PERSPEKTIVEN FÜR UMWELT & GESELLSCHAFT umweltbundesamt

Austria's Annual Greenhouse Gas Inventory 1990–2008

Submission under Decision 280/2004/EC

ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

AUSTRIA'S ANNUAL GREENHOUSE GAS INVENTORY 1990–2008

Submission under Decision 280/2004/EC

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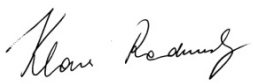
Date 15.01.2010	Responsible for the content of this report  Dr. Klaus Radunsky (Head of the inspection body)
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VORWORT

Dieser Bericht

Der vorliegende Bericht präsentiert die neuesten Daten der Treibhausgas (THG)-Emissionen Österreichs. Diese Daten betreffen die Emissionen des Jahres 2008 sowie die aktualisierte Zeitreihe der Jahre 1990 bis 2007. Der Bericht liefert damit den THG Emissionswert für das erste Jahr der Verpflichtungsperiode des Kyoto-Protokolls.

Er folgt in Format und Inhalt den verbindlichen Anforderungen des THG-Überwachungssystems 280/2004/EG[1] der EU zur Umsetzung des Kyoto-Protokolls. Dieses System umfasst die jährliche Übermittlung von aktualisierten THG-Emissionsdaten und einem dazugehörigen Kurzbericht („Short-NIR") mit 15. Jänner an die Europäische Kommission[2]. Eine detaillierte Darstellung der Daten wird der Europäischen Kommission in digitaler Form übermittelt.

Rechtlicher Hintergrund

Als Vertragsstaat der Klimarahmenkonvention (*Rahmenübereinkommens der Vereinten Nationen über Klimaänderungen* (UN Framework Convention on Climate Change – UNFCCC, BGBl. Nr. 414/1994)) ist Österreich verpflichtet, jährlich seine Emissionen und Senken bezüglich der direkten Treibhausgase CO_2, CH_4, N_2O, HFC, PFC und SF_6, sowie der indirekten Treibhausgase NO_x, NMVOC, CO und SO_2 zu erheben und zu berichten. Die dafür anzuwendende Methodik ist in einem umfassenden Regelwerk entsprechend den Beschlüssen der Vertragsstaatenkonferenz der UNFCCC festgelegt.

Auch die Europäische Union (EU) ist Vertragsstaat der Klimarahmenkonvention. Die EU Inventur wird aus der Summe der Mitgliedsstaaten-Inventuren errechnet. Deshalb hat die EU mit dem o. g. THG Überwachungssystem die Anforderungen, die an die EU gestellt werden an die Mitgliedsstaaten weitergegeben und diese dazu verpflichtet, Daten und Informationen, die für die Erstellung der EU Inventur benötigt werden, rechtzeitig zur Verfügung zu stellen. Mit dem vorliegenden Bericht kommt Österreich dieser Berichtspflicht nach.

Die Erhebung der Daten berücksichtigt außerdem die Ergebnisse der jährlichen Überprüfung durch die UNFCCC im Rahmen der so genannten UNFCCC-Tiefenprüfung. Im September 2008 fand die letzte dieser Tiefenprüfungen der Österreichischen Treibhausgas-Inventur durch internationale Fachexperten statt. Die Ergebnisse dieser Prüfung, welche voraussichtlich noch im Jänner 2010 veröffentlicht werden, werden in das Inventurverbesserungsprogramm 2010 einfließen (siehe Tabelle A).

[1] Entscheidung Nr. 280/2004/EG des Europäischen Parlaments und des Rates vom 11. Februar 2004 über ein System zur Überwachung der Treibhausgasemissionen in der Gemeinschaft und zur Umsetzung des Kyoto-Protokolls.

[2] Der vorliegende Bericht beinhaltet die folgenden Elemente des THG-Überwachungssystems 280/2004/EG: Zusammenfassung des Nationalen Inventur-Berichtes im Sinne des Artikels 3 (1) f; Artikel 3 (1) i: methodische Verbesserungen („Recalculations"); Artikel 3 (1) j: Indikatoren; Artikel 3 (1) k: Informationen zu Änderungen des Nationalen Inventursystems; Artikel 3 (1) g: Informationen des Registers; und Artikel 3 (1) h: Informationen über juristische Personen, die befugt sind, sich an den Mechanismen nach den Artikeln 6, 12 und 17 des Kyoto-Protokolls unter Beachtung der einschlägigen nationalen oder gemeinschaftlichen Bestimmungen zu beteiligen.

Tabelle A: Jährlicher Prozess zur Erstellung und Überarbeitung der THG Inventur.

15. Jänner *(Jahr n)*	Übermittlung der THG Inventur an EK (für die Jahre 1990 bis zum Jahr n-2)
15. Jänner bis 28. Februar *(Jahr n)*	Überprüfung der Daten durch die EK
15. April *(Jahr n)*	Übermittlung der THG Inventur an UNFCCC
Juni *(Jahr n)* bis März *(Jahr n+1)*	Überprüfung der Daten durch UNFCCC: – Stufe 1: Initial Check – Stufe 2: Synthesis and Assessment – Stufe 3: Individual Review
bis 15. Januar *(Jahr n + 1)*	Berücksichtigung der Kommentare der EK und der UNFCCC bei der Erstellung und Überarbeitung der THG Inventur

Zur Erfüllung der Anforderungen, die sich aus der Klimarahmenkonvention und vor allem aus dem Inkrafttreten des Kyoto-Protokolls am 16. Februar 2005 ergeben haben, wurde entsprechend Artikel 5.1 des Kyoto-Protokolls ein Nationales System eingerichtet. Ziel ist es, die Qualität der Inventur sicherzustellen und kontinuierlich zu verbessern. Dazu wurde ein Gesamtkonzept für das Nationale Inventur System Austria (NISA) entwickelt, das auf der *Österreichischen Luftschadstoff-Inventur* (OLI) als zentralem Kern aufbaut. Ein umfassendes Inventurverbesserungsprogramm und ein Qualitätsmanagementsystem entsprechend ISO/IEC 17020 sind ein wesentlicher Teil des NISA[3].

Der vorliegende Bericht wurde vom Umweltbundesamt auf Grundlage des Umweltkontrollgesetzes BGBl. Nr. 152/1998 erstellt. Dem Umweltbundesamt 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.

Dieser Aufgabe wird mit der Erstellung sowie der jährlichen Aktualisierung der *Österreichischen Luftschadstoff-Inventur* (OLI) gemäß den in den relevanten internationalen Übereinkommen vereinbarten Richtlinien vom Umweltbundesamt nachgekommen. Die OLI deckt sowohl Treibhausgasemissionen, als auch Emissionen sonstiger Luftschadstoffe ab und ist damit u. a. die Datenbasis für die Erstellung des vorliegenden Berichts.

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 B: Datengrundlage des vorliegenden Berichts.

Inventur	**Datenstand**	**Berichtsformat**
OLI 2009	Dezember 2009	Common Reporting Format (CRF)

[3] Umweltbundesamt (2005): NISA National Inventory System Austria, Implementation Report, REP-0004; Umweltbundesamt, Vienna.

ZUSAMMENFASSUNG

Die hier dargestellte Entwicklung der Treibhausgase in Österreich folgt in der Einteilung den Sektoren der Klimastrategie 2007.[4]

Im Jahr 2008, dem ersten Jahr der Kyoto Verpflichtungsperiode 2008–2012, liegt die Gesamtmenge der von Österreich emittierten Treibhausgase bei 86,6 Mio. Tonnen CO_2-Äquivalente. Dies entspricht einem Rückgang um 0,3 Mio. Tonnen bzw. 0,4 % gegenüber 2007 und einem Anstieg von 10,9 % gegenüber dem Kyoto-Basisjahr 1990.

Die stärksten Reduktionen im Vergleich zu 2007 weisen die Sektoren Verkehr und Energieaufbringung auf, deutliche Steigerungen verzeichneten die Sektoren Raumwärme und Industrie.

Kyoto-Zielerreichung

Entsprechend dem Österreichischen Kyoto Ziel – minus 13 % im Zeitraum 2008–2012 gegenüber 1990 – dürften in der gesamten Zielperiode 344 Mio. Tonnen Kohlendioxidäquivalente emittiert werden, dies sind 68,8 Mio. Tonnen Treibhausgase pro Jahr.

Damit ergibt sich, unter Berücksichtigung der flexiblen Mechanismen wie dem JI/CDM-Programm, der Bilanz aus Neubewaldung und Entwaldung[5] und des EU-Emissionshandels, für das erste Kyoto-Verpflichtungsjahr (2008) eine Abweichung von 6,9 Mio. Tonnen.

Verkehr

Der Sektor Verkehr ist mit ca. 22,6 Mio. Tonnen im Jahr 2008 der zweitgrößte Emittent von Treibhausgasemissionen in Österreich. Der Reduktionseffekt durch den Einsatz von Biokraftstoffen beträgt im Jahr 2008 ungefähr 1,3 Mio. Tonnen Kohlendioxid-Äquivalente. Mit einem Plus von 61 % seit 1990 wird in diesem Sektor die mit Abstand höchste Zuwachsrate verzeichnet.

Sektoren im Emissionshandel: Industrie und Energieaufbringung

Der Sektor Industrie ist im Jahr 2008 mit ca. 26,4 Mio. Tonnen Kohlendioxid-Äquivalenten der größte Emittent an Treibhausgasen in Österreich. Trotz verbesserter Kohlenstoffintensität steigen die Emissionen in diesem Sektor seit 1990 aufgrund höherer Produktionsmengen. Auswirkungen der Wirtschaftskrise zeigen sich in den Emissionsdaten des Jahres 2008 noch kaum.

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[4] Die Entsprechung der Klimastrategie-Sektoren mit den Sektoren des CRF-Formats wie sie für den englischsprachlichen Teil dieses Berichts verwendet wird, ist wie folgt – CRF Bezeichnung in Klammern: Raumwärme (1.A.4), Verkehr (1.A.3+1.A.5), Energieaufbringung (1.A.1), Industrie (1.A.2+2 ohne F-Gase), Landwirtschaft (4), Abfallwirtschaft (6), F-Gase (F-Gase aus 2), Sonstige (1.B+3);

[5] Nähere Informationen zur Erstellung der Bilanz aus Neubewaldung und Entwaldung sind im NIR enthalten.

Die Treibhausgasemissionen des Sektors Energieaufbringung belaufen sich 2008 auf ca. 13,5 Mio. Tonnen. Die Reduktionen, die in diesem Sektor seit 1990 erzielt wurden, sind auf den Ersatz von Kohle und Heizöl durch Erdgas und Biomasse sowie auf Effizienzsteigerungen zurückzuführen.

Seit 2005 unterliegt ein Großteil der Anlagen dieser beiden Sektoren dem EU Emissionshandel; damit ist der Beitrag der Emissionen dieser Anlagen zur Kyoto-Zielerreichung durch den Nationalen Zuteilungsplan festgelegt.

Raumwärme

Auf den Sektor Raumwärme entfallen 2008 ca. 12,0 Mio. Tonnen Treibhausgasemissionen. Der verstärkte Einsatz von Fernwärme und Erneuerbaren Energieträgern sowie die bessere thermische Qualität der Gebäude führten in den letzten Jahren zu Emissionsminderungen. Witterungsbedingt unterliegen die Emissionen in diesem Sektor jährlichen Schwankungen.

Abfallwirtschaft, Landwirtschaft, F-Gase und Sonstige

Die Sektoren Abfallwirtschaft (ca. 2 Mio. Tonnen) und Landwirtschaft (ca. 7,6 Mio. Tonnen) weisen im Vergleich zu 1990 deutlich geringere Emissionen auf. Die F-Gas-Emissionen (ca. 1,6 Mio. Tonnen) und Sonstige (ca. 0,9 Mio. Tonnen) blieben seit 1990 weitgehend konstant. Insgesamt verursachen diese vier Sektoren 12,1 Mio. Tonnen der österreichischen Treibhausgasemissionen.

Eine detaillierte Analyse des Trends und der treibenden Kräfte der Zeitreihe wird im Klimaschutzbericht des Umweltbundesamts, der im Auftrag des Bundesministeriums für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft (BMLFUW) erstellt wird, zu finden sein.

1 INTRODUCTION

This report updates the Austrian greenhouse gas inventory data for the years 1990 to 2008; it presents the greenhouse gas emission data for the first year of the first commitment period under the Kyoto-Protocol.

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 280/2004/EC ("Monitoring Decision"; replacing Decision 389/1992/EEC amended by Decision 296/1999/EEC) concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol. 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.

According to the above mentioned decision and guidelines and the reporting requirements, which are the same as 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 *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the *Intergovernmental Panel on Climate Change (IPCC) Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, and the *IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry* as well as the Reporting Guidelines established by the Conference of the Parties to the UNFCCC and under the Kyoto Protocol.

The greenhouse gas inventory has to be submitted to the Commission every year no later than 15 January. Furthermore, Member States have to submit by 15 January elements of their National Inventory Reports (NIR) relevant for preparation of the community inventory report (Article 3 (1) f). The elements of the so-called "Short-NIR" are further specified in Article 4 of the Implementing Provisions to 280/2004/EC (Commission Decision 2005/166/EC).

This report was prepared to fulfil the reporting obligations of Article 3 (1) f ("Short-NIR") and of Article 3 (1) i-k (Information on recalculations, reporting on indicators and information on changes of the national systems) of the Monitoring Decision. Since 2008 the reporting under Article 3 (1) g (information from the national registry) and 3 (1) h (information on legal entities authorised to participate in mechanisms of the Kyoto Protocol) is obligatory and is therefore also included in this report.

2 EMISSION TRENDS

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.

The following figure depicts the trend of Austria's GHG emissions and also shows Austria's Kyoto Target for 2008–2012. The figure excludes emission sources and sinks from the sector Land Use, Land Use Change and Forestry as reported under the UNFCCC.

