



**BESTANDSAUFNAHME DER EMISSIONEN
AN TREIBHAUSGASEN IN ÖSTERREICH
VON 1990 BIS 2002**

**Berichterstattung gemäß Entscheidung des
Rates 1999/296/EG**

BERICHTE

BE-234

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VORWORT

Im Rahmen der Entscheidung 1999/296/EG des Rates zur *Änderung der Entscheidung 93/389/EWG über ein System zur Beobachtung der Emissionen von CO₂ und anderen Treibhausgasen in der Gemeinschaft*¹ verpflichtete sich Österreich, jährlich bis spätestens 31. Dezember aktualisierte Emissionsdaten an die Europäische Kommission zu übermitteln.

Diese Daten sind entsprechend den Beschlüssen der Vertragstaatenkonferenzen des *Rahmenübereinkommens der Vereinten Nationen über Klimaänderungen* (BGBl. Nr. 414/1994, UN Framework Convention on Climate Change - UNFCCC) zu erstellen. Sie umfassen Emissionen und Senken bezüglich der direkten Treibhausgase CO₂, CH₄, N₂O, HFC, PFC und SF₆, sowie der indirekten Treibhausgase SO₂, NO_x, NMVOC und CO.

Dieser Bericht basiert auf der *Österreichischen Luftschadstoff-Inventur* (OLI) des UMWELTBUNDESAMTES und zeigt den Ausstoß von Luftschadstoffen in Österreich von 1990 bis 2002. Er stellt ausserdem die Zusammenfassung des Nationalen Inventur-Berichtes im Sinne der vom MM¹-Ausschuss am 1. September 2000 beschlossenen Richtlinien ("Guidelines for MS and EC Annual Inventories") dar. Die Methode der Erhebung entspricht den einschlägigen Richtlinien des IPCC².

Das UMWELTBUNDESAMT bereitet sich auf zukünftige Anforderungen an die OLI vor, die sich aus der Klimarahmenkonvention und dem Kyoto-Protokoll ergeben. Entsprechend Artikel 5.1 des Kyoto-Protokolls wird ein Nationales System eingerichtet, dessen Ziel es u.a. ist, die Qualität der Inventur zu verbessern. Es wurde ein Gesamtkonzept für das Nationale Inventur System Austria (NISA) entwickelt, das auf der OLI als zentralem Kern aufbaut. Weiters wird derzeit ein Qualitätsmanagementsystem entsprechend der Norm EN 45004 aufgebaut bzw. umgesetzt.

Im September 2003 fand erneut eine UNFCCC-Tiefenprüfung der Treibhausgas-Inventur durch internationale Fachexpertengruppen statt. Die Ergebnisse dieser Prüfung fließen in den entsprechenden Bericht und in das Inventurverbesserungsprogramm bis 2005 ein.

Mit diesem Bericht wird der, von der Republik Österreich zur Erfüllung der Entscheidung 1999/296/EG zu übermittelnde, Emissionsbericht in englischer Sprache im dafür geforderten CRF³-Berichtsformat wiedergegeben. Es handelt sich hierbei um eine Zusammenfassung der wichtigsten Daten mit Anführung der wesentlichsten methodischen Änderungen. Die detaillierte Darstellung der Daten wird der Europäischen Kommission in digitaler Form übermittelt.

Der vorliegende Bericht wurde vom UMWELTBUNDESAMT auf Grundlage des Umweltkontrollgesetzes BGBl. Nr. 152/1998 erstellt. Der UMWELTBUNDESAMT GmbH wird in diesem Bundesgesetz in § 6 (2) Z.15 unter anderem die Aufgabe übertragen, fachliche Grundlagen zur Erfüllung des Rahmenübereinkommens der Vereinten Nationen über Klimaänderungen zu erstellen. In § 6 (2) Z.20 werden die Entwicklung und Führung von Inventuren und Bilanzen zur Dokumentation des Zustandes und der Entwicklung der Umwelt sowie der Umweltbelastungen und ihrer Ursachen ausdrücklich als besondere Aufgaben des UMWELTBUNDESAMTES genannt.

Das UMWELTBUNDESAMT versteht den vorliegenden Bericht als Beitrag im Rahmen der Wahrnehmung seiner Funktion als Umweltschutzfachstelle des Bundes in Erfüllung der ihm im Umweltkontrollgesetz zugewiesenen Kompetenzen.

¹ im Englischen: Monitoring Mechanism of Community CO₂ and Other Greenhouse Gas Emissions (MM)

² Intergovernmental Panel on Climate Change, Revised 1996 Guidelines

³ Common Reporting Format der UNFCCC

Datengrundlage

Das UMWELTBUNDESAMT führt jährlich eine Inventur des Ausstoßes von Luftschadstoffen durch, die als Grundlage für die Erfüllung der nationalen und internationalen Berichtspflichten herangezogen wird. Diese *Österreichische Luftschadstoff-Inventur* (OLI) wird erforderlichenfalls auch für zurückliegende Jahre aktualisiert, um eine vergleichbare Zeitreihe zur Verfügung zu haben. Die in diesem Bericht dargestellten Emissionsdaten ersetzen somit die publizierten Daten vorhergehender Berichte.

