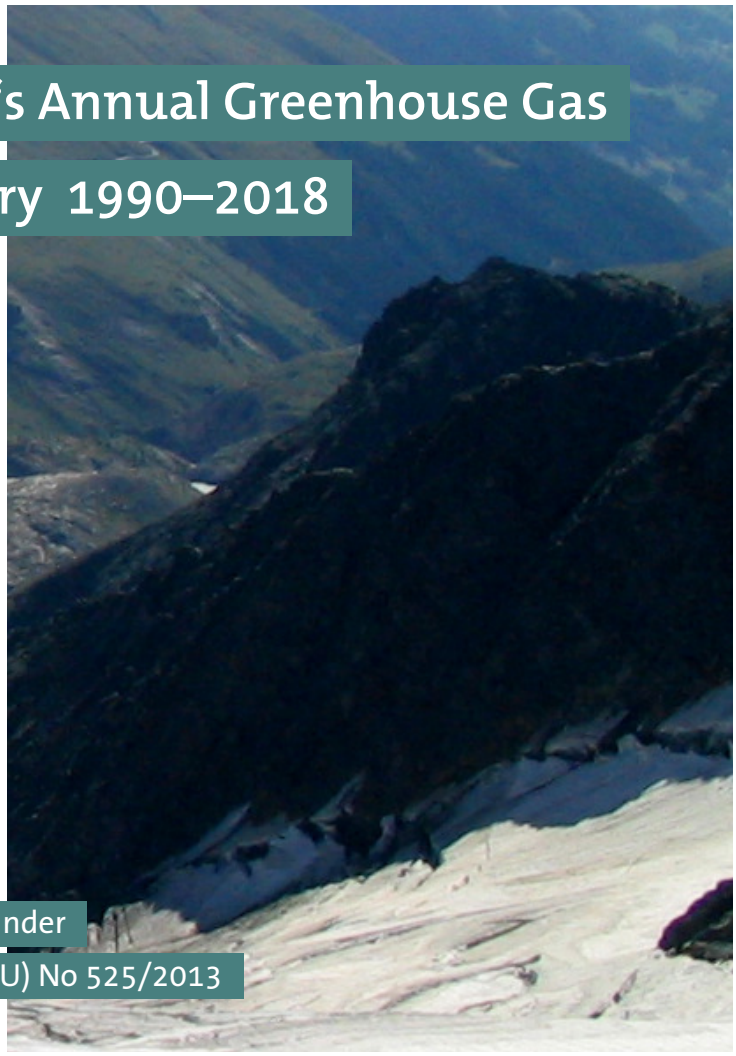
ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

Austria's Annual Greenhouse Gas Inventory 1990–2018



Submission under Regulation (EU) No 525/2013

ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

AUSTRIA'S ANNUAL GREENHOUSE GAS INVENTORY 1990–2018

Submission under Regulation (EU) No 525/2013

REPORT
REP-0711
Vienna 2020

Since 23 December 2005 the Umweltbundesamt has been accredited as Inspection Body for emission inventories, Type A (ID No. 241), in accordance with EN ISO/IEC 17020 and the Austrian Accreditation Law (AkkG), by decree of Accreditation Austria (first decree, No. BMWA-92.715/0036-I/12/2005, issued by Accreditation Austria / Federal Ministry of Economics and Labour on 19 January 2006).

The information covered refers to the following accreditation scope of the IBE: 2006 IPCC GL for National Greenhouse Gas Inventories, 2006 GL Revised Supplementary KP and 2006 GL Supplement Wetlands (www.bmdw.gv.at/akkreditierung)

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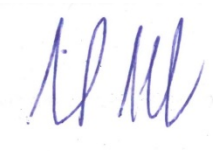
Date 15.01.2020	Responsible for the content of this report  DI Michael Anderl (Head of the inspection body)
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VORWORT

Dieser Bericht

Der vorliegende Bericht präsentiert die neuesten Daten der Emissionen von Treibhausgasen (THG) Österreichs. Diese Daten betreffen die Emissionen des Jahres 2018 sowie die aktualisierte Zeitreihe der Jahre 1990 bis 2017. Damit liefert der Bericht Daten für die ersten sechs Jahre der zweiten Kyoto-Verpflichtungsperiode sowie der Zielperiode 2013–2020 unter der „Effort Sharing-Entscheidung“ (2009/406/EG).

Der Bericht folgt in Format und Inhalt den Anforderungen des THG-Überwachungssystems (Monitoring Mechanism), in Umsetzung von Artikel 7 der Verordnung Nr. 525/2013/EG[1]. Dieses System umfasst die jährliche Übermittlung von aktualisierten THG-Emissionsdaten sowie zusätzlicher Informationen (z. B. SEF, Indikatoren) und einem dazugehörigen Kurzbericht („Short-NIR“) mit 15. Jänner an die Europäische Kommission (EK).

