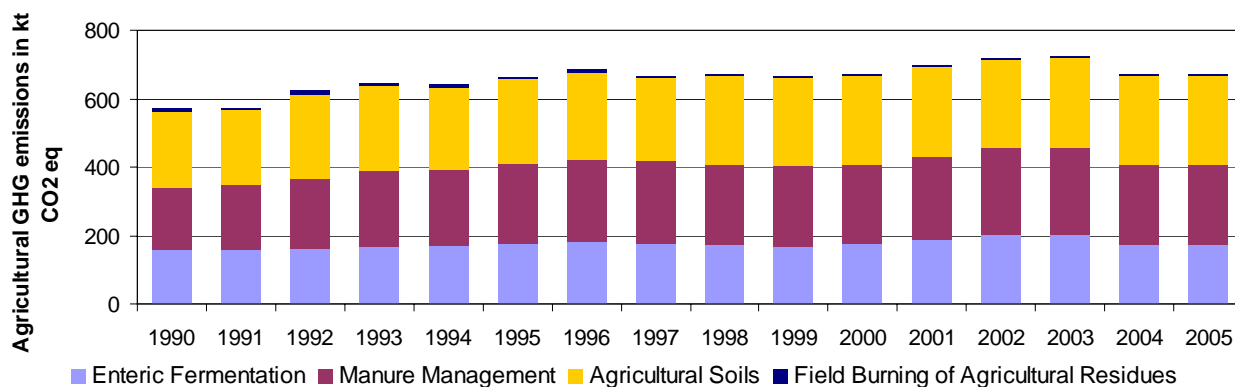


Figure 5.5. GHG emissions from the sector of agriculture for 1990 to 2005.

### 5.5. Waste sector

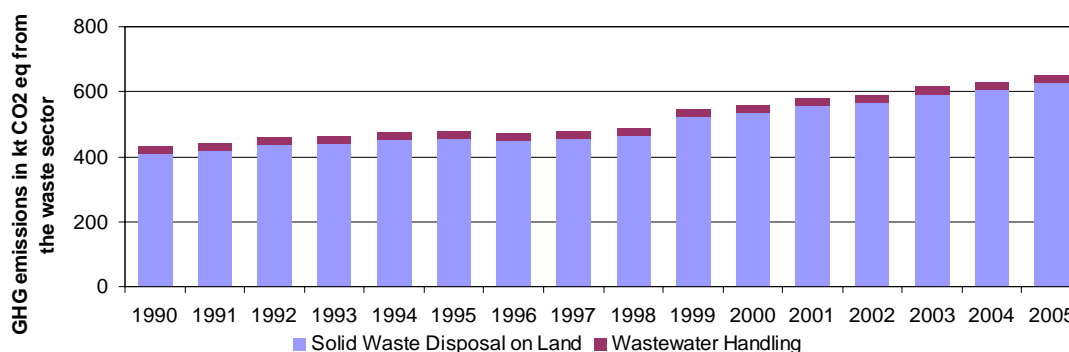


Figure 5.7. Waste sector total GHG emissions during 1990 and 2005

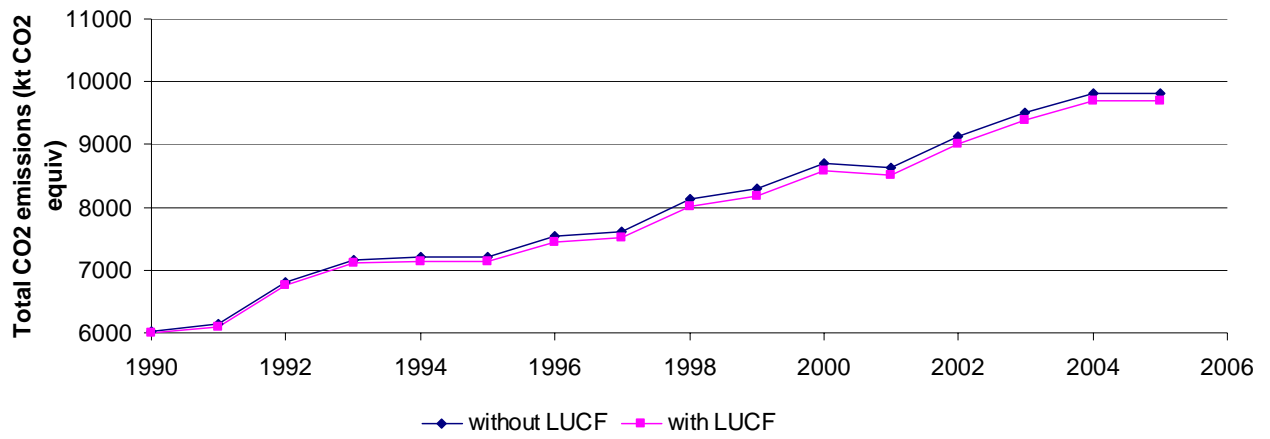
Solid waste disposal on land and wastewater handling are the contributors to GHG emissions for the sector of waste, by 96% and 4% respectively for 2005. Comparing 2005 to 2004 there is no change for wastewater handling emissions, while solid waste disposal increased by 3.8%. In comparison to 1990 emissions, solid waste disposal on land increased by 52.7% and wastewater handling by 12.5%.