Tabelle 1 fasst den Stand der Daten und das Berichtsformat des vorliegenden Berichtes zusammen.

Tabelle 1: Datengrundlage des vorliegenden Berichtes

<i>Inventur</i>	<i>Datenstand</i>	<i>Berichtsformat</i>
OLI 2003	Dezember 2003	IPCC Common Reporting Format (CRF)

**AUSTRIA'S
ANNUAL NATIONAL GREENHOUSE GAS
INVENTORY 1990 - 2002**

Submission under the Monitoring Mechanism of Community CO₂ and
other Greenhouse Gas Emissions
(1999/296/EC)

Vienna, December 2003

Prepared by UMWELTBUNDESAMT

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1 INTRODUCTION

This report summarises the Austrian greenhouse gas inventory for the years 1990-2002. The greenhouse gas inventory is submitted to the European Commission by the Austrian Federal Government in fulfilment of Austria's obligations under article 3 of Decision 1999/296/EC amending Decision 93/389/EEC for a Monitoring Mechanism of Community CO₂ and other Greenhouse Gas Emissions (MM). The purpose of this decision is to monitor all anthropogenic greenhouse gas emissions not controlled by the Montreal Protocol and to evaluate the progress towards meeting the greenhouse gas reduction commitments under the UNFCCC and the Kyoto Protocol. It follows the Guidelines for Member States and EC Annual Inventories as adopted by the MM-Committee on 1 September 2000.

According to the above mentioned decision and guidelines the reporting requirements are the same under the United Nations Framework Convention on Climate Change (UNFCCC), Member States are obliged to determine their anthropogenic emissions by sources and removals by sinks in accordance with the methodologies accepted by the IPCC and agreed upon by the Conference of the Parties to the UNFCCC. The greenhouse gas inventory has to be submitted to the Commission each year, no later than 31 December.

Under the burden sharing agreement of the European Union, Austria is committed to a reduction of its greenhouse gases by 13% below 1990 levels by 2008-2012. Table 1 shows the summary of Austria's anthropogenic greenhouse gas emissions 1990-2002.

Table 1: Austria's anthropogenic greenhouse gas emissions by gas

GREENHOUSE GAS EMISSIONS	Base year ⁽¹⁾	1990	1995	1996	1997	1998	1999	2000	2001	2002
	CO ₂ equivalent (Gg)									
CO ₂ emissions (without LUCF) ⁽⁶⁾	60 899	60 899	62 474	66 147	65 713	65 808	64 336	65 064	69 037	69 671
CH ₄	9 374	9 374	8 773	8 604	8 337	8 216	8 028	7 791	7 656	7 465
N ₂ O	5 988	5 988	6 372	6 140	6 406	6 184	6 093	6 050	5 970	5 750
HFCs	546	4	546	625	718	816	870	1 033	1 033	1 033
PFCs	16	963	16	15	18	21	25	25	25	25
SF ₆	1 175	518	1 175	1 246	1 148	955	730	677	677	677
Total (without CO₂ from LUCF)⁽⁶⁾	77 998	77 746	79 356	82 776	82 340	82 000	80 083	80 640	84 398	84 621

(1) Base year 1990: CO₂, CH₄, N₂O; base year 1995: HFC, PFC, SF₆

(6) The information in these rows is requested to facilitate comparison of data, since Parties differ in the way they report CO₂ emissions and removals from Land-Use Change and Forestry.

Austria's total greenhouse gases showed an increase of 8.5% from the base year to 2002 (CO₂: +14.4%). In the period from 2001 to 2002 Austria's total greenhouse gases increased by 0.3%, CO₂ emissions increased by 0.9%.

Table 2: Summary of Austria's anthropogenic greenhouse gas emissions by sector

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year ⁽¹⁾	1990	1995	1996	1997	1998	1999	2000	2001	2002
	CO ₂ equivalent (Gg)									
1. Energy	54 910	54 910	57 052	61 101	59 917	60 368	58 976	59 116	63 040	63 843
2. Industrial Processes	10 032	9 780	9 881	9 706	10 282	9 906	9 623	10 258	10 171	10 035
3. Solvent and Other Product Use	515	515	422	405	423	405	391	414	426	426
4. Agriculture	8 444	8 444	8 298	7 997	8 276	7 975	7 842	7 736	7 764	7 402
5. Land-Use Change and Forestry ⁽⁷⁾	-9 215	-9 215	-7 254	-5 385	-7 633	-7 633	-7 633	-7 633	-7 633	-7 633
6. Waste	4 097	4 097	3 702	3 566	3 443	3 346	3 251	3 117	2 998	2 915
7. Other	0	0	0	0	0	0	0	0	0	0

(7) Net emissions

2 RELATION WITH EARLIER REPORTED DATA

As a result of the continuous improvement of Austria's GHG inventory, emissions of some sources have been recalculated based on updated data or revised methodologies, thus emission data for the years 1990 to 2001 submitted this year differ from previously reported data.