Eine detaillierte Darstellung der Daten im Common Reporting Format (CRF) wird der Europäischen Kommission in digitaler Form übermittelt. Auch die Berichtstabellen gemäß Durchführungsverordnung (EU) Nr. 749/2014 der Kommission über die Struktur, das Format, die Verfahren der Vorlage und die Überprüfung der von den Mitgliedstaaten gemäß der Verordnung (EU) Nr. 525/2013 gemeldeten Informationen sind nicht Bestandteil des vorliegenden Berichts, sondern werden der Europäischen Kommission separat übermittelt (EIONET/CDR).

Rechtlicher Hintergrund

Als Vertragsstaat der Klimarahmenkonvention (*Rahmenübereinkommen der Vereinten Nationen über Klimaänderungen* (UN Framework Convention on Climate Change – UNFCCC, BGBl. Nr. 414/1994[2]) ist Österreich verpflichtet, jährlich seine Emissionen und Senken bezüglich der direkten Treibhausgase CO_2, CH_4, N_2O, HFC, PFC, SF_6 und NF_3, 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

[1] Verordnung (EU) Nr. 525/2013 des Europäischen Parlaments und des Rates vom 21. Mai 2013 über ein System für die Überwachung von Treibhausgasemissionen sowie für die Berichterstattung über diese Emissionen und über andere klimaschutzrelevante Informationen auf Ebene der Mitgliedstaaten und der Union und zur Aufhebung der Entscheidung Nr. 280/2004/EG. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:165:0013:0040:DE:PDF

[2] BGBl. Nr. 414/1994: Rahmenübereinkommen der Vereinten Nationen über Klimaänderungen samt Anlagen. Änderung durch BGBl. III Nr. 12/1999.
http://www.ris.bka.gv.at/Dokumente/BgblPdf/1994_414_0/1994_414_0.pdf
http://www.ris.bka.gv.at/Dokumente/BgblPdf/1999_12_3/1999_12_3.pdf

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 internationale FachexpertInnen im Rahmen der so genannten UNFCCC-Reviews. Eine solche Tiefenprüfung fand zuletzt als Desk-Review von 10.–15.09.2018 statt, und konnte erfolgreich abgeschlossen werden. Ergebnisse dieser Prüfung, inkl. Empfehlungen zur Verbesserung, werden auf der Website der UNFCCC veröffentlicht[3]. 2019 fand seitens der UNFCCC keine Inventurprüfung statt.

Neben dem UNFCCC-Review findet auch auf Ebene der EU eine jährliche Prüfung der THG-Inventur statt („ESD-Review"). Dieser konnte 2019 erfolgreich (d. h. ohne ‚technical corrections") abgeschlossen werden. 2020 wird der ESD-Review als „comprehensive review" durchgeführt.

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

15. Jänner *(Jahr n)*	Übermittlung der THG-Inventur an Europäische Kommission (CRF für die Jahre 1990 bis zum Jahr n-2)
15. Jänner bis 28. Februar *(Jahr n)*	Überprüfung der Daten durch die EK
15. März *(Jahr n)*	Übermittlung des (endgültigen) nationalen Inventurberichtes (NIR) an die EK
15. Jänner bis 28. Februar *(Jahr n)*	Überprüfung der Daten (CRF) und des nationalen Inventurberichtes (NIR) durch die EEA im Rahmen der ‚initial QA/QC checks'
15. April *(Jahr n)*	Übermittlung der THG-Inventur (CRF und NIR) an die UNFCCC
15. April bis 30. Juni	Überprüfung der THG-Inventur (CRF und NIR) durch die EEA im Rahmen des Reviews unter der Effort-Sharing-Decision (‚ESD-Review')
Juni *(Jahr n)* bis März *(Jahr n+1)*	Überprüfung der Daten durch die UNFCCC: ● Stufe 1: Initial Check ● Stufe 2: Synthesis and Assessment ● Stufe 3: Individual Review
bis 15. Januar *(Jahr n +1)*	Berücksichtigung der Verbesserungsvorschläge 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[4] 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[5].

[3] https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/inventory-review-reports/inventory-review-reports-2018

[4] http://unfccc.int/kyoto_protocol/items/2830.php

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

Der vorliegende Bericht wurde vom Umweltbundesamt auf Grundlage des Umweltkontrollgesetzes BGBl. Nr. 152/1998[6] 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. Um eine vergleichbare Zeitreihe zur Verfügung zu haben wird die OLI erforderlichenfalls auch für zurückliegende Jahre aktualisiert. Die in diesem Bericht dargestellten Emissionsdaten ersetzen somit die publizierten Daten vorhergehender Berichte.

Inventur	Datenstand	Berichtsformat
OLI 2019	15. Jänner 2020	Common Reporting Format (CRF)

Tabelle B: Datengrundlage des vorliegenden Berichts.

[6] https://www.ris.bka.gv.at/Dokumente/BgblPdf/1998_152_1/1998_152_1.pdf

1 INTRODUCTION

This report presents the latest results from the Austrian greenhouse gas (GHG) inventory, which documents the annual national GHG emissions for the years 1990 to 2018. It presents GHG data for the first six years under the second commitment period under the Kyoto-Protocol as well as under the Effort-sharing decision target period 2013–2020.