It has to be noted that for judging the compliance under the Kyoto Protocol sources and sinks related to Article 3.3 of the Kyoto Protocol have to be considered, and also the use of flexible mechanisms under the Kyoto Protocol has to be accounted for.

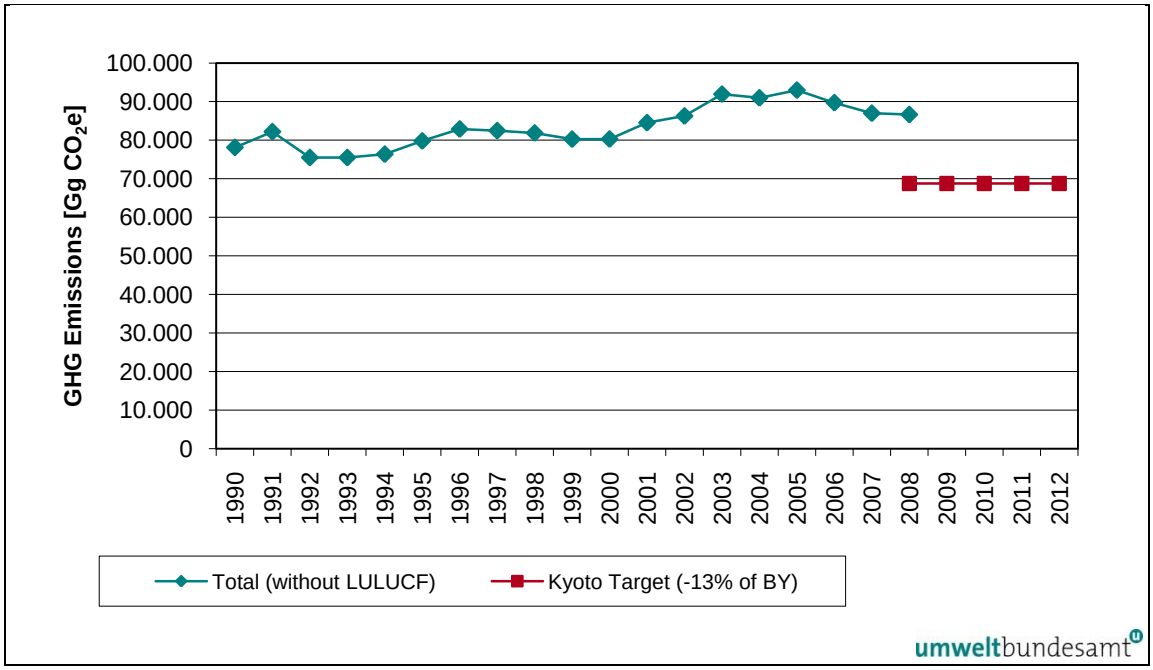

Figure 1: Trend in total GHG emissions 1990–2008 without LULUCF.

Austria's total greenhouse gas emissions without LULUCF show an increase of 10.9% from the base year to 2008 (CO_2: +18.6%). The trend is dominated by the trend of the most important sector – the energy sector.

In 2008 Austria's total greenhouse gas emissions (without LULUCF) decreased by 0.4% compared to 2007, CO_2 emissions decreased by 0.5%.

The key drivers for this slight downward trend 2007–2008 were the decreasing amount of fuel consumed in the sector transport (road transport) and the reduced use of liquid and solid fuels for electrical power and district heating production by energy industries.

Compared to 2007 CO_2 emissions from road transport declined by 6.1% as fuel sales driven by lower transport volumes decreased. Moreover, the increased use of bio-fuels contributes to the falling emissions in this sector. CO_2 emissions from energy industries decreased by 3.6% between 2007 and 2008 as a result of increased renewable energy input.

Those emission reductions were counterbalanced by increasing emissions especially from "other sectors" (mainly residential heating), where GHG emissions rose by 9.6% compared to 2007. The year 2007 was characterised by milder than average temperatures and consequently

low emissions – so the sharp increase in emissions can mainly be attributed to this circumstance. In addition, lower fossil fuel prices at the end of 2008 and the need to fill up empty reserves were additional reasons for the increased demand for fuels. Furthermore: the number of heating days increased in 2008 by 4% compared to 2007 – resulting in higher heat demand. Emissions from industrial processes and agriculture increased slightly, emissions from waste continued to decrease and emissions from solvents remained quite at the same level.

Table 1: Austria's anthropogenic greenhouse gas emissions by gas 1990–2008 without LULUCF.

Greenhouse gas emissions	**1990 (Base year)**	**1995**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
	CO_2 equivalent (Gg)										
CO_2	62 087	63 971	65 819	70 211	72 064	77 858	77 783	79 837	76 729	74 008	73 662
CH_4	8 286	7 622	6 638	6 505	6 360	6 366	6 224	6 092	5 963	5 870	5 727
N_2O	6 141	6 561	6 243	6 135	6 140	6 063	5 365	5 401	5 443	5 470	5 640
HFCs	26	412	902	925	969	950	955	986	963	1 062	1 058
PFCs	1 079	71	85	96	98	116	137	134	146	190	174
SF_6	494	1 154	596	652	635	567	497	507	465	375	381
Total (without LULUCF)	**78 114**	**79 791**	**80 283**	**84 524**	**86 266**	**91 919**	**90 960**	**92 957**	**89 708**	**86 976**	**86 641**

The most important GHG in Austria is carbon dioxide (CO_2) with a share of 85% in 2008. The CO_2 emissions primarily result from combustion activities. Methane (CH_4), which mainly arises from stock farming and waste disposal, contributes 6.6% to national total GHG emissions, and nitrous oxide with agricultural soils as the main source adds another 6.5%. The remaining 1.9% is due to emissions of fluorinated compounds, which are mostly emitted from the use of these gases as substitutes for ozone depleting substances (ODS) in refrigeration equipment.

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

Greenhouse gas source and sink categories	**1990 (Base year)**	**1995**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
	CO_2 equivalents (Gg)										
1. Energy	55 425	57 693	59 099	63 589	64 841	70 706	70 700	72 255	68 652	65 503	64 762
2. Industrial Processes	10 111	9 897	10 322	10 174	10 792	10 744	10 054	10 628	10 990	11 466	11 870
3. Solvent and Other Product Use	512	422	425	425	435	428	384	385	412	387	388
4. Agriculture	8 480	8 666	7 868	7 825	7 721	7 512	7 406	7 369	7 407	7 476	7 596
5. Land-Use Change and Forestry *	*-13 139*	*-16 125*	*-17 154*	*-19 882*	*-15 923*	*-17 375*	*-17 524*	*-17 332*	*-17 317*	*-17 388*	*-17 337*
6. Waste	3 586	3 112	2 569	2 511	2 478	2 528	2 416	2 322	2 248	2 144	2 024
7. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

** Net emissions*

The dominant sector regarding GHG emissions in Austria is the energy sector, which caused 75% of total greenhouse gas emissions in Austria in 2008 (71% in 1990), followed by the Sector *Industrial Processes*, which caused 14% (2008) of greenhouse gas emissions. Both sectors show increasing emissions, while emissions from the other sectors have been decreasing.

Table 3: Austria's greenhouse gas emissions by sector in the base year (1990) and in 2008 as well as their share and trend.

GHG	1990	2008	Trend 1990–2008	1990	2008
	Emissions [Gg CO_2e]			Share [%]	
Total	**78 114**	**86 641**	**+10.9%**	**100.0%**	**100.0%**
1 Energy	55 425	64 762	+16.8%	71.0%	74.7%
2 Industry	10 111	11 870	+17.4%	12.9%	13.7%
3 Solvent	512	388	-24.1%	0.7%	0.4%
4 Agriculture	8 480	7 596	-10.4%	10.9%	8.8%
5 LULUCF	-13 139	-17 337	31.9%	-16.8%	-20.0%
6 Waste	3 586	2 024	-43.6%	4.6%	2.3%

Total emissions without emissions from LULUCF

The most significant increases in GHG emissions from 1990 to 2008 are shown by the sectors industry (+17%) and energy (+17%), whereas the sector with the strongest decline is *Waste* (-44%). A description and interpretation of emissions trends per sector is given in the following sub-chapters.

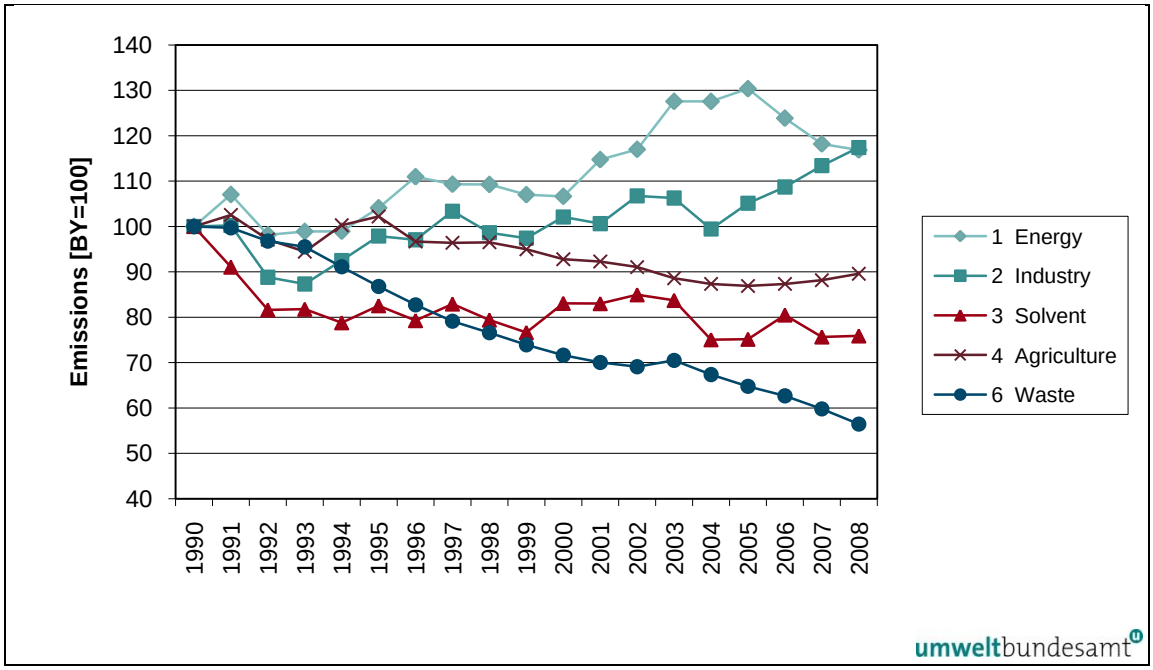

Figure 2: Trend in emissions 1990–2008 by sector in index form (base year 1990 = 100).

2.1 Energy

The **overall trend** in greenhouse gas emissions from the energy sector shows increasing emissions with a plus of 17% from 1990 to 2008. The **main driver** for this trend is the strong increase of emissions from road transport. The significant dips and jumps from year to year are mainly due to the weather circumstances in the corresponding years (in particular cold or mild winters, and/or dry or wet summers) which affect the heating demand, and the availability of climate change-friendly electricity from hydro plants.

From 2007 to 2008 emissions from the energy sector decreased slightly by 1.1%, mainly due to lower emissions from the categories transport and energy industries.

In 2008, greenhouse gas emissions from the energy sector amounted to 64 762 Gg CO_2 equivalent which correspond to 74.7% of the total national emissions. 99.3% of the emissions from this sector originate from fossil fuel combustion; fugitive emissions from fuels are of minor importance.

CO_2 contributed 98.1% to the total **greenhouse gas** emissions from the energy sector, CH_4 0.8% and N_2O 1.2%.

The **most important sub-sector** of energy in 2008 was transport with a share of 35%, followed by manufacturing industries and construction (25%), energy industries (21%), and "other sectors" (mainly residential heating – 19%).

The increasing trend from 1990 to 2008 in this sector is mainly due to a strong rise in emissions from sub-sector **transport** (+61%) due to an increase of road performance (kilometres driven). In addition to the increase of road performance within Austria, the amount of fuel bought in Austria but driven elsewhere – an effect mainly caused by different fuel prices of neighbouring countries – increased considerably. However, from 2007 to 2008, total emissions from transport decreased by 5.5%.

Energy related emissions from **manufacturing industries and construction** increased by 26.5% from 1990 to 2008. Fuel consumption increased by +44% in that period, mainly due to increased use of gas and especially biomass. As gas has a lower carbon content and CO_2 emissions from biomass combustion is not accounted for under the UNFCCC reporting framework, the increase in GHG emissions is significantly smaller compared to the increase in fuel combustion. From 2007 to 2008 emissions increased slightly by 0.1%.

Emissions from sub-sector **energy industries** were in 2008 slightly below the level of the base year (-2.3%). The main drivers for emissions from this sector are total electricity production (which increased about 26% from 1990 to 2008) and an increase in heat production, which more than doubled over this period (+146%) due to an increase in the demand for district heating in the residential and commercial sector. Furthermore, the share of biomass used as a fuel in this sector (increasing from 1% to 24% for the total fuel consumption of sector 1.A.1) and the contribution of hydro plants to total electricity production (68% in 2008 with a range from 65% to 78% in the period under observation – depending on the annual water situation) are important drivers. Also the climatic circumstances influence emissions from this sector: a cold winter leads to an increase of heat production. From 2007 to 2008, emissions from energy industries decreased by 3.5%. Total fuel consumption increased by 0.5%; while liquid and solid fuel consumption decreased by 9% and. 12%, natural gas consumption increased by 9% and biomass consumption increased by 15%, which further contributed to the decrease in anthropogenic GHG emissions (as CO_2 emissions from biomass combustion are not accounted for under the UNFCCC reporting framework).

The variation in demand for heating and hot water generation, climatic circumstances and the change of fuel mix are the most important drivers for emissions from **other sectors** (mainly residential heating). Emissions in 2008 were 17% lower than in the base year, and 9.6% higher than in 2007: total fuel consumption of this sub sector increased by 7.8% from 2007 to 2008. Moreover in 2008 liquid and gaseous fuel sales increased by 10% (liquid) and 7% (gas) – presumably due to the (compared to 2007) colder weather in 2008 and lower energy prices for gasoil at the end of the year 2008.