A description of these recalculations by sector is given in Chapter 4. The most important revisions with respect to data submitted last year were:

- (1) Recalculation of the time series for emissions from Solid Waste Disposal on Land: new activity data (amount of non residual waste landfilled) became available for the years from 1998 onwards from the Austrian database for solid waste disposals (Deponieverordnungsdatenbank). For the years before the value of 1998 was used, for the last submission a constant value for the quantity of non residual waste based on expert judgement was used. Due to this revision CH₄ emissions decreased significantly over the whole time series (2001: -1245.3 Gg CO₂ equivalent).
- (2) Addition of new sources in the Industrial Processes sector and update of activity data in the Industrial Process and the Energy sector led to a net-increase of emissions from these two sectors for the whole time series (note that emissions due to combustion from cement and iron and steel production have been reallocated from the Industrial Processes to the Energy sector in this submission; for details see Chapter 4).
- (3) A new study covering the Solvents sector which combines a top-down with a bottom-up approach has been finished, results were considered for the inventory.
- (4) The change in emissions from the Agriculture sector are mainly due to a correction of the time series for the split of the age classes of swine. There is an inconsistency of the split in the time series in the statistical data set resulting from a changing methodology of the statistical survey in 1992/1993, that's why the time series has been adjusted using the split from 1993, resulting in higher emissions in the base year.

The figures presented in this report replace data reported earlier by the UMWELTBUNDESAMT under the reporting framework of the UNFCCC. Such earlier data were included in particular in the inventory chapter of the 2001 Third National Climate Report of the UMWELTBUNDESAMT (Austria's Third National Communication, Chapter 4) and in Austria's 2002 submission to the UNFCCC (Austrian Greenhouse Gas Emissions 1990 to 2001).

3 SOURCES OF DATA

- The energy balance of STATISTIK AUSTRIA is the main data supplier of Austria's Greenhouse Gas Inventory.
- Operators of steam boilers of public electricity and heating plants with more than 50 MW report their emissions and activity data to the UMWELTBUNDESAMT. Emissions of the pollutants addressed in the inventory are calculated on the basis of these reported data.
- Operators of landfill sites report their activity data directly to the UMWELTBUNDESAMT. Emissions of the years 1998-2002 are calculated on the basis of these data.
- Activity data for calculation of non energetic emissions are based on several statistics collected by STATISTIK AUSTRIA and national and international studies.

- For some sources of the Industrial Processes sector Associations of Industries or individual plant operators provide information about activity and emission data.

4 METHODOLOGICAL CHANGES WITH RESPECT TO THE PREVIOUS SUBMISSION

This chapter describes the methodological changes made to the inventory since the previous submission to the UNFCCC (April 2003). Further background information and a complete description of the 2003 inventory is given in the National Inventory Report 2004 which will be published in spring 2004.

ENERGY (1 A)

Update of data:

Energy balance

From 1999 on a new industry inquiry (Gütereinsatzstatistik) of the 2000 most important Austrian companies have been considered.

From 1990 on fuel consumption of iron and steel industry and petroleum refinery have been revised by means of energy efficiency information.

From 1990 on the transformation sector have been revised [KWK-Statistik].

The revisions above partly affected the final energy consumption of manufacturing industry and the small combustion sector.

1 A 1 a: For the year 2001 the emission declarations of combustion plants ≥ 50 MW have been updated.

1 A 1, 1 A 2, 1 A 4: Fuel consumption of stationary sources have been updated according to the revised energy balance.

Changes in allocation of emissions:

1 A 2 a: Emissions from from fuel combustion of 2 iron and steel plants so far reported under category *2 C 1* are now reported under this category.

1 A 2 f: Emissions from from fuel combustion in cement industry so far reported under category *2 A 1* are now reported under this category.

1 A 5 b: Emissions from military aviation so far reported under *1 A 3 a* are now reported under this category.

1 A 5 b: Emissions from military transportation so far reported under *1 A 3 b* are now reported under this category.

Changes in methodology:

1 A 5 b: The basis of the recalculation of emissions from military aviation is a new study by Kalivoda M., Kudrna M.: "Air Traffic Emission Calculation for Austria 1990-2000"; a study for the Umweltbundesamt, 2002. Unpublished report.

The emission factors for CO₂ were taken from the emission inventory guidebook. Because of similar conditions in Switzerland, the Swiss emission factors were chosen.

Due to lack of detailed data for N₂O and CH₄ the emission factors for civil aviation were used.