## 6. Article 3(1)d: Emissions and removals from land-use, land-use change and forestry

(d) information with regard to the accounting of emissions and removals from land-use, land-use change and forestry, in accordance with Article 3(3) and, where a Member State decides to make use of it, Article 3(4) of the Kyoto Protocol, and the relevant decisions there-under, for the years between 1990 and the year before last (year X-2);

The reduction of emissions caused by change of land use increased by 35% between 1990 and 2005. Due to lack of information it is assumed that is constant at 1998 levels. The total CO<sub>2</sub> equivalent emissions without and with land-use change and forestry are presented in **Table 6.1** and **Figure 6.1**.

Year	Total CO <sub>2</sub> Equivalent Emissions without Land Use Change and Forestry (kt )	Total CO <sub>2</sub> Equivalent Emissions with Land Use Change and Forestry (kt)
1990	6029.5	6010.6
1991	6150.5	6104.9
1992	6805.9	6748.4
1993	7162.7	7110.4
1994	7205.0	7136.4
1995	7203.8	7131.5
1996	7539.9	7456.8
1997	7619.4	7519.4
1998	8132.4	8016.2
1999	8290.7	8174.4
2000	8703.1	8586.9
2001	8636.6	8520.4
2002	9131.8	9015.6
2003	9514.2	9398.0
2004	9810.4	9694.2
2005	9820.6	9704.4



**Figure 6.1. Impact of land use change and forestry in total GHG emissions in Gg CO<sub>2</sub> equivalents for 1990 to 2005.**

## 7. Article 3(1)f: Quality assurance and quality control

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- (f) the elements of the national inventory report necessary for the preparation of the Community greenhouse gas inventory report, such as information on the Member State's quality assurance/ quality control plan, a general uncertainty evaluation, a general assessment of completeness, and information on recalculations performed;
- 

### 7.1. Institutional arrangements for inventory preparation

The Ministry of Agriculture, Natural Resources and Environment (MANRE) is the main governmental body responsible for the development and implementation of environmental policy in Cyprus, as well as for the provision of information concerning the state of the environment in Cyprus in compliance with relevant requirements defined in international conventions, protocols and agreements. In this context and by a Presidential Decision, the Ministry of Agriculture, Natural Resources and Environment, and more specifically the Environment Service<sup>1</sup> has been assigned the overall responsibility for the national GHG inventory.

Within this framework and for the establishment of the National System foreseen in the Decision 280/2004/EC, the Ministry for the Environment is responsible for the following regarding GHG emissions inventory preparation which consists of the preparation/compilation of the annual national inventory, i.e. the selection of methodologies, data collection (activity data and emission factors, provided by statistical services and other organizations), data processing and archiving, as well as the implementation of general quality control procedures; and the development of an inventory QA/QC plan, in accordance with the provisions of the IPCC Good Practice Guidance.

The present report has been developed through the co-operation of the Environment Service (Ministry of Agriculture, Natural Resources and Environment) with the government agencies shown in Table 7.1, as these agencies maintain statistical data necessary for the inventory.