2.2 Industrial Processes

The **overall trend** in greenhouse gas emissions from industrial processes shows increasing emissions with a plus of 17% from 1990 to 2008. Within this period emissions fluctuated showing a minimum in 1993. **Main drivers** for the trend in emissions from this sector were (i) the termination of primary aluminium production in 1993, (ii) the introduction of N_2O abatement techniques in chemical industry in 2004, (iii) increasing metal production resulting in 55% higher CO_2-emissions in 2008 compared to 1990 and (iv) a strong increase of HFC emissions in the period 1992 to 2008 from 32 to 1 058 Gg CO_2 equivalents.

From 2007 to 2008, emissions from this sector increased by 3.5%.

In 2008, greenhouse gas emissions from industrial processes amounted to 11 870 Gg CO_2 equivalents, which corresponds to 13.7% of the total national emissions.

The most important **greenhouse gas** of this sector was carbon dioxide with 84% of emissions from this category, followed by HFCs with 8.9%, SF_6 with 3.2%, N_2O with 2.7%, PFCs with 1.5% and finally CH_4 with 0.2%.

The **most important sub-sectors** of the industrial processes sector are metal production and mineral products, which caused 49% and 30% of the emissions from this sector in 2008.

2.3 Solvent and Other Product Use

The **overall trend** in greenhouse gas emissions from solvent and other product use shows decreasing emissions, with a decrease of 24% from 1990 to 2008. The **main driver** is a decreasing use of solvents as a result of legal measures and decreasing N_2O use.

From 2007 to 2008 emissions decreased slightly by 0.3%.

In 2008, greenhouse gas emissions from solvent and other product use amounted to 388 Gg CO_2 equivalents, which corresponds to 0.4% of the total national emissions.

60% of these **greenhouse gas** emissions were indirect CO_2 emissions, 40% were contributed by N_2O emissions.

2.4 Agriculture

The **overall trend** in greenhouse gas emissions from agriculture shows decreasing emissions with a decrease of 10.4% from 1990 to 2008. The **main drivers** for this trend are decreasing livestock numbers. Fluctuations which can be seen in particular in the first half of the 1990s result from the variability of mineral fertilizer sales data related to volatility in prices; this data is used for calculating N_2O emissions from an important sub-source: agricultural soils.

From 2007 to 2008 emissions increased by 1.6% mainly due to increased fertilizer sales. Furthermore, a higher amount of N input from crop residues contributed to the increasing trend.

In 2008, emissions from agriculture amounted to 7 596 Gg CO_2 equivalent, which corresponds to 8.8% of the total national emissions.

In the Austrian **greenhouse gas** inventory the sector agriculture is the largest source for both N_2O and CH_4 emissions: in 2008 72% (13.0 Gg) of total N_2O emissions and 62% (169 Gg) of total CH_4 emissions in Austria originated from this sector. For N_2O this corresponds to 53% of the GHG emissions from agriculture and for methane to 47%.

The **most important sub-sectors** of agriculture in 2008 were enteric fermentation, which contributed 42% of total greenhouse gas emissions from the agricultural sector, followed by agricultural soils with a contribution of 41%.

2.5 LULUCF

Land use, land-use change and forestry is a net sink in Austria. The **overall trend** in net removals from LULUCF is plus 32% over the observed period. The **main driver** for this trend is the increase of the carbon stock in forest land. Fluctuations are due to weather conditions which affect the growth rates on the one hand and wind throws on the other, as well as timber demand and prices.

In 2008, net removals from this category amounted to 17 337 Gg CO_2 equivalents, which corresponds to 20% of national total GHG emissions (without LULUCF) compared to 17% in the base year.[6]

The **most important sub-sector is** forest land with net removals of 19 467 Gg CO_2 in 2008. Small CO_2, CH_4 and N_2O emissions arise from the other sub-sectors, where total net emissions amounted to 2 130 Gg CO_2 equivalents in 2008.

[6] However, the LULUCF sector as described here is not included under the Kyoto Protocol, instead of that Article 3.3 KP activities are included: afforestation, reforestation and deforestation (Austria decided not to include activities under Article 3.4 of the KP).

2.6 Waste

The **overall trend** in greenhouse gas emissions from waste shows decreasing emissions, with a decrease of 44% from 1990 to 2008. The **main driver** for this trend are implemented waste management policies: Waste separation, reuse and recycling activities have increased from 1990 on and the amount of deposited waste has decreased especially since 2004 when pre-treatment of waste became obligatory. Furthermore, methane recovery has been improved. The slight increase from 2002 to 2003 was followed by a decrease from 2004 on, which is due to the implementation of the Landfill Ordinance, which lead to a reduction in waste volume and carbon content of deposited waste.

From 2007 to 2008 GHG emissions decreased by 5.6% due to the effects of the implementation of the Landfill Ordinance described above.

In 2008, greenhouse gas emissions from the waste sector amounted to 2 024 Gg CO_2 equivalents, which corresponds to 2.3% of the total national emissions.

The most important **greenhouse gas** of the waste sector is CH_4 with a share of 81.1% of the total GHG emissions from this sector in 2008, followed by N_2O with 18.3%, and CO_2 with 0.6%.

The **most important sub-sector** of the waste sector is solid waste disposal on land, which caused 77% of the emissions from this sector in 2008; the second largest source was waste water handling with 14%.

3 METHOD OF REPORTING AND DATA BASIS

The Austrian greenhouse gas inventory for the period 1990 to 2008 was compiled according to the recommendations for inventories as set out in the UNFCCC reporting guidelines according to Decision 18/CP.8, the Common Reporting Format (CRF), Decision 13/CP.9, the new CRF for the Land Use Change and Forestry Sector, the IPCC 1996 Guidelines for National Greenhouse Gas Inventories, which specify the reporting obligations according to Articles 4 and 12 of the UNFCCC as well as the IPCC Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories.

These regulations under the UNFCCC and the Kyoto Protocol define the standard for national emission inventories related to transparency, consistency, comparability, completeness and accuracy of inventories. Above this, each Party shall have in place a national system including 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.

To meet these requirements Austria has set up a national system – National Inventory System Austria (NISA) – covering all aspects from establishing a legal basis for inventory preparation along with defining responsibilities, over availability of data, quality control and quality assurance to continuous improvement of the inventory (see Chapter 3.3).

In Austria, emissions of greenhouse gases are estimated together with emissions of air pollutants in a database based on the CORINAIR (CORe INventory AIR)/SNAP (Selected Nomenclature for sources of Air Pollution) system. This nomenclature is designed to estimate not only emissions of greenhouse gases but all kinds 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 to continuous improvement, resulting in recalculations as outlined in Chapters 3.1 and 3.5. Issues identified in the inventory reviews by the UNFCCC are considered in the inventory improvement programme. The last in-depth review took place in September 2008.

Annex 1 to this report presents Austria's greenhouse gas inventory data (CO_2 emissions/CO_2 removals, CH_4, N_2O, HFC, PFC and SF_6) in the format of the CRF Summary Table 10 (Emission Trends).

The complete tables of the Common Reporting Format, including in particular Sectoral Reports, Sectoral Background Tables and the Reference Approach for CO_2 are submitted separately in digital form only.

Table 4: Status of the present report.

Reporting Obligation	Format	Inventory	Version
Mechanism for monitoring Community greenhouse gas emissions	Common Reporting Format (CRF)	OLI 2009	December 2009

3.1 Relation with data reported earlier

As a result of the continuous improvement of Austria's GHG inventory, emissions of some sources have been recalculated on the basis of updated data or revised methodologies, thus emission data for 1990 to 2007 which are submitted this year differ slightly from data reported previously.

The following table presents the recalculation difference with respect to last year's submission for each gas (positive values indicate that this year's estimate is higher).

Table 5: Recalculation difference of Austria's greenhouse gas emissions compared to the previous submission.

	1990 (Base year)	2007
	Recalculation Difference [%]	
TOTAL	-1.17%	-1.12%
CO_2	+0.01%	-0.23%
CH_4	-9.77%	-15.60%
N_2O	-0.42%	+1.81%
HFC, PFC, SF_6	-0.31%	+11.96%

Emissions without LULUCF

For the base year recalculated national total emissions excluding LULUCF are 1.17% lower than those reported last year and 1.12% lower than those of the year 2007. However, the trend for 1990 to 2007 reported in this and in last year's submission remains the same (+11.3%).

The lower total emissions of the whole time series are mainly attributable to recalculated **CH_4 emissions** in the fugitives and agricultural sector: in the base year these recalculations amounted to -897 Gg (total recalculations were -923 Gg), and -1085 Gg for the year 2007 (with a recalculation difference for the national total of -983 Gg). The main reasons are as follows:

For calculating CH_4 emissions from natural gas distribution a national study became available, replacing estimates based on default values previously used. Now the Tier 2 method was applied and country specific emission factors were used.

In 2008 the Umweltbundesamt commissioned the University of Natural Resources and Applied Life Sciences with the revision of the national emission model of the sector agriculture (AMON, B. & HÖRTENHUBER, S. 2009)[7]. Following a recommendation of the ERT new input-data on animal waste management system (AWMS) distribution were implemented. Data was used from the research project "Animal husbandry and manure management systems in Austria" (AMON et al. 2007)[8]. In this project a comprehensive survey on the agricultural practice in Austria had been carried out.

The revised calculations within the sector agriculture led to considerable lower CH_4 emissions and higher **N_2O emissions** compared to the previous submission (see Chapter 3.5.4).

A new survey was also conducted covering consumption and emissions of **fluorinated gases** in all sub-categories. The results of this study were incorporated in the inventory and emissions of all gases and in all sectors have been revised for the whole time-series accordingly.

The recalculation of **CO_2 emissions** is mainly based on the revisions of the national energy balance, mainly due to a revised stock change of gasoil (see Chapter 3.5.1).

[7] AMON, B. & HÖRTENHUBER, S. (2009): Revision der österreichischen Luftschadstoff-Inventur (OLI) für CH_4 und N_2O; Sektor 4, Landwirtschaft. Universität für Bodenkultur, Institut für Landtechnik im Auftrag vom Umweltbundesamt. Wien (unpublished)

[8] AMON, B , FRÖHLICH, M , WEIßENSTEINER, R , ZABLATNIK, B , AMON, T (2007): Tierhaltung und Wirtschaftsdüngermanagement in Österreich Endbericht Projekt Nr. 1441 Auftraggeber: Bundesministerium für Land und Forstwirtschaft, Umwelt- und Wasserwirtschaft. Wien.

A description of these and other recalculations by sector is given in Chapter 3.5.

Improvements made in response to the issues raised in the UNFCCC review process are summarized in Table 6.

Table 6: Improvements made in response to the UNFCCC review process.

Finding	Reference	Improvement made
General		
The ERT noted that Austria has to include descriptions of QA/QC procedures for all categories in the NIR	FCCC/ARR/2008/ AUT para 17	Sector-specific QA/QC discussions were included in NIR 2009
Energy		
Stationary Combustion – other fuels, CO_2: Austria informed the ERT hat it assumes CO_2 emissions from this category to be overestimated for the period 1990–2004. The ERT recommends that Austria correct the emission estimates in its next submission	FCCC/ARR/2008/ AUT para 28	Energy statistics has been revised and double counting of industrial waste has been eliminated.
Road transportation – biofuels: There are plans to determine the fossil carbon content of diesel fuel by analysis. The ERT recommends that the Party provides more transparent information on the use of biofuels.	FCCC/ARR/2008/ AUT para 31	Consumption and CO_2 emissions from pure and blended biofuels are now reported under biomass in categories 1.A.2.f, 1.A.3.b, 1.A.4.b, 1.A.5. Therefore the implied CO_2-emission factors of "diesel oil" and "liquid fuels" reflect pure fossil fuels.
IP & Fugitive		
Austria uses the IPCC tier 1 method based on default emission factors to estimate CH_4 emissions from natural gas distribution. Since CH_4 emissions from natural gas are a key category, the ERT encourages Austria to use a tier 2 method to estimate CH_4 emissions from natural gas distribution.	FCCC/ARR/2006/ AUT para 36	The method for calculating CH_4 emissions from natural gas distribution has been improved from Tier 1 to Tier 2.
Austria provides activity data for fluid filled into new products for various applications of ODS substitutes, for example, foams. Emissions from manufacturing, however, are reported as "not applicable" ("NA"). The ERT encourages Austria to investigate whether emissions occur from foam manufacturing/ installation or other ODS substitute applications to determine whether emissions are currently being underestimated.	FCCC/ARR/2006/ AUT para 42	A new survey was conducted covering consumption and emissions in all sub-categories. Special focus was given to emissions from manufacturing/installation and disposal. The results of this study were incorporated in the inventory and emissions of all gases and in all sectors have been revised for the whole time-series accordingly
The ERT encourages Austria to review the additional uses of soda ash (additional to soda ash use in the glass industry) described in the Revised 1996 IPCC Guidelines (e.g. soaps and detergents, pulp and paper production and water treatment).	FCCC/ARR/2006/ AUT para 44	CO_2 emissions from uses of soda ash other than in glass industry have been reviewed, identified and included in the inventory for the whole time-series.