FUGITIVE EMISSIONS (1 B)

Addition of source categories:

1 B 2 b ii: CH₄ and CO₂ emissions from gas transmission in pipelines

1 B 2 b iii: CH₄ emission from gas storage

1 B 2 a ii: CH₄ emissions from oil and gas production

Removal of source categories:

1 B 2 b ii: The time series for CO₂ emissions from gas distribution was deleted, according to the emission factor of the GPG (emission factor is zero).

Changes in methodology:

1 B 1 a ii: Coal Mining/ Surface Mines: for CH₄ emissions the IPCC default emission factor is used, which is higher than the country specific emission factor used before.

Changes in allocation of emissions:

1 B 2 a ii: CO₂ emissions from oil and gas production except CO₂ emissions from the treatment of sour gas have been reallocated from *1 B 2 b i* to *1 B 2 a ii*.

INDUSTRIAL PROCESSES (2)

Addition of source categories:

2 A 3: CO₂ emissions from Limestone and Dolomite Use

2 A 4: CO₂ emissions from Soda Ash Use

2 B 4: CO₂ emissions from Calcium Carbide Production

2 A 7: CO₂ emissions from Bricks Production

2 C 3: CO₂ emissions from Aluminium Production

2 C 1: CO₂ emissions from electric arc furnaces

2 B 5: CH₄ emissions from production of fertilizers

Removal of source categories:

2 D 2: CO₂ emissions Food and Drink Production as these are of biogenic origin.

Changes in allocation of emissions:

2 C 1: In this submission only CO₂ process emissions from iron and steel production (both from steel production in basic oxygen furnaces and from electric furnaces) as well as CH₄ emissions from rolling mills are reported in this category.

In the previous submission CO₂ emissions reported in this category also included emissions due to combustion from the two integrated steel plants operating blast furnaces in Austria.

For this submission process specific emissions have been estimated according to the IPCC Good Practice Guidance and allocated to the respective subcategories of the Industry sector (*2 C 1* steel production, *2 C 1* iron production, *2 A 3* Limestone and

Dolomite Use). A simple approach using statistical data, data reported by the plant operator and default values was applied, for iron production it is mainly based on the non-energy use of coke oven coke taken from the energy balance. Emissions due to combustion, i.e. total CO₂ emissions of these two plants as reported by the plant operators, minus process specific CO₂ emissions estimated as described above by UMWELTBUNDESAMT, were allocated to the Energy sector, following the recommendation of the Expert Review Team during the UNFCCC review process of national inventories.

- 2 A 1:* Emissions due to combustion have been reallocated to the Energy sector, they are now reported under category *1 A 2 f*.
- 2 A 7:* Process specific CO₂ emissions (decarbonising) have been recalculated based on information from industry, they have been split into the categories Limestone and Dolomite Use and Soda Ash Use. All other emissions have been allocated to the Energy sector, as they are mainly emissions due to combustion and difficult to separate.

Update of data:

- 2 A 7:* CO₂ emissions from Magnesite Sinter Plants: the time series has been updated with emission data provided by industry.
- 2 A 2:* CO₂ emissions from Lime Production: the time series has been updated with emission data provided by associations of industries.
- 2 A 5:* CH₄ emissions from Asphalt Roofing: activity data for 2001 has been updated using statistical data.
- 2 B 2:* N₂O emissions from Nitric Acid Production: emission and activity data have been corrected as indicated in the NIR 2003.
- 2 C 1:* CH₄ emissions from Iron and Steel Production: activity data have been harmonized with those used for calculating CO₂ emissions from this source.

SOLVENT AND OTHER PRODUCT USE (3)

A new study covering the Solvents sector which combines a top-down with a bottom-up approach has been finished, results were considered for the inventory.

AGRICULTURE (4)

4 A 1 a, 4 B 1 a, 4 D:

The time series of annual milk yields was revised by STATISTIK AUSTRIA. As the methodology for emissions from manure production of dairy cattle is based on milk yield data, this revision resulted in significantly higher emissions from this category.

4 B 8:

As recommended in the centralised review (October 2003), the age class split for swine categories for the years 1990–1992 was adjusted because there is an inconsistency in the time series in the statistical data set resulting from a changing methodology of the statistical survey in 1992/1993. The time series has been adjusted using the split from 1993, resulting in higher emissions for the years 1990-1992.

4 D:

Data on synthetic fertiliser use have been updated for the years 2001 and 2002.

Changes in allocation of emissions:

Sewage sludge spread on agricultural soils:

In the previous submission CH₄ emissions from sludge spreading were reported under category 6 D. Now they are reported under 4 D 1.

The fraction of carbon in sludge emitted as CH₄ has been revised due to results of a new study⁴: previously 5% has been used, according to this study 52% of the carbon in sludge is emitted as CH₄.

WASTE (6)

6 A 1:

Residual Waste: activity data from 1998 to 2002 have been updated on the basis of the Austrian database for solid waste disposals. In the previous submission the amount of waste from administrative facilities of industry was included in the years from 1998 to 2002 but not included in the years before 1998. Therefore the activity data for the time series 1990 to 1997 have been recalculated.