The greenhouse gas inventory is submitted to the European Commission by the Austrian Federal Government in fulfilment of Austria's obligations under Article 7 of Regulation (EU) No 525/2013[7] ("*Monitoring Mechanism Regulation*"; MMR) repealing Decision No 280/2004/EC[8] ("*Monitoring Mechanism Decision*") concerning a mechanism for monitoring European 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[9] and to evaluate the progress towards meeting the greenhouse gas reduction commitments under the UNFCCC and the Kyoto Protocol.

According to the above mentioned regulation and the reporting requirements, which are in accordance with those 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 applying the methods described in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*[10], and to submit information in accordance with the *Reporting Guidelines (Decision 24/CP.19)*[11] established by the Conference of the Parties to the UNFCCC and under the Kyoto Protocol.

The national greenhouse gas inventory has to be submitted to the European Commission (EC) 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 the preparation of the Union greenhouse gas inventory report (Article 7 (1) p of 525/2013/EC). A complete and up-to-date national inventory report is expected to be subsequently submitted by 15 March each year.

The elements of the so-called "Short-NIR" are based on Article 7 paragraph 1 of the MMR and Articles 3-16 of the *Commission Implementing Regulation (EU) No 749/2014* on structure, format, submission processes and review of information reported by Member States pursuant to Regulation (EU) No 525/2013 of the European Parliament and of the Council (MMR IR). The overview table of reporting requirements according to the Commission Implementing Regulation (EU) No 749/2014 ('MMR-IR_Annex1_overview_AT_2020') as well as the completed MMR IR reporting templates are not part of this report but submitted separately by uploading at EIONET/CDR.

[7] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2013:165:0013:0040:EN:PDF

[8] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:049:0001:0001:EN:PDF

[9] http://ozone.unep.org/new_site/en/Treaties/treaty_text.php?treatyID=2

[10] http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html

[11] http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf#page=2

http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf

The complete tables of the Common Reporting Format (CRF), including in particular Sectoral Reports, Sectoral Background Tables and the Reference Approach for CO_2 are submitted separately in digital form only[12].

Table 1: Status of the present report.

Reporting Obligation	Format	Inventory	Version
Mechanism for monitoring Community greenhouse gas emissions	Common Reporting Format (CRF)	OLI 2019	January 15th 2020

Geographical coverage is complete. There is no part of the Austrian territory that is not covered by the inventory. Emissions from most sources specified in the CRF have been estimated. Information on sources not estimated ('NE') and emissions included under sources other than those stipulated in the CRF ('IE') are included in CRF Table 9 on *Completeness*.

[12] http://cdr.eionet.europa.eu/at/eu/AT%20GHG/coluq7lfw/envuq7obg

2 EMISSION TRENDS

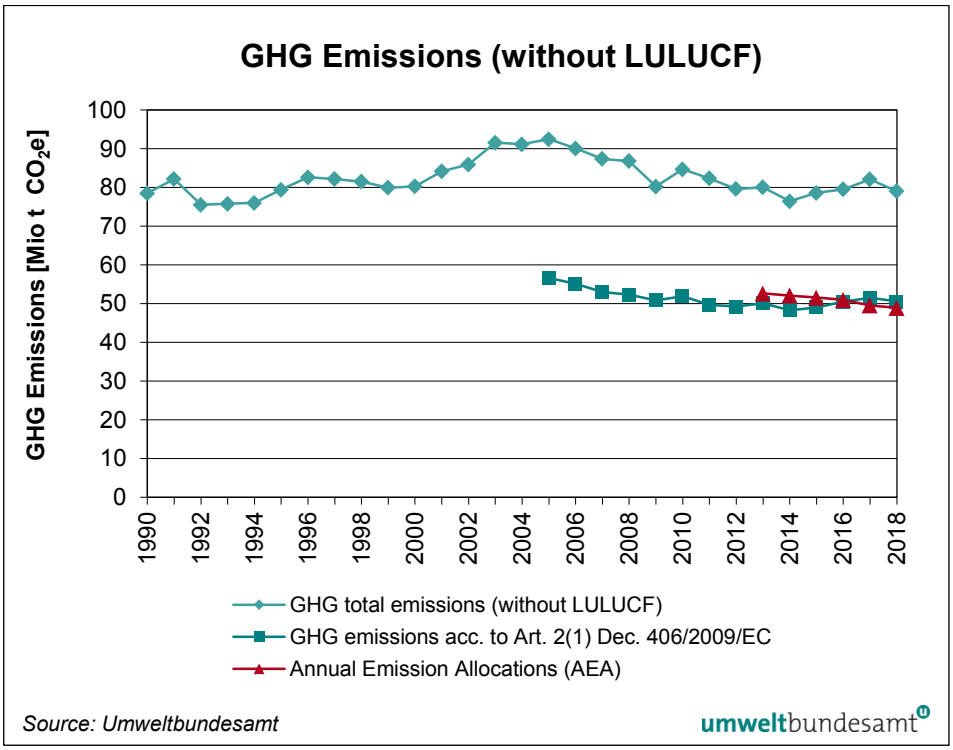
In 2018 Austria's total greenhouse gas (GHG) emissions (without Land Use, Land Use Change and Forestry - LULUCF) amounted to 79.0 Mt CO_2 equivalents (CO_2e). Compared to the base year[13] 1990 GHG emissions increased by 0.7%, compared to 2017 GHG emissions decreased by 3.7%.