Finding	Reference	Improvement made
Agriculture		
Austria is aware that the real shares of the different AWMS have changed over the period and that new treatment systems are currently changing the original pattern. The ERT welcomes Austria's intention to update this information. The ERT also recommends that Austria make efforts to improve its information about "other" treatment of poultry.	FCCC/ARR/2006/ AUT para 50	New AWMS data became available, detailed information is provided in the NIR 2010.
Austria currently applies a single AWMS distribution across the entire time series based on a study carried out in 1995. In previous reviews ERTs have recommended that Austria update its information on AWMS distribution as it has probably changed over the time period. Austria is currently carrying out a study to update its AWMS distribution information and will incorporate the new data into the inventory in coming years. The ERT welcomes this development and recommends that Austria report on the results in its next NIR.	FCCC/ARR/2008/ AUT para 48	A new study was commissioned, detailed information is provided in the NIR 2010.
LULUCF		
The ERT raised the question, whether there were any shortcomings in the used formulas concerning cropland remaining cropland – perennial crops.	2nd Centralized review 2009	Equations were checked and revised adequately by subtracting those areas of perennial cropland before 30 (or 10 or 6, respectively) years that were matter of land use change.
The ERT recommends that Austria reports a consistent and complete set of annual land use and land-use change matrices (see as example table 2A.1.2 of the IPCC good practice guidance for LULUCF) established in accordance with the IPCC good practice guidance for LULUCF, in order to have unbiased activity data.	Voluntary KP LULUCF review by UNFCCC	Austria reported the following two land-use areas in the CRF tables that were not reported previously: 1) the areas of the subcategory "other land remaining other land" and 2) the area of the "forest remaining forest", subcategory "protective forest out of yield (non-productive forest)". With these areas the land use statistic is complete and consistent.
Austria reported altogether lands deforested from 1990 to 2007 and similarly land afforested from 1990 to 2007. To increase transparency it is a good practice to stratify according to the year of the onset of the activity; that requirement is also fundamental for identification and then tracking of those lands.	2nd Centralized review 2009	Information on the ARD-areas emissions/removals were stratified in more detail.
Disaggregation of ARD areas within the country, e.g. by ecological or administrative units, is needed	Voluntary KP LULUCF review by JRC	See answer to related question above
The reported IEF values are, most probably and correctly, for all D areas since 1990. However, these IEF values are not informative as to the mean loss of carbon of the area deforested in the inventory year. A separate and explicit reporting of the mean loss applied to the D areas of the reporting year is suggested for enhanced transparency.	Voluntary KP LULUCF review by JRC	See answer to related question above

Finding	Reference	Improvement made
Waste		
The ERT encourages Austria to include information on assumptions behind the derivation of the 'residual waste' DOC and the percentage composition of 'non-residual waste' in future submissions	FCCC/ARR/2008/ AUT, para 74	The NIR 2009 includes this additional information.
It is recommended that Austria adopts the DOCf value for sludge disposal and bio-waste as lignin is contained.	FCCC/ARR/2008/ AUT, para 75	As recommended, the DOCf for sludge disposal and bio-waste was adjusted (to 0,55) in submission 2010
Austria plans a further study to update the rate of CH4 recovery from 2002 onwards. The ERT encourages Austria to complete this work and incorporate the results in future submissions.	FCCC/ARR/2008/ AUT, para 77	The study has been conducted (UMWELTBUNDESAMT 2008c) and the results incorporated in NIR 2009
The ERT encourages Austria to expand on the trend discussion in the NIR to further explain any remarkable trends or fluctuations in the time series.	FCCC/ARR/2008/ AUT, para 81	A description on the trend is included in NIR 2009

The figures presented in this report replace data reported earlier by Austria under the reporting framework of the UNFCCC, in particular data which had been included in the inventory chapter of the Fourth National Communication of the Austrian Federal Government (2006) and in Austria's 2006–2009 submissions to the UNFCCC (Austrian Greenhouse Gas Emissions 1990–2004, 1990–2005, 1990–2006 and 1990–2007).

3.2 Information on Completeness

Geographical coverage is complete. There is no part of the Austrian territory that has not been covered by the inventory.

Emissions from most sources specified in the CRF have been estimated. For information on sources not estimated („NE") and emissions included with sources other than those stipulated in the CRF („IE") please refer to Table 9 Completeness of the CRF.

3.3 National Inventory System Austria (NISA)

This section provides a short description of the most important aspects of NISA; a detailed description including all required information as set down in Decision 15/CMP.1, part II ("Reporting of supplementary information under Article 7, paragraph 2", D. National systems in accordance with Article 5, paragraph 1) can be found in the Austrian Initial Report[9], in Austria's NIR 2009[10] and in the NISA Implementation Report[11].

[9] BMLFUW (2006): Austria's Initial Report under Article 7, paragraph 4, of the Kyoto Protocol, Federal Ministry of Agriculture and Forestry, Environment and Water Management, Vienna

[10] UMWELTBUNDESAMT (2009): Austria's National Inventory Report, Submission under the United Nations Framework Convention on Climate Change, REP-0188; Umweltbundesamt, Vienna

Legal Arrangements

Austria has a centralized inventory system, with all the work related to inventory preparation being carried out at a single national entity. The most important legal arrangement is the Austrian Environmental Control Act (Umweltkontrollgesetz[12]), which defines the main responsibility for inventory preparation and identifies the Umweltbundesamt as the single national entity with the overall responsibility for inventory preparation. Within the Umweltbundesamt the "Inspection Body for Emission Inventories" is responsible for the compilation of the greenhouse gas inventory.

To ensure the availability of data necessary for the annual compilation of the GHG inventory further legal and institutional arrangements have been made, which are described in more detail in Austria's NIR and in full detail in the NISA Implementation Report.

QMS

A Quality Management System (QMS) has been designed and implemented to fulfil all requirements of *good practice*. Since 2005, the unit in the Umweltbundesamt responsible for inventory preparation is accredited according to the Standard ISO/ICE 17020 *General Criteria for the operation of various types of bodies performing inspections* as "Inspection Body for Emission Inventories". This standard takes into account standards regarding a QMS as set out in the EN/ISO 9000 series and goes beyond: it also provides a clear statement of requirements regarding competence and independence; impartiality, integrity and confidentiality (see Chapter 3.6).

Sector Experts

Within the inventory system specific responsibilities for the different emission source/sink categories ("sector experts") are defined. Sector experts collect activity data, emission factors and all relevant information needed for finally estimating emissions. The sector experts are also responsible for the choice of methods, data processing and archiving and for contracting studies, if needed. As part of the quality management system, the head of the "Inspection body for GHG inventory" approves the methodological choices. Finally, sector experts perform Quality Assurance and Quality Control (QA/QC) activities.

The main data sources used, as well as information on who did the actual calculations, are presented in the Chapter 3.4.

Data Management

The Austrian Inventory is based on the SNAP nomenclature and has to be transformed into the UNFCCC Common Reporting Format to comply with the reporting obligations under the UNFCCC. In addition to the actual emission data, the background tables of the CRF are filled in by the sector experts, and finally QA/QC procedures as defined in the inventory planning process are carried out before the data are submitted to the European Commission and to the UNFCCC.

As part of the QMS's documentation and archiving procedures a reliable data management system has been established to fulfil the data collecting and reporting requirements. This ensures the necessary documentation and archiving for future reconstruction of the inventory and consequently enables easy access to up-to-date and previously submitted data for the quantitative evaluation of recalculations.

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[11] UMWELTBUNDESAMT (2005): NISA National Inventory System Austria, Implementation Report, REP-0004; Umweltbundesamt, Vienna. **http://www.umweltbundesamt.at/umweltkontrolle/**

[12] „Umweltkontrollgesetz"; Federal Law Gazette 152/1998

Corrective and Preventive Actions

As part of the QMS an efficient process is established to grant transparency when collecting and analyzing findings by UNFCCC review experts or any other issues concerning the quality of activity data, emission factors, methods and other relevant technical elements of inventories. Any findings and discrepancies are documented; responsibilities, resources and a time schedule are attributed to each of these in the improvement plan. Measures, which include possible recalculations, are taken by the sector experts.

Changes since the last submission

There were no changes in the NISA since the last submission.

3.4 Sources of data

The national energy balance is the most important data basis for the Austrian Air Emissions Inventory. The Austrian statistical office (Statistik Austria) is required by contract with the Federal Ministry of Agriculture, Forestry, Environment and Water Management and with the Federal Ministry of Economics and Labour to annually prepare the national energy balance. The compilation of several other relevant statistics is regulated by law; other data sources include reporting obligations under national and European regulations and reports of companies and associations.

The following table presents the main data sources used for activity data as well as information on who did the actual calculations (for unpublished studies a detailed description of the methodologies is given in the NIR):

Table 7: Main data sources for activity data and emission values.

Sector	Data Sources for Activity Data	Emission Calculation
Energy	Energy Balance from Statistik Austria; EU-ETS; Steam boiler database;	Umweltbundesamt, plant operators
Transport	Energy Balance from Statistik Austria	Umweltbundesamt (Aviation), Technical University Graz (Road and Off-road transport)
Industry	National production statistics, import/export statistics; EU-ETS; direct information from industry or associations of industry	Umweltbundesamt, plant operators F-gases based on a study by: EcoEfficient Technologies, Vienna
Solvent	Short term statistics for trade and services Austrian foreign trade statistics Structural business statistics Surveys at companies and associations	Umweltbundesamt, based on studies by: Institut für industrielle Ökologie and Forschungsinstitut für Energie und Umweltplanung, Wirtschaft und Marktanalysen GmbH[13]
Agriculture	National Studies, national agricultural statistics obtained from Statistik Austria	Umweltbundesamt, based on studies by: University of Natural Resources and Applied Life Sciences, Research Center Seibersdorf

[13] Research Institute for Energy and Environmental Planning, Economy and Market Analysis Ltd./Institute for Industrial Ecology

Sector	Data Sources for Activity Data	Emission Calculation
LULUCF	National forest inventory obtained from the Austrian Federal Office and Research Centre for Forests	Umweltbundesamt
Waste	Database on landfills (1998–2007), Electronic Data Management (from 2008 on)	Umweltbundesamt

The main sources for emission factors are:

- national studies for country specific emission factors
- plant-specific data reported by plant operators
- IPCC GPG
- Revised IPCC 1996 Guidelines
- EMEP/CORINAIR Guidebook.

A complete list of data sources for activity and emission data or emission factors used by sector for the submission 2010 can be found in the National Inventory Report 2010 to be published in spring 2010.

Table *Summary 3* of the CRF (Summary Report for Methods and Emission Factors Used) presents the methods applied and the origin of emission factors used in the present Austrian GHG inventory.[14]

3.5 Recalculations

This chapter describes the changes made to the inventory since the last submission to the UNFCCC (April 2009). Further background information and a complete description of the recalculation of the inventory for the period 1990–2007 will be given in Austria's National Inventory Report 2010, which will be published in spring 2010.

3.5.1 Energy (Sector 1)

Combustion Activities (1 A)

Update of activity data

Updates of activity data and NCVs follow the updates of the IEA-compliant energy balance compiled by the federal statistics authority Statistik Austria.

Energy balance update and corrections

The new estimates are mainly due to a revised evaluation of the census data 2004–2008. Major revisions affect the years from 2001 onwards (except for natural gas which has been revised from 1999 onwards). Revisions of traded fuels affect the categories *1.A.2 Industry*

[14] The description of methodologies and data sources used for the Community's key sources can be found in the separate file AT_AnnexI_ KS2009.xls which is submitted together with this report. This file follows in structure and content the latest version provided by the Commission to the member states on November 10, 2008.

and *1.A.4 Other Sectors* because gross inland consumption has in general not been revised except for gasoil which has been shifted between the years 2003 and 2005–2007.

Natural gas: From 2001 to 2007 up to 5.3 PJ have been shifted between the transformation sectors (public electricity and auto producers; 2007: -0.3 PJ) to *1.A.1.b petroleum refining* (2007: +3.6 PJ) and final consumption of *1.A.2 Industry* (2007: +2 PJ) and *1.A.4 Other* (2007: -5.3 PJ).

Residual fuel oil: Revision of final consumer stock change and final consumption of category *1.A.4 other* for the years 2001 (+3.6 PJ) and 2006 (+1.2 PJ).

Gasoil: Revision of final consumer stock change for the years 2003 and 2005–2007 (up to ±6.3 PJ) to better reflect yearly final consumption instead of fuel sales. This change affects category *1.A.4 Other Sectors* only. The 'net change' for the 4 revised years is +0.4 PJ.

Other solid biomass (such as wood waste, wood chips, pellets): Revision of gross inland consumption from 1999 to 2007 (2007: -6.3 PJ). This affects mainly the categories *1.A.1.a public electricity and heat* (2007: -2.5 PJ), *1.A.4 other* (2007: -2.6 PJ), non metallic mineral products industry (2007: +3 PJ; included in *1.A.2.f*) and wood products industry (2007: -2.6 PJ; included in *1.A.2.f*).

Fuel wood: Revision of gross inland consumption from 2001 (-4.5 PJ) to 2007 (-2.9 PJ). This mainly affects the categories *1.A.4.b Residential* (2007: -1.3 PJ) and wood products industry (2007: -1.7 PJ; included in *1.A.2.f*).

Industrial waste: Revision of gross inland consumption from 2001 (+0.5 PJ) to 2007 (-5.1 PJ), mainly due to chemicals (1.A.2.c), wood product and non metallic mineral products industry (included in 1.A.2.f).

Minor revisions have been carried out for coal and LPG from 2001 to 2007. The changes do not affect gross inland consumption and thus total CO_2 emissions from 1.A fuel combustion activities but emissions were only shifted between sub categories.

Stationary sources

1.A.1.a Public Electricity and Heat

Transformation input of natural gas and biomass has been revised from 2001 to 2007 by the national energy regulator (E-Control). Biomass consumption has been revised according to a new evaluation of boilers < 1 MW (E-Control, Ökostrom-Erhebung).

1.A.1.b Petroleum Refining

Liquid fuel consumption 1999–2001 has been revised following the energy balance. In the previous submission liquid fuel consumption was calculated from other data sources.

Natural gas consumption 2001 (-0.5 PJ) to 2007 (+3.6 PJ) has been revised following the energy balance. This implies e.g. a lower natural gas energy consumption in 2007 for other *1.A Fuel Combustion Activities*.

1.A.4.b Residential

A new household census has been applied from 2004 onwards. This leads to a shift of biomass consumption from stoves to boilers and thus to a reduction of CH_4 emissions. Energy consumption of secondary residences has been estimated for the first time. For the years 2003 to 2007 gasoil stock changes of end consumers have been revised to reflect fuel consumption rather than fuel sales (based on heating degree days).