Non Residual Waste: previously the amount of non-residual waste has been estimated based on expert judgement, now activity data for the years from 1998 to 2002 is taken from the Austrian database for solid waste disposal sites. No data was available for the years before 1998 from this database, therefore the values of 1998 was also used for the years 1990-1997.

The operators of landfill sites reported their annual collected landfill gas in the context of an investigation of the UMWELTBUNDESAMT. Emissions have been recalculated on the basis of these data.

The Bio-degradable organic carbon content (DOC) has been corrected according to a new study of the Umweltbundesamt.

5 METHOD OF REPORTING AND DATA BASIS

The Austrian greenhouse gas inventory for the period 1990 to 2002 was compiled according to the recommendations for inventories set out in the UNFCCC reporting guidelines according to Decision 3/CP.5, the Common Reporting Format (CRF) and the IPCC 1996 Guidelines for National Greenhouse Gas Inventories, which specify the reporting obligations according to Articles 4 and 12 of the UNFCCC.

Regulations under the UNFCCC and the Kyoto Protocol define the new standards for national emission inventories. These standards include more stringent requirements related to transparency, consistency, comparability, completeness and accuracy of inventories. Each Party shall have in place a national system, no later than one year prior to the start of the first

⁴ SCHÄFER; R. (2002): Neues Konzept zum Düngemittleinsatz. In VKS News 65. Ausgabe 08/2002. Institute for Applied Ecology.

commitment period (2008-2012). This national system shall include all institutional, legal and procedural arrangements made within a Party 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.

As the National Inventory System Austria (NISA) shall fulfil the requirements of the Kyoto Protocol following Article 5.1, the UMWELTBUNDESAMT is now taking further steps to set up the inventory system and is currently implementing a quality management system based on the EN 45004. This system takes into account recommendations of European and international documents such as the ISO 9000 series of standards and Guide-G24 (Accreditation of Inspection Bodies – Guidelines on the application of EN 45004. European Co-operation for Accreditation: 1996) as far as they are relevant for inspection bodies. The accreditation as inspection body is planned.

In Austria, emissions of greenhouse gases are estimated together with emissions of air pollutants in a data base based on the CORINAIR (CORe INventory AIR)/ SNAP (Selected Nomenclature for sources of Air Pollution) systematic. This nomenclature is designed to estimate not only emissions of greenhouse gases but all kind of air pollutants. To comply with the reporting obligations under the UNFCCC, emissions are transformed according to the IPCC Guidelines into the UNFCCC Common Reporting Format.

The Austrian greenhouse gas inventory is subject of continuous improvements, resulting in recalculations as outlined in Chapters 2 and 4. Issues identified in the reviews of the inventory by the UNFCCC are considered for the inventory improvement program, the last review took place in September 2003.

A first comprehensive uncertainty analysis was performed in the form of a pilot study by WINIWARTER & RYPDAL⁵, 2001 on greenhouse gases CO₂, CH₄, and N₂O for the years 1990 and 1997.

Annex 1 to this report presents Austria's greenhouse gas inventory data (CO₂-emissions, CO₂-removals, CH₄, N₂O, HFC, PFC and SF₆) in the format of the CRF Summary Table 10 (Emission Trends) IPCC Table 7A.

The complete tables of the Common Reporting Format, including in particular Sectoral Reports, Sectoral Background Tables and a Reference Approach for CO₂ are submitted separately in digital form only (excel files).

Following table summarises the status of the present report:

Table 2: Status of the present report

<i>Reporting Obligation</i>	<i>Format</i>	<i>Inventory</i>	<i>Version</i>
Monitoring Mechanism	Common Reporting Format (IPCC)	OLI 2003	December 2003

⁵ WINIWARTER, W.; RYPDAL, K. (2001): Assessing the Uncertainty Associated with National Greenhouse Gas Emission Inventories: A Case Study for Austria, Accepted for publication in Atmospheric Environment.

6 ANNEX 1

NOTATION KEYS

This report uses the following UNFCCC notation keys for all tables:

- NO** (not occurring): for emissions by sources and removals by sinks of greenhouse gases that do not occur for a particular gas or source/sink category.
- NE** (not estimated): for existing emissions by sources and removals by sinks of greenhouse gases which have not been estimated.
- IE** (included elsewhere): for emissions by sources and removals by sinks of greenhouse gases estimated but included elsewhere in the inventory instead of the expected source/sink category.
- 0**: for emissions by sources and removals by sinks of greenhouse gases which are estimated to be less than one half the unit being used to record the inventory table and which therefore appear as zero after rounding.