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<sup>1</sup> Mr. Theodoulos Mesimeris, [tmesimeris@environment.moa.gov.cy](mailto:tmesimeris@environment.moa.gov.cy), tel. + 357 22 303 841

## 7.2. GHG emissions inventory preparation process

The preparation of the Cyprus GHG emissions inventory is based predominantly on the application of the CORINAIR (CORINe AIR emissions inventory) methodology. The compilation of the inventory is distinguished in three main stages:

1. Data collection and processing per source/sink category. The main data sources used are the Cyprus Statistical Service, the government agencies involved and large private enterprises (Table 7.1). Additional data source was the verified reports of installations under the Emissions Trading Directive. Once the reliability of the data is assessed, emissions/removals per source/sink category can be estimated.
2. GHG emissions are estimated on the basis of the methods described in the IPCC Guidelines, the IPCC Good Practice Guidance, the IPCC Good Practice Guidance for LULUCF and the CORINAIR methodology. 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 special attention is paid in selecting the emission factors from the pre-mentioned methodological resources that describe best the practices in Cyprus.
3. The internal check of CRF tables and the compilation of the NIR, which is then commented by the government agencies involved. On the basis of these comments, the final report is prepared and submitted to the European Commission.

## 7.3. Methodologies and data sources

The data used for the preparation of this inventory were mainly obtained from published official reports and bulletins of the Statistical Service of Cyprus and statistical departments of the Ministries involved. The main methodological references for the estimation of GHG emissions/removals are the following:

- Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories;
- Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories;
- Good Practice Guidance for Land Use, Land Use Change and Forestry; and
- CORINAIR methodology.

For the preparation of the 2005 Emission Inventory, the top-down approach has been followed based on the fuel consumed in each main sector. In many cases, sub-sectors are reported as NE (Not Estimated) due to the fact that the quantity of fuels consumed in the sub-sectors is unknown.

In the coming years, our target is to improve our inventory by estimating emissions in each sub-sector, especially in the industrial sector. In general, our effort is to steadily upgrade qualitatively and quantitatively

our emission data submitted and every coming year expand it by additional NFR sectors, thus minimizing the use of Notation Key NE.

**Table 7.1. Data sources per IPCC sector**

<b>SECTOR</b>	<b>STATISTICAL DATA</b>	<b>DATA SOURCES</b>
1.A1 Electricity generation	Fuel consumption	<ul style="list-style-type: none"> <li>▪ National Statistical Service</li> <li>▪ Energy Service</li> <li>▪ Cyprus Electricity Authority</li> <li>▪ Verifier Report</li> </ul>
1.A2 Manufacturing industry and construction	Fuel consumption	<ul style="list-style-type: none"> <li>▪ National Statistical Service</li> <li>▪ Energy Service</li> <li>▪ Cyprus Electricity Authority</li> </ul>
1.A3 Transport	Number of vehicles	<ul style="list-style-type: none"> <li>▪ Ministry for Transport</li> <li>▪ National Statistical Service</li> </ul>
	Aircraft landing and take off cycles	<ul style="list-style-type: none"> <li>▪ Civil Aviation Authority</li> <li>▪ National Statistical Service</li> </ul>
1.A4 Other sectors	Fuel consumption	<ul style="list-style-type: none"> <li>▪ Energy Service</li> </ul>
1.B Fugitive emissions from fuels	Amount of fuels	<ul style="list-style-type: none"> <li>▪ Energy Service</li> </ul>
2 Industrial Processes	Industrial production	<ul style="list-style-type: none"> <li>▪ National Statistical Service</li> <li>▪ Industrial units</li> </ul>
3 Solvents and other products use	Amount of solvents/other products use	<ul style="list-style-type: none"> <li>▪ Department of Labour Inspection</li> </ul>
4 Agriculture	Cultivated areas	<ul style="list-style-type: none"> <li>▪ National Statistical Service</li> </ul>
	Agricultural production	<ul style="list-style-type: none"> <li>▪ Ministry of Agriculture, Natural Resources and Environment</li> </ul>
	Livestock population	<ul style="list-style-type: none"> <li>▪ Ministry of Agriculture, Natural Resources and Environment</li> </ul>
	Fertilizer use	<ul style="list-style-type: none"> <li>▪ UN Food and Agricultural Organisation</li> </ul>
5 Land use, Land use change and Forestry	Forest area	<ul style="list-style-type: none"> <li>▪ Ministry of Agriculture, Natural Resources and Environment</li> </ul>
	Forest fires	<ul style="list-style-type: none"> <li>▪ General Directorate for the Forests and the Natural Environment</li> </ul>
6 Waste	Quantities and composition of solid waste generated	<ul style="list-style-type: none"> <li>▪ Ministry of Interior</li> <li>▪ National Statistical Service</li> </ul>
	Recycling	
	Population	

The information related to the annual GHG emissions inventory (activity data, emission factors, analytic results, compilation in the required analysis level of the CRF tables) is available through MS Excel spreadsheets.