Greenhouse gas emissions according to Article 2(1) of Decision No. 406/2009/EC amounted to 50.5 Mt CO_2 equivalents in 2018 (see 'MMR-IR_AnnexX_ESD_AT_2020'), which is 1.8% (0.9 Mt CO_2e) less than in 2017. Emissions were above the annual emission allocation (AEA) for the year 2018 (+1.6 Mt CO_2e), as well as for the year 2017 (+2.0 Mt CO_2e). However, emission data for the period 2013 to 2016 provided in submission 2020 were below the annual emission allocation: the difference amounted in 2016 to −0.5 Mt CO_2e, in 2015 to −2.5 Mt CO_2e, in 2014 to −3.8 Mt CO_2e and in 2013 to −2.5 Mt CO_2e the first year of the Effort-Sharing Decision target period[14].

[13] Austria's base year under the UNFCCC is 1990. Under the Kyoto Protocol the base year for CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 is 1990, for NF_3 it is 2000. Under the EU Effort Sharing Decision, the base year is 2005 (relates only to emissions not included in the EU Emissions Trading Scheme). Unless otherwise specified, references to the base year in this report refer always to 1990.

[14] Initial AEAs: Annex II of Commission Decision (No 2013/162/EU) of 26 March 2013 on determining Member States' annual emission allocations for the period from 2013 to 2020 pursuant to Decision No 406/2009/EC of the European Parliament and of the Council (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013D0162&from=EN) adjusted by Commission Implementing Decision (No 2013/634/EU) of 31 October 2013 on the adjustments to Member States' annual emission allocations for the period from 2013 to 2020 pursuant to Decision No 406/2009/EC of the European Parliament and of the Council (http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013D0634&from=EN). COMMISSION DECISION (EU) 2017/1471 of 10 August 2017 amending Decision 2013/162/EU to revise Member States' annual emission allocations for the period from 2017 to 2020

Figure 1: Trend in GHG emissions 1990–2018 without LULUCF.



Trend 2017–2018

The key drivers for the emissions decrease between 2017 and 2018 were the decreasing GHG emissions from *Industrial Processes and Other Product Use (CRF 2)* (-1 596 kt CO_2e; -9.3%) and *Energy (CRF 1)* (-1 318 kt CO_2e; -2.4%).

Overall emissions from *Industrial Processes and Other Product Use (CRF 2)* decreased, mainly due to a lower production of iron and steel. Emissions from *Energy (CRF 1)* decreased, due to lower emissions from sub-category *energy industries (CRF 1.A.1)* – mostly because of decreased electricity production from natural gas power plants – and sub-category *other sectors (CRF 1.A.4)* – as a result of a lower use of natural gas and gasoil due to decreased heating demand of households.

Net removals from *LULUCF* (*CRF 4*) show an increase by 6.2% (301 kt CO_2e) from 2017–2018, mainly caused by the increase in the harvested wood products sink.

Emissions from *Agriculture (CRF 3)* decreased by 1.2% (−89 kt CO_2e) from 2017 to 2018, mainly due to lower emissions from enteric fermentation and agricultural soils.

The declining emission trend of recent decades continues for Sector *Waste (CRF 5)* with a further decline by 4.6% (−68 kt CO_2e) as a result of low waste volumes as well as decreased carbon content of waste deposited in previous years.

GHG source and sink categories	1. Energy	2. IPPU	3. Agriculture	4. LULUCF	5. Waste	6. Other
	CO_2 equivalents (kt)					
1990	52 815	13 662	8 089	-11 988	3 926	NO*
1995	54 358	13 605	7 768	-13 138	3 653	NO
2000	55 300	14 610	7 387	-16 391	2 965	NO
2001	59 461	14 488	7 334	-19 234	2 868	NO
2002	60 685	15 130	7 226	-14 227	2 866	NO
2003	66 326	15 271	7 078	-4 834	2 870	NO
2004	66 336	14 810	7 061	-9 152	2 933	NO
2005	67 017	15 631	6 996	-10 622	2 794	NO
2006	64 112	16 287	6 991	-5 159	2 675	NO
2007	60 820	16 964	7 050	-5 398	2 547	NO
2008	59 881	17 291	7 185	-4 158	2 435	NO
2009	56 796	13 918	7 219	-4 449	2 288	NO
2010	59 510	15 924	7 080	-5 777	2 161	NO
2011	57 186	15 966	7 150	-6 005	2 046	NO
2012	54 981	15 565	7 100	-5 348	1 946	NO
2013	55 231	15 885	7 091	-4 396	1 827	NO
2014	51 443	16 009	7 233	-4 603	1 724	NO
2015	53 103	16 585	7 246	-4 439	1 641	NO
2016	54 227	16 383	7 361	-4 271	1 560	NO
2017	56 076	17 209	7 314	-4 852	1 487	NO
2018	54 757	15 613	7 224	-5 153	1 420	NO

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

** not occurring*

The most important GHG in Austria remains carbon dioxide (CO_2) with a share of 85% in 2018. The CO_2 emissions primarily result from combustion activities. Methane (CH_4), which mainly arises from stock farming and waste disposal, contributes 8.1% to total national GHG emissions; nitrous oxide (N_2O) with agricultural soils as the main source contributes another 4.5% in 2018. The remaining 2.9% are 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 3: Austria's anthropogenic greenhouse gas emissions by gas.