Mobile sources

1.A.2.f Manufacturing Industries and Construction – Other – mobile sources

Activity data for mobile machineries (especially in industry) for the whole time series was updated following the revised national energy balance. Now the activity of mobile machineries in industry is higher.

1.A.3.b Road Transport

An update of statistical energy data, particularly the energy consumption for mobile machineries in 1.A.2.f c shows that more fuel is used by off-road vehicles. As the overall fuel consumption is a fixed value, this increase in fuel consumption had to be counterbalanced by a decrease of fuel tourism on the road.

1.A.3.c Railways

Activity data was updated with updated emission factors.

1.A.4. Other Sectors – mobile sources

Activity data for mobile machineries for the whole time series was updated following the revised national energy balance.

Improvements of methodologies and emission factors

1.A.3.b Road Transport

Adaptation of the specific CO_2 emissions factors of passenger cars according to the national CO_2-monitoring data

1.A.3.c Railways

Activity data was updated with updated emission factors

Improvements of reporting

Transport biofuels: Consumption and CO_2 emissions from pure and blended biofuels are now reported under biomass in categories 1.A.2.f, 1.A.3.b, 1.A.4.b, 1.A.5. Therefore the implied CO_2-emission factors of “diesel oil” and “liquid fuels” reflect pure fossil fuels.

Gasoline IEF: For 1990 to 1991 the net calorific value (NCV) and fuel consumption of gasoline has been revised (increased) by means of the 1992 value. This does not imply changes in emissions but improves time series consistency of the CO_2 implied emission factor which has been flagged as an outlier by the ERT.

Fugitive Emissions (1 B)

Update of activity data

1.B.2.a Refining/Storage

Activity data for 2007 was updated according to data from the national energy balance.

Improvements of methodologies and emission factors

1.B.2.b Transmission and Distribution

Following a recommendation from the in-country review 2007 the method for calculating CH_4 emissions from the key category natural gas distribution has been improved from Tier 1 to Tier 2. For the implementation of the higher tier method country specific emission factors have been developed from national studies. For the sub-category *gas distribution* that contributed more than 70% to CH_4 emissions from 1.B.2.b in the last submission, a Tier 3 approach based on the annual composition of distribution network materials has been developed.

3.5.2 Industrial Processes (Sector 2)

Update of activity data

2.C.2. Ferroalloys: Activity data for 2007 was updated.

2.C.4. SF_6 Used in Aluminium and Magnesium Foundries: In the course of industry inquires applications of SF_6 in secondary aluminium smelting works have been identified in recent years. The resulting emissions have been included in the inventory.

Improvements of methodologies and emission factors

2.A.7. Glass Production: CO_2 emissions from limestone, dolomite and soda ash use in the glass production are reported under this category in contrast to previous reports, where these emissions were reported under the categories 2.A.3 Limestone and Dolomite Use and 2.A.4 Soda Ash Use.

2.A.4. Soda Ash Use: Following the recommendation from the in-country review 2007 CO_2 emissions from uses of soda ash other than in glass industry have been reviewed, identified and included in the inventory for the whole time-series.

2.F. Consumption of Halocarbons and SF_6: A new survey was conducted covering consumption and emissions in all sub-categories. Following a recommendation from the in-country review 2007 special focus was given to emissions from manufacturing/installation and disposal. The results of this study were incorporated in the inventory and emissions of all gases and in all sectors have been revised for the whole time-series accordingly.

3.5.3 Solvent and other Product Use (Sector 3)

Update of activity data

3.A, 3.B, 3.C and 3.D.5.

The short term statistics for trade and services and the Austrian foreign trade statistics were updated from 2004 onwards.

The activity data from 2000 onwards concerning non-solvent use and solvent content of products has been updated by surveys at companies and associations.

Improvements of methodologies and emission factors

3.A, 3.B, 3.C and 3.D.5.

Emission factors have been updated with information from surveys at companies and associations from 2004 onwards.

3.5.4 Agriculture (Sector 4)

Improvements of methodologies and emission factors

As a result of the previous UNFCCC reviews the ERT recommended Austria to update its information on average waste management system (AWMS) distribution (ARR 2006, ARR 2008). Hence, in 2008 the Umweltbundesamt commissioned the University of Natural Resources and Applied Life Sciences with the revision of the national emission model of sector agriculture (AMON, B. & HÖRTENHUBER, S. 2009)[15]. The new input-data on AWMS was taken from the research project "Animal husbandry and manure management systems in Austria" (AMON et al. 2007)[16]. In this project a comprehensive survey on the agricultural practice in Austria had been carried out.

The emission calculations within the revised agriculture GHG inventory follow the methodologies defined in the Revised 1996 IPCC Guidelines and the IPCC Good Practice Guidance 2000.

For the calculation of the losses of gaseous N species the mass-flow procedure pursuant to EMEP/CORINAIR has been used. In 2009 a new revised emission model (AMON, B. & HÖRTENHUBER, S. 2008)[17] has been implemented into the national inventory.

4.A.1.a Enteric Fermentation Dairy Cattle: The method of adjusting the GE-intake to the yearly milk yield of dairy cattle has been improved, resulting in yearly slightly differing emissions compared to the previous submission.

4.A.1.b Enteric Fermentation Non-Dairy Cattle (suckling cows): The milk yield of suckling cows has been revised on the basis of the results of a new national study (HÄUSLER, J. 2009)[18]. The new data show an increased GE-intake and thus increased emissions in recent years.

4.B Manure Management: New national data on AWMS distribution have been implemented. A new time series of AWMS has been generated. The new AWMS data show an increasing share of liquid systems and a decreasing share of solid systems and pasture. Following new systems

[15] AMON, B. & HÖRTENHUBER, S. (2009): Revision der österreichischen Luftschadstoff-Inventur (OLI) für CH_4 und N_2O; Sektor 4, Landwirtschaft. Universität für Bodenkultur, Institut für Landtechnik im Auftrag vom Umweltbundesamt. Wien (unpublished)

[16] AMON, B , FRÖHLICH, M, WEIßENSTEINER, R , ZABLATNIK, B & AMON, T (2007): Tierhaltung und Wirtschaftsdüngermanagement in Österreich Endbericht Projekt Nr 1441 Auftraggeber: Bundesministerium für Land und Forstwirtschaft, Umwelt- und Wasserwirtschaft. Wien.

[17] AMON, B. & HÖRTENHUBER, S. (2008): Revision der österreichischen Luftschadstoff-Inventur (OLI) für NH_3, NMVOC und NO_x; Sektor 4, Landwirtschaft. Endbericht. Universität für Bodenkultur, Institut für Landtechnik im Auftrag vom Umweltbundesamt. Wien (unpublished)

[18] JOHANN HÄUSLER (2009): Das Leistungspotenzial von Fleckviehmutterkühen – Versuchsergebnisse des LFZ Raumberg-Gumpenstein. Fachtag „Erfolgreiche Mutterkuhhaltung" Fachschule Warth.

have been taken into account: yard, deep litter, composting, aerobic treatment and anaerobic digester. In the CRF 4.B(a)s2 the new AWMS have been summarised under "Other".

4.B Manure Management – CH_4: In the new inventory for liquid systems new national methane conversion factors (MCF) have been applied. The new factors (cattle: 10,03% swine: 3,42%) have been obtained from a national peer reviewed study (AMON et al. 2006[19], AMON et al. 2007[20]). The factors are based on measurements and considerable lower than the IPCC default value of 39%. For yard (which is not included in the GPG 2000) the MCF of pasture, range and paddock has been taken. For deep litter the MCF of the 2006 IPCC Guidelines (17%) has been taken because the MCF of the GPG 2000 (39%) is not applicable to Austria's cold climate conditions.

4.B Manure Management – N_2O: deep litter: in consistency with the calculations of CH_4, see above, the IPCC 2006 emission factor of 0.01 kg N_2O-N/kg N_2O has been used.

4.B.8 Swine: In the new calculations of emissions from fattening pigs young swine from 20 to 50 kg were considered. In the previous submission these animals were treated like piglets and therefore not accounted (because the emission factor of breeding sows includes piglets). The consideration of pigs 20-50 kg in the fattening pigs category causes higher emissions from swine.

4.D.1 Direct Soil Emissions – Animal Manure Applied to Soils: The revised calculations within category 4.B (see above) as well as the more detailed calculation of NH_3-N and NO_x-N losses within the UN/LRTAP submission resulted in lower amounts of manure N applied to soils.

4.D.1 Direct Soil Emissions – Crop Residue: An error in the calculation of N_2O from certain crop residues was found and corrected, leading to higher N_2O emissions.

4.D.1 Direct Soil Emissions – Other direct emissions: The consideration of NH_3-N and NO_x-N losses led to reduced emissions from sewage sludge spreading.

4.D.2 Pasture, Range and Paddock Manure: The smaller share of grazed animals led to smaller emissions from grazing.

4.D.3 Indirect Emissions: The comprehensive revision of the agriculture model – including the emission calculation of NH_3 and NO_x – led to higher N_2O emissions from atmospheric deposition and slightly differing emissions from leaching compared to the previous submission.

3.5.5 LULUCF (Sector 5)

Revision of the data series for LULUCF are due to the following changes:

[19] AMON, B.; KRYVORUCHKO, V. & AMON, T. (2006): Influence of different levels of covering on greenhouse gas and ammonia emissions from slurry stores. International Congress Series (ICS) No 1293 "2nd International Conference on Greenhouse Gases and Animal Agriculture

[20] AMON, B., V. KRYVORUCHKO, M. FRÖHLICH, T. AMON, A. PÖLLINGER, I. MÖSENBACHER & ANTON HAUSLEITNER (2007). Ammonia and greenhouse gas emissions from a straw flow system for fattening pigs: Housing and manure storage. Livestock Science 112, 199–207.

5.A Forestland

There was a mistake in the equation used for estimating the emissions from forest fires due to a misunderstanding of the IPCC GPG. The equation was corrected and the time series of the emissions from forest fires was revised.

The new submission includes now information on the area of "protective forests out of yield" (non-productive forest).

5.B Cropland

Some shortcomings in the area data (activity data) were corrected leading to new figures for the estimates of the subcategories "cropland remaining cropland" and "LUC to cropland"

The estimates of the subcategory "cropland remaining cropland" included some double accounting of increment and losses in perennial cropland due to a calculation with the whole perennial cropland area of Austria within this category. These estimates also included losses of perennial cropland to other land uses and areas that changed from other land uses to perennial cropland. In the new estimates these areas were subtracted and the time series of emissions/removals from perennial cropland remaining perennial cropland was revised.

5.E Settlements

Some shortcomings throughout the time series of the areas of LUCs to settlements was corrected which resulted in partly new figures for the emissions/removals of the time series of this subcategory.

5.F Other land

The new submission includes now information on the area of other land remaining other land.

3.5.6 Waste (Sector 6)

Update of activity data

6.A.1 Managed waste disposal on land

Activity data was revised for the whole time series, mainly due to the slightly adapted compilation of considered waste types. A further reason for the revised activity data are delayed reports from operators of landfill sites on the amounts of deposited waste that were now considered, mainly with regard to residual waste, sorting residues, sludges and paper landfilled in 2007. Furthermore, as recommended by the Expert Review Team, the DOCf for sludge disposal and bio-waste was adjusted (to 0.55) in this years' submission.

6.B Waste Water Handling

The FAO has published new data concerning daily protein intake in Austria – This was taken into account in the calculation and has led to revised emission values for the years 1998 to 2007. The minor revision of the 1996 value is due to the correction of a rounded value. Furthermore, a new value for the denitrification rate became available for 2008, changing the value for 2007 too (interpolation between 2006 and 2008).

6.D Compost Production

Activity data for composted organic waste have been updated for the years 2004–2007 as new data and findings became available, resulting in significant higher emission values (for interpolated values too).

3.6 Quality Assurance and Quality Control (QA/QC)

A quality management system (QMS) has been designed to achieve to the objectives of *good practice guidance*, namely to improve transparency, consistency, comparability, completeness and confidence in national inventories of emissions estimates. The QMS is based on the International Standard ISO/IEC 17020 *General Criteria for the operation of various types of bodies performing inspections*. The QMS ensures that all requirements of a type A inspection body as stipulated in ISO/IEC 17020 are met, which include strict independence, impartiality and integrity. Since December 2005 the Umweltbundesamt has been accredited as inspection body (Id.No.241) in accordance with the Austrian Accreditation Law.

The implementation of QA/QC procedures as required by the IPCC-GPG support the development of national greenhouse gas inventories that can be readily assessed in terms of quality and completeness. The QMS as implemented in the Austrian inventory includes all elements of the QA/QC system outlined in IPCC-GPG Chapter 8 "Quality Assurance and Quality Control", and goes beyond. It also comprises supporting and management processes in addition to the QA/QC procedures in inventory compilation and thus ensures agreed standards not only within (i) the inventory compilation process and (ii) supporting processes (e.g. archiving), but also for (iii) management processes (e.g. annual management reviews, internal audits, regular training of personnel, error prevention).

The Austrian Quality Management System is described in detail in Austria's NIR 2010[10].

Changes to the QMS since last submission/ Focus of QA/QC activities in the year 2009

The most important improvements of the QMS were:

- Documentation of the tasks of the data manager and the methodology for calculating the overall uncertainty as operating procedures in the QM manual
- A new version of the progress directive for preparation of the inspection report (the NIR) which now also considers the reporting obligations to the EU (Short NIR) and better defines the process and the responsibilities for finalization and publication.
- In response to an external audit by the accreditation body the progress directive for software validation was tightened so that now all excel files used for emission estimation will have to be validated before use additionally to the validation of the results.