#### **7.4. Quality assurance - Quality control plan**

During the last year, quality assurance and quality control procedures for the preparation of the national emission inventory have been established in Cyprus. These procedures are considered to be preliminary as it is the first time they have been implemented. In the following years our efforts will focus on the

implementation of a more effective QA/QC procedure. The QA/QC system has been developed on the basis of the IPCC guidelines. The quality objectives used are the following:

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

The QA/QC system developed covers the following processes:

- *QA/QC system management*, comprising all activities that are necessary for the management and control of the inventory agency in order to ensure the accomplishment of the above-mentioned quality objectives.
- *Quality control* that is directly related to the estimation of emissions. The process includes activities related to (a) data inquiry, collection and documentation, (b) methodological choices in accordance with IPCC Good Practice Guidance, (c) quality control checks for data from secondary sources and (d) record keeping.
- *Archiving of inventory information*, comprising activities related to centralised archiving of inventory information and the compilation of the national inventory report.
- *Quality assurance*, comprising activities related to the different levels of review processes including the review of input data from experts if necessary, and comments from the public.
- *Estimation of uncertainties*, defining procedures for estimating and documenting uncertainty estimates per source / sink category and for the whole inventory.
- *Inventory improvement*, that is related to the preparation and the justification of any recalculations made.

Data provided by the Statistical Service of Cyprus are characterised by independence, integrity and accountability. Hence, these data are not subjected to any checking.

## **7.5. Uncertainty assessment**

No uncertainty analysis was applied for the GHG Inventory.

## **7.6. Comparison of sectoral approach with 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<sub>2</sub> emissions, while the sectoral approach is based on a detailed disaggregation of energy consumption by sector, fuel and technology for the calculation of CO<sub>2</sub> emissions. The estimation of carbon dioxide emissions according to the two methodologies is presented in Table 7.2.

The estimated deviation ranges from –0.5% to 2.5% and is attributed to:

1. *Statistical differences in fuel consumption*: The sectoral approach uses the actual consumption of the different fuels, while the reference approach uses their apparent consumption. In theory, both consumption estimates should be equal, but there is usually a difference between them due to the different sources used for collection of information. The reference approach does not provide for the calculation of these differences.
2. *Emission factors*. In the reference approach, CO<sub>2</sub> emissions from liquid fuel consumption are mainly estimated assuming "combustion" of crude oil. The sectoral approach however, calculates emissions using the actual consumption per liquid fuel and appropriate emission factors. Moreover, the emission factors and the calorific values of solid fuels (lignite) are differentiated by sector, resulting in deviations in the calculated energy consumption.

**Table 7.2. CO<sub>2</sub> emissions (in kt) from the energy sector (fuel combustion) according to the reference and the sectoral approach for the period 1990 – 2005.**

Year	Reference approach	Sectoral approach	Deviation – Actual (kt CO <sub>2</sub> )	Deviation – in%
1990	4087.0	4067.4	19.6	0.5%
1991	4188.4	4165.0	23.4	0.6%
1992	4729.5	4696.3	33.2	0.7%
1993	5028.3	5005.9	22.4	0.4%
1994	5063.0	5042.6	20.4	0.4%
1995	5081.0	5058.2	22.8	0.4%
1996	5398.5	5350.0	48.5	0.9%
1997	5498.9	5472.9	26.0	0.5%
1998	5799.6	5780.0	19.7	0.3%
1999	6036.3	5886.6	149.7	2.5%
2000	6238.5	6125.3	113.2	1.8%
2001	6174.9	6044.5	130.4	2.1%
2002	6415.5	6382.8	32.6	0.5%
2003	6659.7	6609.9	49.8	0.7%
2004	6815.0	6846.6	- 31.6	- 0.5%
2005	6923.4	6881.7	41.7	0.6%

## 7.7. Description and interpretation of emission trends

The GHG emissions trends (per gas and per sector) for the period 1990 - 2005 are presented in Table 7.3 in kt CO<sub>2</sub> eq.