GHG emissions	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3
	CO_2 equivalents (kt)						
1990	62 125	10 391	4 321	2.4	1 183	471	0.0
1995	64 065	9 530	4 244	353	83	1 100	6.4
2000	66 163	8 393	4 319	714	88	575	11
2001	70 103	8 235	4 195	863	116	629	11
2002	71 919	8 094	4 199	969	102	613	11
2003	77 554	8 030	4 190	1 073	126	549	22
2004	77 674	8 034	3 603	1 160	158	484	27
2005	79 203	7 800	3 601	1 148	163	494	28
2006	76 940	7 700	3 610	1 155	172	453	33
2007	74 306	7 595	3 625	1 198	230	367	59
2008	73 632	7 469	3 805	1 250	208	373	53
2009	67 552	7 393	3 583	1 310	36	342	4.5
2010	72 073	7 309	3 389	1 486	78	336	4.1
2011	69 959	7 108	3 481	1 414	74	307	4.1
2012	67 273	7 007	3 449	1 492	51	312	8.6
2013	67 808	6 907	3 435	1 520	49	305	10
2014	64 147	6 777	3 519	1 588	53	314	11
2015	66 348	6 702	3 529	1 623	50	310	13
2016	67 176	6 643	3 620	1 643	50	393	6.1
2017	69 692	6 626	3 562	1 751	44	400	12
2018	66 784	6 439	3 526	1 835	33	382	17

The dominant sector regarding GHG emissions in Austria is *Energy*, causing 69% of the total national GHG emissions in 2018 (67% in 1990), followed by the sector *Industrial Processes and Other Product Use* (20% in 2018) and *Agriculture* (9.1% in 2018).

Table 4: Austria's greenhouse gas emissions by sector 1990 and 2018 as well as their share and trend.

GHG	1990	2018	Trend 1990–2018	1990	2018
	Emissions [kt CO_2e]			Share [%]	
Total	**78 493**	**79 014**	**+0.7%**	**100%**	**100%**
Energy	52 815	54 757	+3.7%	67%	69%
IPPU	13 662	15 613	+14%	17%	20%
Agriculture	8 089	7 224	-11%	10%	9.1%
LULUCF	-11 988	-5 153	-57%	-15%	-6.5%
Waste	3 926	1 420	-64%	5.0%	1.8%

Total emissions without emissions from sector LULUCF

In 2018 emissions from *Industrial Processes and Other Product Use* were 14% higher than in 1990. GHG emissions from *Energy* increased by 3.7% between 1990 and 2018. The other sectors show decreasing trends, with the most significant decrease in GHG emissions in the sector *Waste* (–64%).

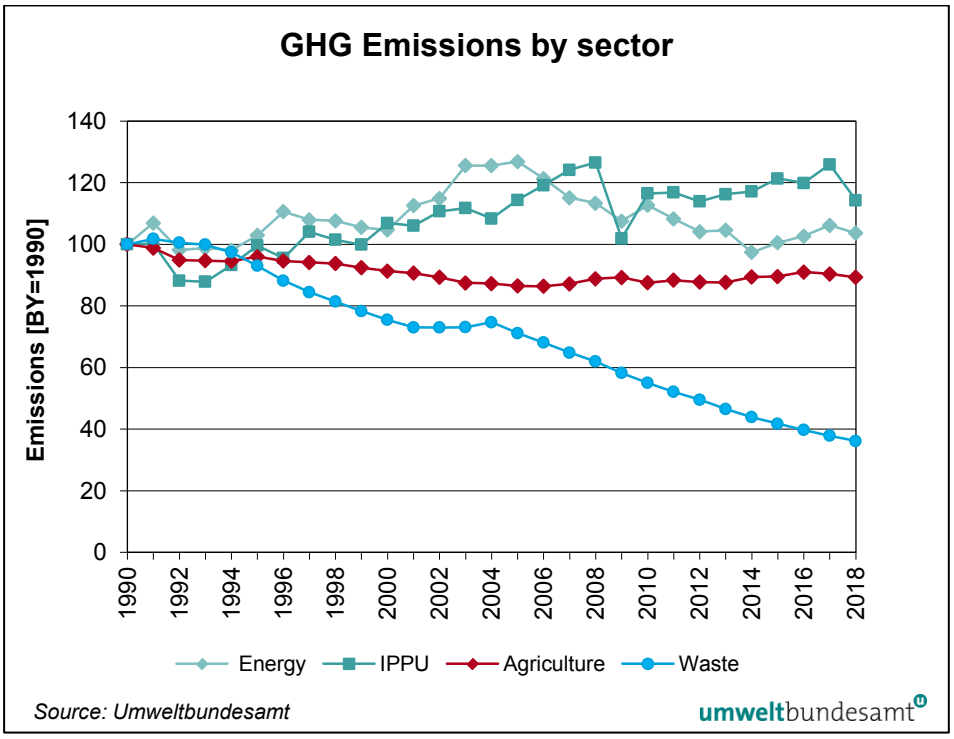


Figure 2: Trend in emissions 1990–2018 by sector in index form (1990 = 100).