Table 3: Emission Trends CO₂

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year ⁽¹⁾	1990	1995	1996	1997	1998	1999	2000	2001	2002
	(Gg)									
1. Energy	53 218.87	53 218.87	54 992.95	59 023.90	57 983.84	58 414.13	57 098.19	57 306.43	61 188.51	61 981.95
A. Fuel Combustion (Sectoral Approach)	53 116.84	53 116.84	54 865.92	58 952.87	57 863.33	58 272.30	56 927.65	57 141.90	61 005.77	61 814.92
1. Energy Industries	13 475.12	13 475.12	12 438.20	13 695.83	13 675.08	12 847.42	12 796.98	12 500.81	14 511.94	15 013.10
2. Manufacturing Industries and Construction	13 032.63	13 032.63	13 805.30	13 524.42	15 011.66	14 161.59	13 318.76	13 706.53	12 920.20	12 504.07
3. Transport	12 759.20	12 759.20	14 418.49	16 063.85	15 013.44	17 093.93	16 551.64	17 437.19	18 705.54	20 606.16
4. Other Sectors	13 814.87	13 814.87	14 171.35	15 629.83	14 126.02	14 126.92	14 218.65	13 452.42	14 824.69	13 650.84
5. Other	35.02	35.02	32.59	38.94	37.13	42.45	41.62	44.95	43.40	40.75
B. Fugitive Emissions from Fuels	102.03	102.03	127.03	71.03	120.51	141.83	170.53	164.53	182.73	167.03
1. Solid Fuels	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
2. Oil and Natural Gas	102.03	102.03	127.03	71.03	120.51	141.83	170.53	164.53	182.73	167.03
2. Industrial Processes	7 377.00	7 377.00	7 281.47	6 939.93	7 528.79	7 210.70	7 068.33	7 565.32	7 643.77	7 484.49
A. Mineral Products	3 242.73	3 242.73	2 825.81	2 738.24	2 938.01	2 765.73	2 750.73	2 804.29	2 814.17	2 910.66
B. Chemical Industry	461.34	461.34	514.86	516.90	507.83	555.63	524.86	532.29	509.05	510.25
C. Metal Production	3 672.92	3 672.92	3 940.79	3 684.79	4 082.95	3 889.34	3 792.74	4 228.74	4 320.56	4 063.58
D. Other Production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Production of Halocarbons and SF ₆										
F. Consumption of Halocarbons and SF ₆									NE	NE
G. Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
3. Solvent and Other Product Use	282.67	282.67	189.88	172.81	190.09	172.24	158.37	181.02	193.60	193.60
4. Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A. Enteric Fermentation	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
B. Manure Management	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
C. Rice Cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural Soils ⁽²⁾	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
G. Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
5. Land-Use Change and Forestry⁽³⁾	-9 214.81	-9 214.81	-7 254.00	-5 385.22	-7 633.36	-7 633.36	-7 633.36	-7 633.36	-7 633.36	-7 633.36
A. Changes in Forest and Other Woody Biomass Stocks	-9 214.81	-9 214.81	-7 254.00	-5 385.22	-7 633.36	-7 633.36	-7 633.36	-7 633.36	-7 633.36	-7 633.36
B. Forest and Grassland Conversion	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
C. Abandonment of Managed Lands	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
D. CO ₂ Emissions and Removals from Soil	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
E. Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
6. Waste	20.70	20.70	10.09	10.40	10.70	10.99	11.31	11.28	11.24	11.24
A. Solid Waste Disposal on Land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B. Waste-water Handling	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C. Waste Incineration	20.70	20.70	10.09	10.40	10.70	10.99	11.31	11.28	11.24	11.24
D. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
7. Other (please specify)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Emissions/Removals with LUCF⁽⁴⁾	51 684.42	51 684.42	55 220.38	60 761.82	58 080.06	58 174.72	56 702.84	57 430.70	61 403.76	62 037.93
Total Emissions without LUCF⁽⁴⁾	60 899.24	60 899.24	62 474.38	66 147.04	65 713.42	65 808.07	64 336.20	65 064.05	69 037.12	69 671.29
Memo Items:										
International Bunkers	885.97	885.97	1 327.42	1 466.42	1 525.57	1 578.21	1 541.67	1 674.93	1 614.75	1 512.24
Aviation	885.97	885.97	1 327.42	1 466.42	1 525.57	1 578.21	1 541.67	1 674.93	1 614.75	1 512.24
Marine	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Multilateral Operations	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
CO₂ Emissions from Biomass	9 750.24	9 750.24	11 254.16	11 973.05	12 058.41	11 474.32	11 960.24	11 691.36	13 112.68	13 562.05

- (1) Fill in the base year adopted by the Party under the Convention, if different from 1990.
- (2) See footnote 4 to Summary 1.A of this common reporting format.
- (3) Take the net emissions as reported in Summary 1.A of this common reporting format. Please note that for the purposes of reporting, the signs for uptake are always (-) and for emissions (+).
- (4) The information in these rows is requested to facilitate comparison of data, since Parties differ in the way they report CO₂ emissions and removals from Land-Use Change and Forestry.

General notes on the consistency with last year's submission:

Category 1 A 2 a:

Emissions due to combustion from iron and steel production in the previous submission reported under category 2 C 1 are now reported under this category.