Total GHG emissions for Cyprus (LUCF excluded) in 2005 were estimated at 9,820.64 kt CO<sub>2</sub> eq, showing an increase of 62.9 % compared to 1990 levels (6,029.52 kt CO<sub>2</sub> eq). If emissions/ removals from LUCF are included then the increase is estimated at 61.5% (from 6,010.6 kt CO<sub>2</sub> eq in 1990 to 9,704.4 kt CO<sub>2</sub> eq in 2005).

Carbon dioxide emissions accounted for 79.0 % of total GHG emissions (excluding LUCF) in 2005 and increased by 66.0% from 1990. Nitrous oxide emissions accounted for 10.9% of total GHG emissions in 2005 and increased by 55.1% from 1990, while methane emissions that accounted for 10.1% of the total GHG emissions in 2005, increased by 37.7% from 1990.

- Emissions from energy sector in 2005 accounted for 77.1% of total GHG emissions (LUCF excluded) and increased by 70.5% compared to 1990 levels. This increase was due mainly to the increase of emissions from transport and electricity production that is affected by the high electricity demand from the residential and tertiary sectors.
- Emissions from Industrial processes accounted for 8.0% of the total emissions and increased by 58.3% compared to 1990 levels (LUCF excluded).
- The contribution of the Solvent and other products use sector to total GHG emissions is minor, (0.03% of the total emissions) and increased by 13.1% compared to 1990 levels (LUCF excluded).
- Emissions from Agricultural sector that accounted for 8.3% of the total emissions, increased by 17.7% in 2005 compared to 1990 levels (LUCF excluded).
- Finally, emissions from Waste sector (6.6% of the total emissions, LUCF excluded), increased by approximately 50% from 1990.

## **7.8. Recalculations**

It should be noted here, that recalculations have been performed for previously submitted CRF tables, but have not been imported in the relative sheets in the CRF tables.

**Table 7.3. GHG emissions/removals in Cyprus (in kt CO<sub>2</sub> eq) for the period 1990-2005**

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
<b>A. GHG emissions / removals per sector</b>																
Energy	4452.9	4564.4	5153.9	5502.0	5556.8	5541.8	5865.3	6012.3	6364.2	6498.9	6762.5	6664.6	7073.4	7338.1	7612.8	7590.6
Industrial processes	570.5	570.4	566.6	547.9	530.8	515.0	513.5	458.0	604.6	575.8	707.6	693.1	746.5	836.0	893.3	902.9
Solvents	2.3	2.4	2.4	2.5	2.5	2.5	2.5	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6	2.6
Agriculture	570.6	573.4	621.6	645.2	639.5	663.5	684.6	666.0	671.7	666.9	671.8	695.6	718.4	721.8	671.7	671.7
LUCF	-18.9	-45.6	-57.5	-52.3	-68.6	-72.3	-83.1	-100.0	-116.2	-116.2	-116.2	-116.2	-116.2	-116.2	-116.2	-116.2
Waste	433.2	440.0	461.4	465.2	475.4	481.1	474.0	480.5	489.3	546.5	558.6	580.8	590.8	615.8	630.0	652.8
<b>Total (with LUCF)</b>	<b>6010.6</b>	<b>6104.9</b>	<b>6748.4</b>	<b>7110.4</b>	<b>7136.45</b>	<b>7131.49</b>	<b>7456.80</b>	<b>7519.40</b>	<b>8016.21</b>	<b>8174.44</b>	<b>8586.93</b>	<b>8520.43</b>	<b>9015.57</b>	<b>9397.98</b>	<b>9694.19</b>	<b>9704.42</b>
<b>Total (without LUCF)</b>	<b>6029.5</b>	<b>6150.5</b>	<b>6805.9</b>	<b>7162.7</b>	<b>7205.0</b>	<b>7203.8</b>	<b>7539.9</b>	<b>7619.4</b>	<b>8132.4</b>	<b>8290.7</b>	<b>8703.1</b>	<b>8636.6</b>	<b>9131.8</b>	<b>9514.2</b>	<b>9810.4</b>	<b>9820.6</b>
<b>B. GHG emissions / removals per gas (without LUCF)</b>																
CO <sub>2</sub>	4617.7	4688.6	5204.2	5500.4	5503.8	5499.8	5779.4	5830.0	6267.4	6345.2	6715.7	6620.4	7012.2	7328.7	7622.7	7667.4
CH <sub>4</sub>	711.3	722.9	760.7	781.5	792.1	811.3	812.5	813.0	814.2	866.8	884.1	930.4	963.6	993.2	958.0	979.8
N <sub>2</sub> O	681.6	693.4	783.5	828.6	840.5	820.4	864.9	876.4	934.6	962.4	987.1	969.6	1039.8	1076.1	1113.5	1057.2
<b>Total</b>	<b>6010.6</b>	<b>6104.9</b>	<b>6748.4</b>	<b>7110.4</b>	<b>7136.4</b>	<b>7131.5</b>	<b>7456.8</b>	<b>7519.4</b>	<b>8016.2</b>	<b>8174.4</b>	<b>8586.9</b>	<b>8520.4</b>	<b>9015.6</b>	<b>9398.0</b>	<b>9694.2</b>	<b>9704.4</b>