A more detailed description and interpretation of emissions trends per sector is given in the following sub-chapters.

2.1 Energy

In 2018, greenhouse gas emissions from sector *Energy* amounted to 54 387 kt CO_2 equivalents which corresponds to 69.3% of total national emissions. 99% of the emissions from this sector originate from fuel combustion (*1.A*) while fugitive emissions from fuels (*1.B*) are of minor importance.

The most important **sub-category** is *transport* with a share of 45% in 2018, followed by *manufacturing industries and construction* (20%), *energy industries* (18%) and the sub-category *other sectors* (16%). The most important **greenhouse gas** is CO_2, contributing 98% to total sectoral GHG emissions, followed by CH_4 (1.1%) and N_2O (1.2%).

From 2017 to 2018, emissions from this sector decreased by 2.4% (–1 318 kt CO_2e), affected by decreasing emissions from *energy industries* and *other sectors*.

Increased emissions were reported for *manufacturing industries* (+220 kt CO_2e) due to higher natural gas consumption. Increased emissions of the *transport sector* (+115 kt CO_2e) were mainly due to higher consumption of diesel oil as well as due to higher consumption of motor gasoline.

Emissions from *energy industries* decreased by 870 kt CO_2e, mostly because of decreased electricity production from natural gas power plants. The main driver for decreasing emissions (–727 kt CO_2e) from *other sectors* in 2018 was the lower use of natural gas and gasoil due to decreased heating demand of households (heating degree days decreased by 9.5%).

The **overall trend** in GHG emissions from the sector *Energy* shows increasing emissions with a 3.7% rise from 1990 to 2018. Greenhouse gas emissions from road transport are 76% higher than in 1990. The 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 electricity from hydro and wind power plants
- the economic situation as reflected in the gross domestic product (GDP)
- change in power generation (switch from coal to gas)

Trend 1990–2018 by sub-category

In 2018 emissions from sub-category ***energy industries*** were 28% below the level in 1990. Emissions from power plants are quite continuously decreasing since 2005, mainly because of the growing contribution of renewable energy sources, the substitution of solid and liquid fuels by natural gas and biomass as well as improvements in efficiency.

The share of biomass used as a fuel in this sector increased from 0.9% (1990) to 26% (2018), the contribution of hydro and wind power plants to total public electricity production increased from 69% (1990) to 78% (2018). Electricity consumption increased by 51.5% since 1990 and since 2002 the increase is to a large extent covered by electricity imports.

Energy related GHG emissions from ***manufacturing industries and construction*** increased by 11% from 1990 to 2018, mainly in the chemicals industry, non-ferrous metals industry and from off road vehicles, while emissions from iron & steel and pulp & paper industries decreased since 1990. Fuel consumption increased by 39% in that period, mainly due to increased use of natural gas and biomass. As natural gas has a lower carbon content, and CO_2 emissions from biomass combustion are not accounted for under the UNFCCC reporting framework, the increase in GHG emissions is significantly smaller (only +11%) compared to the increase in fuel combustion.

Transport showed a strong increase in GHG emissions since 1990 (+75%) mainly due to an increase of road performance (kilometres driven) in passenger and freight transport. In addition to the increase of road performance within Austria, the amount of fuel sold in Austria but used elsewhere – an effect (fuel export) mainly caused by higher fuel prices in Austria's neighbouring countries – has increased considerably since 1990. Between 2005 and 2012 GHG emissions were decreasing due to lower amounts of fuel sold together with an increased use of biofuels and the gradual replacement with newer, vehicles with lower specific fuel consumption. Since 2013 GHG emissions from sector transport are again increasing.

The variation in demand for heating and hot water generation due to climatic circumstances and the shift in the fuel mix are the most important drivers for emissions from sub-category ***other sectors***. Emissions in 2018 were 38% lower than in 1990. This reduction is mainly attributable to the declining consumption of heating oil and coal and the increase in the consumption of biomass and natural gas as well as the growing importance of district heating and the modernisation of heating systems. Total fuel consumption of this sub-category decreased by 16% since 1990.

Fugitive emissions decreased by 47% since 1990 due to the progressive closure of coal mines up until 2006. There have been no coal-mining activities in Austria since 2007.

2.2 Industrial Processes and Other Product Use

In 2018 greenhouse gas emissions from *Industrial Processes and Other Product Use* amounted to 15 613 kt CO_2 equivalent, which correspond to 2.0% of total national emissions.