3.7 Uncertainty Assessment

After a first uncertainty analysis in 2000[21] and sector-specific uncertainty updates by expert judgements in the following years, a second comprehensive uncertainty analysis was performed by WINIWARTER the greenhouse gases CO_2, CH_4, N_2O, HFC, PFC and SF_6 for 1990 and 2005. Information on the more general results of this uncertainty analysis can be found in Austria's NIR 2008[22]. Table 8 shows the key results of the latest uncertainty evaluation of the Austrian GHG

[21] WINIWARTER, W. & RYPDAL, K. (2001): Assessing the Uncertainty Associated with National Greenhouse Gas Emission Inventories: A Case Study for Austria, Atmospheric Environment 35 (2001) 5425–5440.

[22] UMWELTBUNDESAMT (2008): Anderl, M.; Freudenschuß, A.; Kampel, E.; Köther, T.; Muik, B; Poupa S.; S.; Schodl, B.; Schwaiger, E., Weiss, P.; Wieser, M. & Zethner, G.: Austria's National Inventory Report 2008. Reports, Bd. REP-152. Umweltbundesamt, Wien.

Inventory using the method developed in (WINIWARTER 2008)[23] based on the Tier 2 approach (Monte-Carlo Analysis).

Table 8: Key results of the Austrian GHG inventory uncertainty analysis 2009.

	Random uncertainty	**CO_2**	**CH_4**	**N_2O**	**PFC***	**HFC**	**SF_6***	**Total GHG emissions**
1990	Mean value [Tg]	62.09	9.16	6.22	1.05	0.02	0.53	79.07
	Standard deviation	0.41	0.72	2.64	0.26	0.01	0.04	2.78
	2σ	**1.3%**	**15.8%**	**84.9%**	**49.8%**	**53.8%**	**16.1%**	**7.0%**
2007	Mean value [Tg]	74.18	6.94	5.42	0.00	0.85	0.60	88.00
	Standard deviation	0.63	0.53	2.34	0.00	0.23	0.09	2.48
	2σ	**1.7%**	**15.2%**	**86.2%**	**54.3%**	**54.3%**	**29.4%**	**5.6%**

**Due to the definition of key category FC emissions from 2.F.7, PFC emissions are partly considered in SF_6 emissions*

Uncertainty calculation and reporting according to IPCC GPG (2000) Table 6.1 for key categories is presented in Annex II.

3.8 Comparison of the Sectoral Approach with the Reference Approach

In this chapter, CO_2 emissions from the sectoral and reference approach are compared and explanations for the differences are provided.

Table 9 shows CO_2 emissions calculated from the two approaches.

Table 9: CO_2 emissions by type of fuel.

Year	**Reference Approach**				**Sectoral Approach *1 A Fuel Combustion***				
	Liquid [Gg CO_2]	Solid [Gg CO_2]	Gaseous [Gg CO_2]	**Total [Gg CO_2]**	Liquid [Gg CO_2]	Solid [Gg CO_2]	Gaseous [Gg CO_2]	Other [Gg CO_2]	**Total [Gg CO_2]**
1990	28 207	15 917	12 238	**56 362**	28 138	13 924	11 301	732	**54 094**
1991	30 741	16 771	12 939	**60 451**	30 615	14 518	11 940	805	**57 878**
1992	29 819	12 957	12 705	**55 480**	29 349	10 666	12 000	956	**52 972**
1993	30 890	11 650	13 399	**55 939**	30 758	9 495	12 453	675	**53 381**
1994	30 146	11 810	13 782	**55 739**	30 127	9 379	13 111	820	**53 437**
1995	30 751	13 499	15 048	**59 298**	30 336	10 741	14 339	839	**56 255**
1996	33 169	13 511	16 017	**62 697**	32 950	10 760	15 287	1 073	**60 070**
1997	32 633	14 318	15 437	**62 388**	32 150	11 318	14 720	1 017	**59 206**
1998	34 924	12 550	15 848	**63 323**	34 274	8 905	15 136	818	**59 133**
1999	32 907	12 481	16 125	**61 513**	32 425	9 210	15 406	819	**57 860**
2000	32 037	14 152	15 388	**61 578**	31 717	10 443	14 684	832	**57 676**
2001	34 551	14 581	16 309	**65 440**	34 255	11 249	15 629	978	**62 112**
2002	35 337	14 880	16 494	**66 711**	35 301	11 134	15 792	1 163	**63 391**

[23] WINIWARTER, W. (2008): Quantifying Uncertainties of the Austrian Greenhouse Gas Inventory, ARC-sys-0154.

Year	Reference Approach				Sectoral Approach *1 A Fuel Combustion*				
	Liquid [Gg CO_2]	Solid [Gg CO_2]	Gaseous [Gg CO_2]	**Total [Gg CO_2]**	Liquid [Gg CO_2]	Solid [Gg CO_2]	Gaseous [Gg CO_2]	Other [Gg CO_2]	**Total [Gg CO_2]**
2003	37 762	15 983	17 833	**71 578**	38 085	12 624	17 070	1 389	**69 167**
2004	38 569	15 813	17 621	**72 003**	38 449	12 310	16 916	1 518	**69 193**
2005	39 108	15 722	19 307	**74 136**	38 841	11 945	18 508	1 405	**70 699**
2006	37 850	15 872	17 605	**71 326**	37 072	11 740	16 792	1 515	**67 120**
2007	37 002	14 851	16 476	**68 328**	35 746	10 947	15 810	1 480	**63 982**
2008	35 688	13 968	17 639	**67 294**	34 675	10 294	16 833	1 492	**63 293**

Table 10 shows the difference (in percent) between reference and sectoral approach CO_2 emissions.

Table 10: Difference (in%) of CO_2 emissions by type of fuel.

Year	Liquid	Solid	Gaseous	Total
1990	0.25%	14.31%	8.29%	4.19%
1991	0.41%	15.52%	8.36%	4.45%
1992	1.60%	21.47%	5.87%	4.74%
1993	0.43%	22.70%	7.60%	4.79%
1994	0.06%	25.92%	5.12%	4.31%
1995	1.37%	25.67%	4.94%	5.41%
1996	0.66%	25.57%	4.77%	4.37%
1997	1.50%	26.50%	4.87%	5.38%
1998	1.90%	40.94%	4.71%	7.09%
1999	1.49%	35.51%	4.67%	6.31%
2000	1.01%	35.51%	4.80%	6.76%
2001	0.86%	29.62%	4.35%	5.36%
2002	0.10%	33.65%	4.44%	5.24%
2003	-0.85%	26.61%	4.47%	3.49%
2004	0.31%	28.46%	4.17%	4.06%
2005	0.69%	31.62%	4.31%	4.86%
2006	2.10%	35.19%	4.84%	6.27%
2007	3.51%	35.67%	4.21%	6.79%
2008	2.92%	35.69%	4.79%	6.32%

Positive numbers indicate that CO_2 emissions from the reference approach are higher than emissions from the sectoral approach.

3.8.1 Explanation of differences

In the reference approach IPCC default net calorific values are used except for bituminous coal and lignite. In the sectoral approach country-specific net calorific values are used for all types of fuels.

The selected carbon emission factors (carbon content) of the two approaches are different, especially for coal.

Liquid Fuels: The energy balance is mass-balanced but not carbon balanced. The fuel category *Other Oil* is an aggregation of several fuel types and therefore it is difficult to quantify a reliable carbon emission factor for the reference approach. The reference approach takes a share of feedstock used for plastics and solvent production as non-carbon stored. In the sectoral approach emissions from waste incineration including plastics and waste oil are included in *Other Fuels*. Emissions from solvent use are included in category *3. Solvent and Other Products Use*. In the sectoral approach a share of municipal solid waste without energy recovery is considered in category *6.C.* for 1990 and 1991.

Diesel: In the Reference Approach CO_2 emissions from diesel are fully accounted for as fossil emissions while in the sectoral approach the share of mixed biofuel is accounted for as biogenic.

Solid fuels: The reference approach includes process emissions from blast furnaces and steel production which are included in category *2.C. Metal Production* as well as process emissions from carbide production which are included in category *2.B.4. Carbide Production*. In the sectoral approach plant-specific CO_2 emission factors have been used for large coal boilers since 2005.

Gaseous fuels: The national approach uses country specific carbon contents and heating values different to IPCC default factors. Process emissions from ammonia production are included in category *2.B.1. Ammonia Production*.

Other fuels: The sectoral approach considers waste as an additional fuel type (e.g. municipal solid waste, hazardous waste and industrial fuel waste).

Carbon Stored: The reference approach uses IPCC default values for "fractions of carbon stored".

3.8.2 Quantification of differences

By quantifying the difference between the two approaches the remaining difference is between -1.2 to +1.6%. Currently it is not possible to quantify all fossil carbon flows such as solvents and plastic products which are imported or exported by products, bulk or waste.

Table 11 shows the differences that can be easily quantified. Positive numbers indicate CO_2 emissions not included in the sectoral approach. Negative numbers indicate CO_2 emissions which are not considered by the reference approach. The remaining differences are mainly due to the use of country-specific emission factors and NCVs within the sectoral approach and the use of "default fractions of carbon stored" within the reference approach.

Table 11: Quantification of differences.

Year	Natural Gas[(1)] [Gg CO_2]	2 B 1 Ammonia Production[(3)] [Gg CO_2]	Coke Oven Coke[(4)] [Gg CO_2]	Other Fuels [Gg CO_2]	Biofuels[(5)] [Gg CO_2]	Total [Gg CO_2]	Remaining difference[(2)]
1990	162	826	2 704	-732	0	2 960	-1.2%
1991	168	884	2 722	-805	0	2 969	-0.7%
1992	167	595	2 458	-956	0	2 263	0.4%
1993	171	831	2 526	-675	0	2 854	-0.5%
1994	177	556	2 767	-820	0	2 680	-0.7%
1995	194	583	3 136	-839	0	3 075	-0.1%
1996	205	597	2 918	-1 073	0	2 648	0.0%
1997	196	591	3 316	-1 017	0	3 086	0.2%
1998	200	585	3 214	-818	0	3 181	1.6%

Year	Natural Gas[1] [Gg CO_2]	2 B 1 Ammonia Production[3] [Gg CO_2]	Coke Oven Coke[4] [Gg CO_2]	Other Fuels [Gg CO_2]	Biofuels[5] [Gg CO_2]	Total [Gg CO_2]	Remaining difference[2]
1999	203	590	3 102	-819	0	3 076	0.9%
2000	193	582	3 489	-832	0	3 432	0.8%
2001	204	551	3 449	-978	0	3 226	0.2%
2002	205	573	3 879	-1 163	0	3 493	-0.3%
2003	220	625	3 721	-1 389	0	3 177	-1.1%
2004	218	568	3 650	-1 518	0	2 917	-0.1%
2005	239	598	4 128	-1 405	125	3 684	-0.3%
2006	217	638	4 206	-1 515	879	4 426	-0.3%
2007	205	560	4 214	-1 480	1 010	4 509	-0.2%
2008	218	623	4 147	-1 492	993	4 489	-0.7%

(1) *Deviation due to the use of different carbon emission factors and distribution losses.*

(2) *Negative numbers indicate that CO_2 emissions from the reference approach are lower than emissions from the sectoral approach.*

(3) *Process emissions of natural gas used for ammonia production.*

(4) *Process emissions of coke oven coke used in blast furnaces. Emissions are allocated to 2.C.1. Iron and Steel Production.*

(5) *Share of biofuel in diesel.*

4 ADDITIONAL REPORTING UNDER ARTICLE 3 OF DECISION 280/2004/EC

4.1 Article 3 (1) d

Austria decided not to make use of additional activities under Article 3(4) Kyoto Protocol. However, it already reported on a voluntary basis in its submission 2009 on activities under Article 3(3) Kyoto Protocol (net changes in GHG emissions and removals resulting from direct human-induced land-use change and forestry activities, limited to afforestation, reforestation and deforestation since 1990). Austria also volunteered to participate in the exercise on adjustments of estimates of GHG resulting from activities under Article 3.3. Unfortunately, the process related to that exercise has not yet been finished as there still remain some unresolved issues between Austria and the ERT. The exercise showed that in particular the demonstration of "direct human-induced" land-use change is an issue that needs further clarification. It is expected that the discussion at the next lead-reviewer meeting under the UNFCCC will further clarify this issue. Therefore no figures are presented in this report but will be only included in the final submission to the UNFCCC by 15 April 2010.

4.2 Article 3 (1) g

AAUs, RMUs, ERUs or CERs issued or transferred to the Austrian registry in the reporting period, the year 2008, can be found in the separate file AT_Report_Art31g_2010.xls which is submitted together with this report.

4.3 Article 3 (1) h

Austria has authorised Kommunalkredit Public Consulting GmbH (Türkenstraße 9, 1092 Vienna) to participate in the mechanisms according to Article 6, 12 and 17 of the Kyoto Protocol.

4.4 Article 3 (1) j

Indicators pursuant to Article 3 (1) j of the Monitoring Decision are reported in Annex III. Emission data are consistent with the CRF; denominators are taken from official Austrian statistics.

4.5 Article 3 (1) k

The national inventory system is unchanged compared to the description given in chapter 3.3 and in the Austrian Initial Report under the Kyoto Protocol[24].

[24] http://unfccc.int/files/national_reports/initial_reports_under_the_kyoto_protocol/application/pdf/at-initial-report-200611-corr.pdf

ANNEX I: EMISSION TRENDS

This Annex presents emission trends for CO_2, CH_4, N_2O and FCs.

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

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.

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.

NA (not applicable):.....for activities in a given source/sink category that do not result in emissions or removals of a specific gas.

C (confidential): .....for emissions which could lead to the disclosure of confidential information if reported at the most disaggregated level. In this case a minimum of aggregation is required to protect business information.