## 8. Reporting for Articles 3(1)e,g,h,i,j,k

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### 8.1. Article 3(1)e: Changes in 1990–2003 data

The changes made to the emissions' calculations are for

1. *Industrial sector emissions*: data has been revised for years 1998 – 2004. The revised emissions are presented in the tables above, and the new CRF tables accompanying this report.
2. *Other gases*: reporting for carbon monoxide (CO), sulphur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOC) have been revised for the purposes of this report and are currently under revision. It should be noted here that the Department of Labour Inspection, submitted in February 2007 the “LRTAP informative inventory report of Cyprus” (Appendix I), which describes among others the trends for CO, NO<sub>x</sub>, NMVOCs and SO<sub>2</sub>, for 1990 – 2005.

### 8.2. Article 3(1)g: National Registry

The national registry of Cyprus is maintained through the cooperation with the other member states of the European Union with the supplementary transaction log (STL) and the registry of the European Community. The Registry Administrator is Mr. Theodoulos Mesimeris<sup>2</sup>, Environment Officer (Environment Service, Ministry of Agriculture, Natural Resources and Environment). A detailed description of the Cyprus National Registry is presented in the official website of the Environment Service<sup>3</sup>.

### 8.3. Article 3(1)i: Improvement of estimates

As already mentioned above (Section 8.1), changes have been made to the calculations for the industrial sector emissions, and is presented in the new CRF tables.

### 8.4. Article 3(1)j: Information on indicators

The priority indicators used for 2005 are presented in Table 8.1.

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<sup>2</sup> [mesimeris@environment.moa.gov.cy](mailto:mesimeris@environment.moa.gov.cy)

<sup>3</sup> [www.moa.gov.cy](http://www.moa.gov.cy)

**Table 8.1. Indicators used for the 2005 inventory**

No	Indicator
1	Total CO <sub>2</sub> intensity of GDP, t/Mio Euro
2	Energy related CO <sub>2</sub> intensity of GDP, t/Mio Euro
3	Specific CO <sub>2</sub> emissions of passenger cars, t/pkm
4	Specific CO <sub>2</sub> emissions of freight transport on road, t/tkm
5	Energy related of CO <sub>2</sub> intensity of industry, t/Mio Euro
6	Total CO <sub>2</sub> intensity - iron and steel industry, t/Mio Euro
7	Energy related CO <sub>2</sub> intensity - chemical industry, t/Mio Euro
8	Energy related CO <sub>2</sub> intensity - glass, pottery and building materials industry, t/Mio Euro
7	Specific CO <sub>2</sub> emissions of iron and steel industry, t/t
9	Specific energy CO <sub>2</sub> emissions of cement industry, t/t
10	Specific CO <sub>2</sub> emissions of households, t/dwelling
11	Specific CO <sub>2</sub> emissions of households for space heating, t/m <sup>2</sup>
12	CO <sub>2</sub> intensity of the services sector, t/Mio Euro
13	Specific CO <sub>2</sub> emissions of public and private-use power plants, t/TJ

### **8.5. Article 3(1)k: Changes in national inventory system**

The first data collection concerning the Cyprus GHG emissions was performed by the National Observatory of Athens. The report was completed in December 2001, and was the “1<sup>st</sup> National report of Cyprus on GHG emissions”. Until 2006, no further work was performed by the Environment Service for the monitoring of the GHG. However, data was collected and reported under different Directive, as mentioned previously, by the Department of Labour Inspection (Ministry of Labour and Social Insurance). In 2006, a new team, within the Environment Service took over the monitoring and reporting of the GHG emissions for Cyprus, and is the same group that prepared the Inventory Reports for the Decision No 280/2004/EC Article 3(1).