Category 1 A 5 b:

Emissions from military aviation and transportation in the previous submission reported under the categories 1 A 3 a and 4 A 3 b are now reported under category 1 A 5 b.

Table 4: Emission Trends CH₄

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year ⁽¹⁾	1990	1995	1996	1997	1998	1999	2000	2001	2002
	(Gg)									
Total Emissions	446.39	446.39	417.78	409.69	397.00	391.25	382.26	370.98	364.56	355.46
1. Energy	35.46	35.46	33.74	35.56	31.06	30.47	30.38	28.93	30.60	29.69
A. Fuel Combustion (Sectoral Approach)	22.24	22.24	19.78	20.63	16.23	15.66	15.35	14.34	15.83	15.24
1. Energy Industries	0.15	0.15	0.16	0.18	0.20	0.18	0.17	0.17	0.20	0.26
2. Manufacturing Industries and Construction	0.41	0.41	0.43	0.44	0.48	0.44	0.46	0.44	0.43	0.37
3. Transport	2.86	2.86	2.29	2.08	1.91	1.91	1.72	1.61	1.54	1.56
4. Other Sectors	18.82	18.82	16.89	17.93	13.65	13.12	13.00	12.11	13.65	13.04
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive Emissions from Fuels	13.22	13.22	13.96	14.93	14.83	14.81	15.02	14.60	14.77	14.45
1. Solid Fuels	0.52	0.52	0.28	0.24	0.24	0.24	0.24	0.27	0.26	0.26
2. Oil and Natural Gas	12.70	12.70	13.68	14.69	14.59	14.57	14.78	14.33	14.51	14.19
2. Industrial Processes	0.33	0.33	0.28	0.28	0.30	0.32	0.27	0.27	0.25	0.39
A. Mineral Products	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.04	0.04
B. Chemical Industry	0.29	0.29	0.24	0.24	0.26	0.29	0.23	0.23	0.21	0.35
C. Metal Production	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Other Production	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
E. Production of Halocarbons and SF ₆										
F. Consumption of Halocarbons and SF ₆										
G. Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
3. Solvent and Other Product Use	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4. Agriculture	218.67	218.67	211.28	207.96	205.48	204.94	200.69	197.13	194.76	190.35
A. Enteric Fermentation	169.68	169.68	163.51	161.10	158.61	157.56	155.78	153.54	150.83	147.83
B. Manure Management	48.59	48.59	47.25	46.34	46.35	46.86	44.39	43.07	43.42	42.02
C. Rice Cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural Soils	0.33	0.33	0.44	0.45	0.45	0.45	0.45	0.45	0.43	0.43
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.07
G. Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
5. Land-Use Change and Forestry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A. Changes in Forest and Other Woody Biomass Stocks	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
B. Forest and Grassland Conversion	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
C. Abandonment of Managed Lands	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
D. CO ₂ Emissions and Removals from Soil	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
E. Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
6. Waste	191.93	191.93	172.48	165.89	160.16	155.52	150.93	144.65	138.95	135.03
A. Solid Waste Disposal on Land	177.69	177.69	157.15	150.48	144.81	140.15	135.51	129.24	123.68	119.75
B. Waste-water Handling	13.73	13.73	14.29	14.31	14.34	14.35	14.37	14.40	14.27	14.27
C. Waste Incineration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Other	0.52	0.52	1.04	1.09	1.01	1.02	1.05	1.01	1.01	1.01
7. Other (please specify)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Memo Items:										
International Bunkers	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03
Aviation	0.01	0.01	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03
Marine	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Multilateral Operations	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
CO₂ Emissions from Biomass										

General notes on the consistency with last year's submission:**Category 1 A 2 a:**

Emissions due to combustion from iron and steel production in the previous submission reported under category 2 C 1 are now reported under this category.

Category 1 A 5 b:

Emissions from military aviation and transportation in the previous submission reported under categories 1 A 3 a and 4 A 3 b are now reported under category 1 A 5 b.

Category 4 D 1:

Emissions from sludge spreading in the previous submission reported under category 6 D are now reported under this category.