Table A.I-1: Emission Trends CO_2.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Gg										
Total Emissions/Removals with LULUCF	**48 515.80**	**47 567.80**	**48 378.83**	**50 055.67**	**55 717.24**	**60 067.73**	**59 991.79**	**62 225.89**	**59 095.49**	**56 330.66**	**56 006.46**
Total Emissions without LULUCF	**62 086.70**	**63 971.01**	**65 819.27**	**70 211.21**	**72 064.41**	**77 857.59**	**77 783.09**	**79 837.49**	**76 729.48**	**74 008.42**	**73 661.67**
1. Energy	**54 196.26**	**56 382.04**	**57 840.70**	**62 294.38**	**63 558.04**	**69 400.47**	**69 402.77**	**70 904.17**	**67 352.00**	**64 219.26**	**63 505.06**
A. Fuel Combustion (Sectoral Approach)	54 094.17	56 254.90	57 676.06	62 111.53	63 390.89	69 167.31	69 192.62	70 699.02	67 119.85	63 982.10	63 292.90
1. Energy Industries	13 792.26	12 918.63	12 206.88	13 777.04	13 644.56	16 087.17	16 150.38	16 097.58	15 482.09	13 918.37	13 422.88
2. Manufacturing Industries and Construction	12 685.23	13 487.01	13 722.60	13 620.70	14 048.71	14 453.79	14 425.28	15 988.40	15 943.17	15 971.21	15 996.58
3. Transport	13 770.29	15 673.05	18 808.92	20 056.77	21 981.11	23 820.86	24 340.03	24 691.16	23 380.85	23 556.11	22 285.96
4. Other Sectors	13 811.39	14 143.65	12 896.86	14 615.67	13 674.60	14 763.02	14 233.90	13 878.31	12 269.68	10 491.81	11 542.31
5. Other	35.01	32.56	40.80	41.36	41.91	42.47	43.03	43.56	44.06	44.61	45.17
B. Fugitive Emissions from Fuels	102.09	127.15	164.65	182.85	167.15	233.15	210.15	205.15	232.16	237.16	212.16
1. Solid Fuels	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO
2. Oil and Natural Gas	102.09	127.15	164.65	182.85	167.15	233.15	210.15	205.15	232.16	237.16	212.16
2. Industrial Processes	**7 584.25**	**7 388.04**	**7 773.68**	**7 700.46**	**8 268.26**	**8 213.54**	**8 169.33**	**8 710.01**	**9 117.55**	**9 549.94**	**9 912.49**
A. Mineral Products	3 274.18	2 862.55	2 965.71	2 983.49	3 093.10	3 081.21	3 178.18	3 132.87	3 306.72	3 517.56	3 530.92
B. Chemical Industry	585.10	583.65	587.27	539.50	551.22	592.50	528.09	563.47	599.25	530.62	593.35
C. Metal Production	3 724.96	3 941.84	4 220.70	4 177.48	4 623.93	4 539.83	4 463.06	5 013.66	5 211.58	5 501.76	5 788.22
D. Other Production	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Production of Halocarbons and SF_6											
F. Consumption of Halocarbons and SF_6											
G. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	279.30	189.95	192.62	204.10	225.85	231.32	198.72	211.05	247.67	226.96	231.86

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Gg										
4. Agriculture											
A. Enteric Fermentation											
B. Manure Management											
C. Rice Cultivation											
D. Agricultural Soils [(2)]											
E. Prescribed Burning of Savannas											
F. Field Burning of Agricultural Residues											
G. Other											
5. Land Use, Land-Use Change and Forestry	**-13 570.90**	**-16 403.21**	**-17 440.44**	**-20 155.54**	**-16 347.17**	**-17 789.85**	**-17 791.29**	**-17 611.60**	**-17 634.00**	**-17 677.76**	**-17 655.21**
A. Forest Land	-15 913.42	-18 604.71	-19 339.66	-22 013.93	-18 195.26	-19 647.35	-19 620.30	-19 593.24	-19 566.19	-19 539.13	-19 512.08
B. Cropland	1 595.29	1 661.92	1 680.25	1 658.78	1 732.83	1 731.37	1 748.06	1 766.04	1 757.82	1 729.69	1 789.46
C. Grassland	-1 021.55	-1 134.84	-1 220.98	-1 207.83	-1 268.54	-1 259.15	-1 291.15	-1 265.56	-1 288.27	-1 264.41	-1 283.77
D. Wetlands	199.73	255.80	293.40	301.63	309.87	318.10	326.65	318.79	337.67	371.78	376.97
E. Settlements	759.10	674.69	568.23	545.18	530.98	541.92	533.88	664.52	640.83	553.87	517.46
F. Other Land	809.95	743.93	578.31	560.63	542.95	525.26	511.56	497.85	484.15	470.44	456.74
G. Other	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
6. Waste	**26.89**	**10.97**	**12.26**	**12.26**	**12.26**	**12.26**	**12.26**	**12.26**	**12.26**	**12.26**	**12.26**
A. Solid Waste Disposal on Land	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
B. Waste-water Handling											
C. Waste Incineration	26.89	10.97	12.26	12.26	12.26	12.26	12.26	12.26	12.26	12.26	12.26
D. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Gg										
7. Other *(please specify)*	**NA**	**NA**	**NA**	NA	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
Memo Items:											
International Bunkers	**885.97**	**1 327.42**	**1 695.58**	**1 651.28**	**1 540.85**	**1 452.97**	**1 724.93**	**1 959.83**	**2 048.88**	**2 175.79**	**2 181.97**
Aviation	885.97	1 327.42	1 695.58	1 651.28	1 540.85	1 452.97	1 724.93	1 959.83	2 048.88	2 175.79	2 181.97
Marine	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Multilateral Operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 Emissions from Biomass	9 803.18	11 260.05	12 445.30	13 320.46	12 747.95	13 293.16	13 774.96	16 787.54	18 087.09	19 711.59	20 878.59

Table A.I-2: Emission Trends CH_4.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Gg										
Total Emissions/ Removals with LULUCF	**394.56**	**362.96**	**316.07**	**309.75**	**302.85**	**303.15**	**296.36**	**290.07**	**283.94**	**279.53**	**272.70**
Total Emissions without LULUCF	**394.56**	**362.96**	**316.07**	**309.75**	**302.85**	**303.15**	**296.36**	**290.07**	**283.94**	**279.53**	**272.70**
1. Energy	31.94	31.15	25.21	25.41	24.31	24.32	24.20	25.41	24.21	24.34	24.14
A. Fuel Combustion (Sectoral Approach)	21.96	20.41	15.10	15.41	14.35	14.28	13.28	14.25	12.60	12.33	12.01
1. Energy Industries	0.16	0.16	0.16	0.19	0.20	0.24	0.27	0.25	0.30	0.30	0.28
2. Manufacturing Industries and Construction	0.34	0.39	0.44	0.45	0.46	0.52	0.57	0.60	0.62	0.61	0.62
3. Transport	3.06	3.10	1.96	1.81	1.73	1.61	1.44	1.29	1.13	1.01	0.88
4. Other Sectors	18.40	16.76	12.54	12.95	11.95	11.91	11.00	12.10	10.54	10.41	10.23
5. Other	0.00	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	9.98	10.74	10.11	10.00	9.95	10.04	10.92	11.16	11.61	12.00	12.13
1. Solid Fuels	0.52	0.28	0.27	0.26	0.30	0.25	0.05	0.00	0.00	IE,NA,NO	IE,NA,NO
2. Oil and Natural Gas	9.46	10.46	9.84	9.75	9.65	9.80	10.87	11.16	11.61	12.00	12.13
2. Industrial Processes	**0.71**	**0.69**	**0.70**	**0.67**	**0.71**	**0.70**	**0.70**	**0.75**	**0.92**	**0.91**	**0.89**
A. Mineral Products	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B. Chemical Industry	0.70	0.68	0.70	0.67	0.70	0.69	0.70	0.75	0.92	0.90	0.88
C. Metal Production	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Other Production											
E. Production of Halocarbons and SF_6											
F. Consumption of Halocarbons and SF_6											
G. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Gg										
3. Solvent and Other Product Use											
4. Agriculture	**198.71**	**191.46**	**180.24**	**177.92**	**174.08**	**172.37**	**172.02**	**170.01**	**169.37**	**170.14**	**169.45**
A. Enteric Fermentation	178.73	172.08	162.71	160.48	157.20	155.70	155.69	153.75	153.23	153.84	153.52
B. Manure Management	19.59	18.87	17.02	16.94	16.45	16.19	15.87	15.83	15.67	15.81	15.47
C. Rice Cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural Soils [(2)]	0.33	0.44	0.45	0.43	0.38	0.41	0.37	0.37	0.41	0.42	0.41
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	0.07	0.07	0.06	0.07	0.07	0.06	0.09	0.06	0.06	0.06	0.06
G. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5. Land Use, 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**	**0.00**
A. Forest Land	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Cropland	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
C. Grassland	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
F. Other Land	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
G. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6. Waste	**163.20**	**139.67**	**109.92**	**105.75**	**103.75**	**105.76**	**99.43**	**93.91**	**89.44**	**84.15**	**78.21**
A. Solid Waste Disposal on Land	157.82	134.42	106.01	101.91	99.99	102.08	95.31	89.60	85.51	80.14	74.16
B. Waste-water Handling	4.85	4.21	2.68	2.43	2.18	1.95	1.96	1.97	1.48	1.49	1.50
C. Waste Incineration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Other	0.52	1.04	1.24	1.41	1.58	1.74	2.16	2.33	2.44	2.52	2.55

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Gg										
7. Other *(please specify)*	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**
Memo Items:											
International Bunkers	0.01	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04
Aviation	0.01	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04
Marine	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Multilateral Operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 Emissions from Biomass											

Table A.I-3: Emission Trends N_2O.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Gg										
Total Emissions/ Removals with LULUCF	**21.20**	**22.06**	**21.07**	**20.67**	**21.18**	**20.90**	**18.17**	**18.33**	**18.58**	**18.58**	**19.22**
Total Emissions without LULUCF	**19.81**	**21.16**	**20.14**	**19.79**	**19.81**	**19.56**	**17.31**	**17.42**	**17.56**	**17.65**	**18.19**
1. Energy	**1.80**	**2.12**	**2.35**	**2.46**	**2.49**	**2.57**	**2.55**	**2.63**	**2.55**	**2.49**	**2.42**
A. Fuel Combustion (Sectoral Approach)	1.80	2.12	2.35	2.46	2.49	2.57	2.55	2.63	2.55	2.49	2.42
1. Energy Industries	0.15	0.16	0.16	0.19	0.19	0.22	0.24	0.26	0.29	0.31	0.32
2. Manufacturing Industries and Construction	0.26	0.31	0.43	0.42	0.40	0.40	0.40	0.46	0.49	0.50	0.49
3. Transport	0.63	0.87	0.98	1.01	1.09	1.12	1.10	1.08	1.00	0.95	0.86
4. Other Sectors	0.76	0.78	0.78	0.83	0.80	0.81	0.80	0.83	0.77	0.73	0.75
5. Other	0.00	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	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA
1. Solid Fuels	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA
2. Oil and Natural Gas	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA	IE,NA
2. Industrial Processes	**2.94**	**2.77**	**3.07**	**2.54**	**2.60**	**2.85**	**0.91**	**0.88**	**0.90**	**0.87**	**1.05**
A. Mineral Products	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B. Chemical Industry	2.94	2.77	3.07	2.54	2.60	2.85	0.91	0.88	0.90	0.87	1.05
C. Metal Production	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D. Other Production											
E. Production of Halocarbons and SF_6											
F. Consumption of Halocarbons and SF_6											
G. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Solvent and Other Product Use	0.75	0.75	0.75	0.71	0.67	0.64	0.60	0.56	0.53	0.52	0.51

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Gg										
4. Agriculture	**13.89**	**14.99**	**13.17**	**13.19**	**13.11**	**12.56**	**12.24**	**12.25**	**12.42**	**12.59**	**13.02**
A. Enteric Fermentation											
B. Manure Management	3.01	3.09	3.01	3.01	2.97	2.98	2.99	2.97	2.97	3.01	2.97
C. Rice Cultivation											
D. Agricultural Soils [(2)]	10.89	11.89	10.16	10.18	10.14	9.58	9.25	9.29	9.45	9.58	10.05
E. Prescribed Burning of Savannas	NO	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	0.00
G. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
5. Land Use, Land-Use Change and Forestry	**1.39**	**0.90**	**0.93**	**0.88**	**1.37**	**1.34**	**0.86**	**0.90**	**1.02**	**0.94**	**1.03**
A. Forest Land	0.58	0.09	0.12	0.07	0.56	0.53	0.05	0.09	0.22	0.11	0.15
B. Cropland	0.81	0.80	0.80	0.81	0.81	0.81	0.81	0.81	0.81	0.83	0.88
C. Grassland	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
F. Other Land	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
G. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6. Waste	**0.43**	**0.54**	**0.80**	**0.90**	**0.92**	**0.95**	**1.02**	**1.09**	**1.15**	**1.18**	**1.19**
A. Solid Waste Disposal on Land											
B. Waste-water Handling	0.35	0.40	0.63	0.71	0.71	0.71	0.72	0.77	0.81	0.83	0.84
C. Waste Incineration	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Other	0.08	0.14	0.17	0.19	0.22	0.24	0.30	0.32	0.34	0.35	0.35
7. Other *(please specify)*	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Gg										
Memo Items:											
International Bunkers	**0.03**	**0.05**	**0.06**	**0.06**	**0.05**	**0.05**	**0.06**	**0.07**	**0.07**	**0.07**	**0.07**
Aviation	0.03	0.05	0.06	0.06	0.05	0.05	0.06	0.07	0.07	0.07	0.07
Marine	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Multilateral Operations	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
CO_2 Emissions from Biomass											

Table A.I-4: Emission Trends HFCs, PFCs and SF_6.