The most important **sub-categories** of this sector are *metal industry* and *mineral industry*, generating 61% and 19% of total sectoral emissions, respectively. The most important **greenhouse gas** of this sector is CO_2 with a contribution of 84% to total sectoral emissions, followed by HFCs with 12%, SF_6 with 2.4%, N_2O with 1.2%, CH_4 with 0.3% and PFCs with 0.2%. NF_3 contributes 0.1% to total emissions from this sector.

From 2017 to 2018, overall emissions from this sector decreased by 9.3%. Main reason is a decreased production of iron and steel due to maintenance shutdown of a blast furnace.

The **overall trend** in GHG emissions from *Industrial Processes and Other Product Use* is an increase in emissions of 14% from 1990 to 2018. Within this period, emissions fluctuated, with a minimum in 1993 and a maximum in 2008. **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 technologies in the chemical industry in 2004 and in 2009 (which became fully operational in 2010), (iii) increasing metal production resulting in 17% higher GHG emissions in 2018 compared to 1990 and (iv) a strong increase of HFC emissions in the period 1992 to 2018 from 5.6 to 1 835 kt CO_2 equivalent.

Trend 1990–2018 by sub-category

The largest increase in GHG emissions between 1990 and 2018 can be observed in the *metal industry* due to an increase in emissions from iron and steel production (+44%). In sub-categories *mineral industry* and *chemical industry*, emissions declined by 6.0% and 59% respectively during that period. Emissions from *non-energy products from fuels and solvent use* dropped by 59%, due to legal measures controlling the solvent content of products and their use.

Emissions of *fluorinated gases* increased by 37% since 1990, driven by increasing emissions of HFCs (+419% since 1995) used as cooling agents that replaced Ozone Depleting Substances (ODSs).

2.3 Agriculture

In 2018, greenhouse gas emissions from *Agriculture* amounted to 7 224 kt CO_2 equivalent, which correspond to 9.1% of total national emissions.

The **most important sub-categories** of this sector are *enteric fermentation* (57%) and *agricultural soils* (28%). *Agriculture* is the largest source of national N_2O and CH_4 emissions: in 2018 69% (8.2 kt N_2O) of total N_2O emissions and 72% (187 kt CH_4) of total CH_4 emissions in Austria originated from this sector. Total GHG emissions from the sector *Agriculture* are dominated by CH_4 with a share of 65% and N_2O with a share of 34%. CO_2 emissions account for 1.7% of the emissions from this sector.

From 2017 to 2018 GHG emissions decreased by 1.2%, mainly due to lower emissions from *enteric fermentation* and *agricultural soils*. Between 2017 and 2018 the number of cattle, dairy cows as well as other cattle, decreased. Furthermore, a smaller amount of mineral fertilizers was applied on agricultural soils compared to the previous year. Lower N_2O emissions from crop residues are the result of unfavourable growth conditions (drought period in April and May): In 2018 the cereal harvest was, similar to 2017, again at a low level, but also oil seeds and vegetable production decreased compared to the previous year. In particular sugar beet was one of the big losers due to weevil infestation.

The **overall trend** in GHG emissions from *Agriculture* shows a decrease of 11% from 1990 to 2018. The **main drivers** for this trend are decreasing livestock numbers and lower amounts of N-fertilizers applied on agricultural soils.

2.4 Land Use, Land Use Change and Forestry (LULUCF)

In 2018, net removals from sector *LULUCF* amounted to −5 153 kt CO_2 equivalent, which correspond to 6.5% of national total GHG emissions (without LULUCF) in 2018 compared to 15% in the base year.

With regard to the **overall trend** of net removals from *LULUCF*, the removals decreased by 57% over the observed period. The **main driver** for this trend is the biomass carbon stock change in forest land. Fluctuations are due to weather conditions which affect the growth rates on the one hand (e.g. very low increment in 2003) and windthrows on the other, as well as timber demand and prices (e.g. very high harvest rates in 2007 and 2008).

The **most important sub-category** is *forest land (4.A)* with net removals of −4 277 kt CO_2 equivalent in 2018 (including indirect emissions). *Harvested Wood Products (4.G)* is the second largest sink category and contributed –2 001 kt CO_2 equivalent. In 2018, CH_4 and N_2O emissions together amounted to 159 kt CO_2 equivalent (including indirect emissions). Total net emissions arising from the other non-forest sub-sectors (excluding HWPs) amounted to 1 126 kt CO_2 equivalent in 2018 (including indirect emissions).

Regarding **LULUCF activities pursuant to Decision No 529/2013/EU**, Austria decided to account only for greenhouse gas emissions and removals from af-/reforestation, deforestation and forest management.

The activity which contributes most to GHG removals is forest management which amounts to −4 129 kt CO_2 equivalents in 2018 (including HWPs). Afforestation/reforestation (incl. HWPs) contribute to GHG removals as well (−2 182 kt CO_2 equivalents), whereas emissions from deforestation amount to 499 kt CO_2 in 2018 (both including indirect emissions).

2.5 Waste

In 2018, greenhouse gas emissions from sector *Waste* amounted to 1 420 kt CO_2 equivalent, which correspond to 1.8% of total national emissions.