Table 5: Emission Trends N₂O

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year ⁽¹⁾	1990	1995	1996	1997	1998	1999	2000	2001	2002
	(Gg)									
Total Emissions	19.32	19.32	20.55	19.80	20.66	19.95	19.66	19.52	19.26	18.55
1. Energy	3.05	3.05	4.36	4.29	4.13	4.24	4.00	3.88	3.90	3.99
A. Fuel Combustion (Sectoral Approach)	3.05	3.05	4.36	4.29	4.13	4.24	4.00	3.88	3.90	3.99
1. Energy Industries	0.15	0.15	0.16	0.16	0.15	0.17	0.17	0.17	0.20	0.20
2. Manufacturing Industries and Construction	0.44	0.44	0.50	0.50	0.55	0.55	0.54	0.54	0.54	0.52
3. Transport	1.57	1.57	2.72	2.59	2.40	2.48	2.24	2.14	2.08	2.24
4. Other Sectors	0.89	0.89	0.97	1.04	1.03	1.04	1.05	1.02	1.07	1.03
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive Emissions from Fuels	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1. Solid Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Oil and Natural Gas	IE	IE	IE	IE	IE	IE	IE	IE	IE	NE
2. Industrial Processes	2.94	2.94	2.77	2.82	2.78	2.89	2.98	3.07	2.54	2.60
A. Mineral Products	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00
B. Chemical Industry	2.94	2.94	2.77	2.82	2.78	2.89	2.98	3.07	2.54	2.60
C. Metal Production	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Other Production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Production of Halocarbons and SF ₆										
F. Consumption of Halocarbons and SF ₆										
G. Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
3. Solvent and Other Product Use	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
4. Agriculture	12.42	12.42	12.46	11.71	12.78	11.84	11.70	11.60	11.85	10.98
A. Enteric Fermentation	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
B. Manure Management	2.54	2.54	2.50	2.45	2.43	2.42	2.38	2.34	2.31	2.26
C. Rice Cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural Soils	9.88	9.88	9.96	9.25	10.34	9.41	9.32	9.26	9.54	8.72
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
G. Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
5. Land-Use Change and Forestry	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A. Changes in Forest and Other Woody Biomass Stocks	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
B. Forest and Grassland Conversion	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
C. Abandonment of Managed Lands	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
D. CO ₂ Emissions and Removals from Soil	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
E. Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
6. Waste	0.15	0.15	0.23	0.23	0.22	0.22	0.23	0.22	0.22	0.22
A. Solid Waste Disposal on Land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
B. Waste-water Handling	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
C. Waste Incineration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Other	0.08	0.08	0.15	0.16	0.14	0.15	0.15	0.14	0.14	0.14
7. Other (please specify)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Memo Items:										
International Bunkers	0.03	0.03	0.05	0.05	0.05	0.06	0.05	0.06	0.06	0.05
Aviation	0.03	0.03	0.05	0.05	0.05	0.06	0.05	0.06	0.06	0.05
Marine	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Multilateral Operations	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
CO₂ Emissions from Biomass										

General notes on the consistency with last year's submission:**Category 1 A 2 a:**

Emissions due to combustion from iron and steel production in the previous submission reported under category 2 C 1 are now reported under this category.

Category 1 A 5 b:

Emissions from military aviation and transportation in the previous submission reported under categories 1 A 3 a and 4 A 3 b are now reported under category 1 A 5 b.

Table 6: Emission Trends HFCs, PFCs and SF₆

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	Base year ⁽¹⁾	1990	1995	1996	1997	1998	1999	2000	2001	2002
	(Gg)									
Emissions of HFCs⁽⁵⁾ - CO₂ equivalent (Gg)	546.07	3.69	546.07	624.83	718.02	815.61	870.46	1 033.25	1 033.25	1 033.25
HFC-23	0.0002	0.0002	0.0002	0.0003	0.0003	0.0004	0.0005	0.0006	0.0006	0.0006
HFC-32	0.0001	0.0000	0.0001	0.0002	0.0004	0.0006	0.0009	0.0017	0.0017	0.0017
HFC-41	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-43-10mee	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-125	0.0014	0.0000	0.0014	0.0057	0.0110	0.0148	0.0162	0.0219	0.0219	0.0219
HFC-134	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-134a	0.4143	0.0014	0.4143	0.4578	0.5089	0.5677	0.6020	0.6531	0.6531	0.6531
HFC-152a	0.0001	0.0000	0.0001	0.0003	0.0006	0.0008	0.0007	0.4522	0.4522	0.4522
HFC-143	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-143a	0.0004	0.0000	0.0004	0.0025	0.0056	0.0081	0.0095	0.0136	0.0136	0.0136
HFC-227ea	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001	0.0001	0.0002	0.0002	0.0002
HFC-236fa	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HFC-245ca	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Emissions of PFCs⁽⁵⁾ - CO₂ equivalent (Gg)	15.62	963.17	15.62	14.79	18.26	20.85	25.32	25.16	25.16	25.16
CF ₄	0.0008	0.1328	0.0008	0.0007	0.0009	0.0009	0.0015	0.0015	0.0015	0.0015
C ₂ F ₆	0.0011	0.0109	0.0011	0.0011	0.0014	0.0016	0.0017	0.0017	0.0017	0.0017
C ₃ F ₈	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C ₄ F ₁₀	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
c-C ₄ F ₈	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C ₅ F ₁₂	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C ₆ F ₁₄	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Emissions of SF₆⁽⁵⁾ - CO₂ equivalent (Gg)	1 174.74	517.74	1 174.74	1 246.13	1 148.06	954.90	729.90	676.95	676.95	676.95
SF ₆	0.05	0.02	0.05	0.05	0.05	0.04	0.03	0.03	0.03	0.03