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Gg										
Emissions of HFCs – Gg CO_2 equivalent	**26.32**	**411.89**	**901.88**	**924.92**	**969.22**	**949.55**	**955.14**	**986.41**	**962.62**	**1 061.99**	**1 058.10**
HFC-23	NA,NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-32	NA,NO	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
HFC-41	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-43-10mee	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NA,NO	NA,NO	NA,NO	NA,NO
HFC-125	NA,NO	0.01	0.04	0.05	0.05	0.05	0.05	0.06	0.07	0.08	0.08
HFC-134	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-134a	0.02	0.28	0.40	0.40	0.40	0.42	0.42	0.40	0.36	0.37	0.38
HFC-152a	NA,NO	0.08	0.60	0.61	0.95	0.64	0.43	0.21	0.25	0.25	0.09
HFC-143	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-143a	NA,NO	0.00	0.04	0.04	0.04	0.05	0.05	0.06	0.06	0.07	0.07
HFC-227ea	NA,NO	NA,NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-236fa	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
HFC-245ca	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Unspecified mix of listed HFCs[5] – (Gg CO_2 equivalent)	1.93	8.53	3.85	4.14	4.05	3.88	4.06	3.98	5.03	7.07	7.39
Emissions of PFCs – Gg CO_2 equivalent	**1 079.24**	**71.27**	**84.79**	**95.91**	**97.70**	**116.44**	**136.65**	**133.82**	**145.72**	**190.12**	**173.53**
CF_4	0.14	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO
C_2F_6	0.02	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO
C_3F_8	IE,NA,NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C_4F_{10}	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
c-C_4F_8	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO	IE,NA,NO
C_5F_{12}	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
C_6F_{14}	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO
Unspecified mix of listed PFCs[5] – (Gg CO_2 equivalent)	29.05	68.39	67.46	81.67	83.46	102.20	125.49	125.04	135.50	182.55	166.39
Emissions of SF_6 – CO_2 equivalent (Gg)	**494.28**	**1 154.06**	**595.54**	**652.28**	**634.81**	**566.62**	**497.35**	**507.33**	**465.15**	**374.54**	**381.44**
SF_6	0.02	0.05	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02

ANNEX II: TIER 1 UNCERTAINTY ASSESSMENT

This Annex presents activity data and emission factor uncertainty and/or uncertainty of the emission estimate (”combined uncertainty”) for key sources of the Austrian GHG inventory, based on the key source assessment of the 2009 submission. Sources of uncertainties are explained in the NIR 2009. The key source analysis of the 2010 submission will be presented in the NIR 2010[25].

Table A.II: Uncertainties for Key Sources of the Austrian GHG Inventory (KS Assessment 2009).

IPCC Source category	Gas	AD	EF	Combined	Combined as% of total national emissions in 2007	Introduced into the trend in total national emissions
		Uncertainty [%]				
1 A 1 a liquid: Public Electricity and Heat Production	CO_2	0.5	0.5	0.7	0.01	0.01
1 A 1 a other: Public Electricity and Heat Production	CO_2	10.0	20.0	22.4	0.17	0.18
1 A 1 a solid: Public Electricity and Heat Production	CO_2	0.5	0.5	0.7	0.04	0.05
1 A 1 b liquid: Petroleum refining	CO_2	0.5	0.3	0.6	0.02	0.03
1 A 2 mobile-liquid: Manufacturing Industries and Construction	CO_2	3.0	0.5	3.0	0.03	0.04
1 A 2 other: Manufacturing Industries and Construction	CO_2	10.0	20.0	22.4	0.25	0.24
1 A 2 solid: Manufacturing Industries and Construction	CO_2	1.0	0.5	1.1	0.07	0.10
1 A 2 stat-liquid: Manufacturing Industries and Construction	CO_2	3.0	0.5	3.0	0.08	0.12
1 A 3 a jet kerosene: Civil Aviation	CO_2	3.0	3.0	4.2	0.00	0.00
1 A 3 b diesel oil: Road Transportation	CO_2	3.0	3.0	4.2	0.85	1.05
1 A 3 b gasoline: Road Transportation	CO_2	3.0	3.0	4.2	0.30	0.35
1 A 4 biomass: Other Sectors	CH_4	10.0	50.0	51.0	0.15	0.08
1 A 4 mobile-diesel: Other Sectors	CO_2	3.0	0.5	3.0	0.03	0.04
1 A 4 other: Other Sectors	CO_2	10.0	20.0	22.4	0.04	0.07
1 A 4 solid: Other Sectors	CO_2	1.0	0.5	1.1	0.01	0.02
1 A 4 stat-liquid: Other Sectors	CO_2	3.0	0.5	3.0	0.17	0.27
1 A gaseous: Fuel Combustion (stationary)	CO_2	2.0	0.5	2.1	0.38	0.58
1 B 2 b: Natural gas	CH_4	4.2	14.1	14.7	0.10	0.07
2 A 1: Cement Production	CO_2	5.0	2.0	5.4	0.13	0.20
2 A 2: Lime Production	CO_2	20.0	5.0	20.6	0.14	0.22

[25] Austria’s National Inventory Report 2010, submission under the United Nations Framework Convention on Climate Change (the NIR is due for reporting under the Monitoring Mechanism (280/2004/EC) by March 15 and will be reported under the UNFCCC by April 15 – it will be published in April).

IPCC Source category	Gas	AD	EF	Combined	Combined as% of total national emissions in 2007	Introduced into the trend in total national emissions
		Uncertainty [%]				
2 A 3: Limestone and Dolomite Use	CO_2	19.6	2.0	19.7	0.07	0.11
2 A 7 b: Sinter Production	CO_2	2.0	5.0	5.4	0.02	0.02
2 B 1: Ammonia Production	CO_2	2.0	4.6	5.0	0.03	0.02
2 B 2: Nitric Acid Production	N_2O	0.0	5.0	5.0	0.02	0.05
2 C 1: Iron and Steel Production	CO_2	0.5	0.5	0.7	0.05	0.05
2 C 3: Aluminium production	CO_2	2.0	0.5	2.1	0.00	0.01
2 C 3: Aluminium production	PFC	0.0	50.0	50.0	0.00	0.12
2 C 4: SF6 Used in Al and Mg Foundries	SF_6	0.0	5.0	5.0	0.00	0.02
2 F 1/2/3/4/5: ODS Substitutes	HFC	20.0	50.0	53.9	0.18	0.14
2 F 7: Semiconductor Manufacture	FCs	5.0	10.0	11.2	0.04	0.03
2 F 9: Other Sources of SF6	SF_6	25.0	50.0	55.9	0.56	0.67
3: SOLVENT AND OTHER PRODUCT USE	CO_2	5.0	10.0	11.2	0.03	0.02
4 A 1: Cattle	CH_4	10.0	20.0	22.4	0.79	0.61
4 B 1: Cattle	N_2O	10.0	100.0	100.5	0.93	0.33
4 B 1: Cattle	CH_4	10.0	70.0	70.7	0.37	0.20
4 B 8: Swine	CH_4	10.0	70.0	70.7	0.34	0.11
4 D 1: Direct Soil Emissions	N_2O	5.0	150.0	150.1	2.87	0.75
4 D 2: Pasture, Range and Paddock Manure	N_2O	5.0	150.0	150.1	0.39	0.04
4 D 3: Indirect Emissions	N_2O	5.0	150.0	150.1	1.94	0.70
6 A: Solid Waste Disposal on Land	CH_4	12.0	25.0	27.7	0.57	0.76
6 B: Wastewater Handling	N_2O	20.0	50.0	53.9	0.18	0.15
Total					**3.97**	**2.13**

ANNEX III: INDICATORS

This Annex presents the indicators pursuant to Article 3 (1) j of the Monitoring Decision (280/2004/EC), a detailed description of the indicators can be found in Annex II of the "Implementing Provisions" (Commission Decision 2005/166/EC).

Information on all Priority Indicators (including Additional Priority Indicators) is provided; however, data for one Supplementary Indicator was not available (indicated by NA in the cells).[26]

Table A.III: Indicators pursuant to Article 3 (1) j of the Monitoring Decision for the years 1990, 1995, 2000–2008.

No	Indicator	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008
	Priority											
1	Total CO_2 intensity of GDP [t CO_2/Mio Euro]	353.9	329.2	292.4	310.3	313.3	335.8	327.2	327.8	304.5	283.6	276.6
2	Energy related CO_2 intensity of GDP [t CO_2/Mio Euro]	308.4	289.5	256.2	274.5	275.6	298.3	291.0	290.2	266.3	245.2	237.7
3	Specific CO_2 emissions of passenger cars [g CO_2/ km]	212.6	206.9	193.8	190.3	186.7	183.7	181.4	177.7	172.1	169.1	164.7
4	Energy related CO_2 intensity of industry [t/Mio Euro]	290.1	282.1	250.5	247.9	257.0	260.2	253.5	271.3	255.1	238.3	229.6
5	Specific CO_2 emissions of households [t CO_2/dwelling]	3.38	3.17	2.82	2.85	2.69	2.72	2.58	2.68	2.41	2.10	2.14
6	CO_2 intensity of the commercial and institutional sector [t CO_2/Mio Euro]	25.93	28.91	19.61	30.83	26.77	33.01	30.93	24.66	18.98	13.85	18.93
7	Specific CO_2 emissions of public and autoproducer power plants [t CO_2/TJ]	166.8	150.9	128.7	134.2	132.2	132.2	130.2	124.7	116.7	114.1	105.5
	Additional Priority											
1	Freight transport on road [g CO_2/ ton-km]	146.0	124.9	98.9	94.9	92.1	90.9	91.7	89.7	88.7	87.8	87.8
2	Total CO_2 intensity – iron and steel industry [t CO_2/Mio Euro]	2 651	3 253	2 524	2 422	2 976	3 162	3 336	3 503	3 695	3 493	3 564
3	Energy related CO_2 intensity – chemical industry [t CO_2/Mio Euro]	575.2	596.7	570.4	661.4	618.3	648.5	569.2	518.6	429.8	338.5	339.0

[26] The units of the transport indicators (No. 3 Priority Indicator, No. 1 Additional Priority Indicator, and No.1-3 Supplementary Indicator) were changed to the common unit g CO_2/km (the suggested unit was g CO_2/100 km). Furthermore, the names of the transport indicators No.3 and 4 Supplementary Indicator have been adapted to be consistent.

No	Indicator	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008
4	Energy related CO_2 intensity – glass, pottery and building materials industry [t CO_2/Mio Euro]	672.6	652.2	615.0	586.1	670.7	662.3	709.0	643.7	660.3	695.3	643.1
5	Specific CO_2 emissions of iron and steel industry [t CO_2/t production]	2.17	1.92	1.82	1.75	1.80	1.78	1.73	1.79	1.78	1.72	1.75
6	Specific energy related CO_2 emissions of cement industry [t CO_2/t production]	0.225	0.226	0.214	0.200	0.204	0.189	0.211	0.194	0.207	0.213	0.205
	Supplementary											
1	Specific diesel related CO_2 emissions of passenger cars [g CO_2/ km]	193.8	189.1	179.0	176.2	173.6	171.7	170.2	166.7	159.9	158.3	156.5
2	Specific petrol related CO_2 emissions of passenger cars [g CO_2/ km]	216.6	213.6	205.0	202.3	198.9	196.1	194.1	191.3	188.4	184.1	176.8
3	Passenger transport on road [g CO_2/passenger-km]	156.0	159.9	158.1	157.0	155.8	153.8	152.3	149.7	145.4	143.3	140.0
4	Passenger transport by air [kg CO_2/passenger]	234.0	226.1	125.8	104.2	109.6	107.0	106.2	110.8	110.7	106.4	95.0
5	Energy related CO_2 intensity – food, drink and tobacco industry [t CO_2/Mio Euro]	234.2	214.4	208.1	216.2	260.4	203.7	180.5	203.2	203.2	179.9	172.9
6	Energy related CO_2 intensity – paper and printing industry [t CO_2/Mio Euro]	864.7	836.4	676.4	620.3	657.6	738.5	667.1	662.4	579.5	530.5	503.2
7	Specific CO_2 emissions of households for space heating [t CO_2/m²]	35.92	32.25	27.54	27.61	25.39	25.05	23.32	24.07	21.51	18.50	18.83
8	Specific CO_2 emissions of commercial and institutional sector for space heating [kg CO_2/m²]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
9	Specific CO_2 emissions of public power plants [t CO_2/TJ]	166.4	143.5	133.4	134.0	128.1	129.9	122.4	113.7	108.1	101.6	93.2
10	Specific CO_2 emissions of autoproducer plants [t CO_2/TJ]	168.2	168.2	117.6	134.7	143.9	140.6	157.3	164.1	144.8	149.4	140.6

No	Indicator	1990	1995	2000	2001	2002	2003	2004	2005	2006	2007	2008
11	Carbon intensity of total power generation [t CO_2/TJ]	68.37	58.70	48.04	54.79	53.56	64.48	61.11	59.89	57.17	53.03	49.04
12	Carbon intensity of transport [t CO_2/TJ]	65.94	64.05	63.50	64.26	65.52	66.34	65.72	64.68	62.71	62.03	60.80
13	Specific energy related CO_2 emissions of paper industry [t CO_2/t production]	0.755	0.643	0.536	0.520	0.501	0.523	0.461	0.460	0.420	0.421	0.415
14	Carbon intensity in Industry [kt CO_2 /PJ]	58.57	61.75	54.10	53.93	55.48	55.77	55.07	54.95	52.44	51.30	51.30
15	Carbon intensitiy Households [kt CO_2 /PJ]	40.86	37.51	34.50	33.83	33.02	32.61	32.31	31.31	30.12	27.97	28.03

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The Umweltbundesamt presents up-to-date figures of greenhouse gas emissions in Austria. In 2008, the first year of the commitment period under the Kyoto-Protocol, greenhouse gas emissions amounted to 86.6 million t of CO_2 equivalents. This corresponds to a 0.4 % reduction below 2007 levels and a 10.9 % increase against 1990 base-year levels. Driving forces behind the emission trend 2007–2008 are declining emissions in energy industries and road transport and increasing emissions in residential heating and industrial processes.

Both the content and format of this report are in accordance with obligations under the greenhouse gas monitoring mechanism 280/2004/EC for implementing the Kyoto Protocol, which specify that updated greenhouse gas emission data have to be reported to the European Commission by 15 January each year.

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