The most important sub-category of *Waste* is *solid waste disposal*, which caused 74% of the emissions from this sector in 2018, followed by *waste water treatment and discharge* (14%) and *biological treatment of solid waste* (13%). The most important greenhouse gas is CH_4 with a share of 81% in emissions, mainly arising from *solid waste disposal*, followed by N_2O with 19% and CO_2 with 0.1%.

From 2017 to 2018 GHG emissions continued to decrease (−4.6%) mainly due to the decreasing carbon content of waste deposited in previous years.

The **overall trend** in GHG emissions from *Waste* is decreasing, with a decrease of 64% from 1990 to 2018. The **main driver** for this trend is the implementation of waste management policies: Waste separation, reuse and recycling activities have increased since 1990 and the amount of disposed waste has decreased correspondingly especially since 2004 when pre-treatment of waste became obligatory (although some exceptions were granted to some Austrian provinces). The legal basis for the reduced disposal of waste as well as the landfill gas recovery is the Landfill Ordinance. Since 2009 all waste with high organic content has to be pre-treated before deposition (without exceptions). Furthermore, methane recovery from landfills was implemented in the 1990s.

3 RECALCULATIONS

This chapter describes the changes made since the last submission to the UNFCCC and supplements the tabular format on recalculations as set out in Annex III to the Commission Implementing Regulation (EU) No 749/2014 ('MMR-IRArticle8_Recalculations_AT_2020').

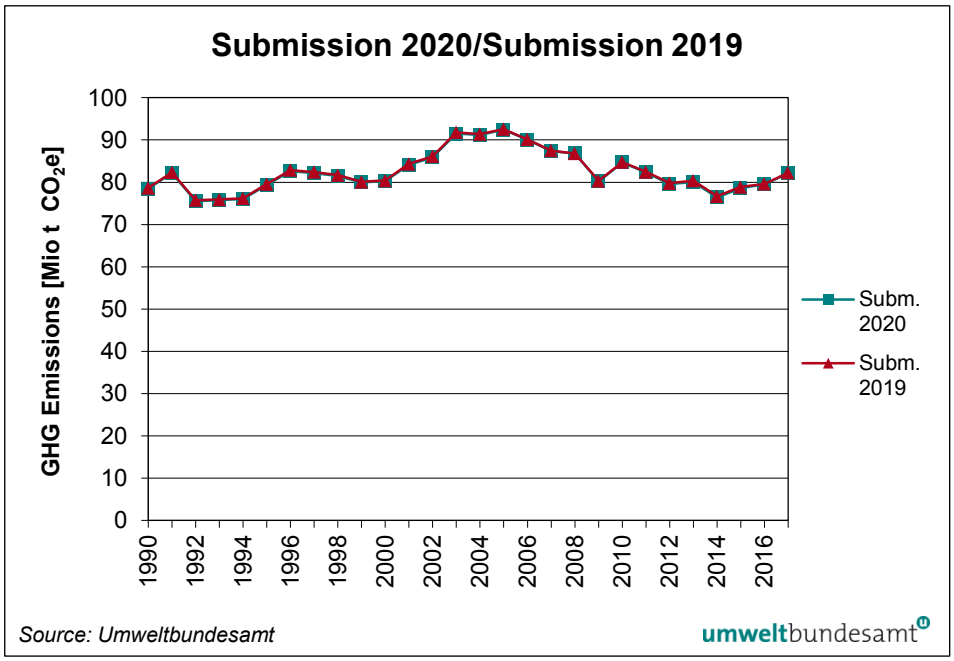
3.1 Background

The Austrian greenhouse gas inventory is subject to continuous improvement. An inventory improvement programme was established as part of the QMS, to grant transparency and monitoring of findings by the ESD (EC) and the UNFCCC review experts (or other sources) on 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 for implementation of measures and improvements (incl. recalculations) are included for each of them in the improvement plan (specified for each sector).

3.2 Implications (level, trend)

As can be seen in Figure 3, Austria's GHG emissions reported this year in sum differ only slightly from the data submitted last year. The national total (excl. LULUCF) for the base year is 0.23% (−178 kt CO_2e) lower than reported last year; the national total (excl. LULUCF) for 2017 is 0.21% (−175 kt CO_2e) lower than the value submitted last year.

Figure 3: Comparison Submission 2020/Submission 2019 (Recalculations).



National total emissions (excluding LULUCF) for **1990** have been slightly revised downwards since last years' submission (−178 kt CO_2e) mainly due to revised estimates reported for *Energy* (mainly *1.A.1* and *1.A.2*) and *Agriculture* (mainly *3.G*). Within sector Energy, the sub-categories *public electricity and heat production* (*1.A.1.a*) and c*hemicals* (*1.A.2.c*) contribute most to sectoral recalculations, due to revisions of the energy balance. Within sector Agriculture, revised reporting of emissions from the application of limestone and dolomite due to availability of new activity data contribute most to sectoral revisions.

Revised total emissions for **2017** are 0.21% lower (−175 kt CO_2e) than total emissions submitted last year for 2017, mainly due to revised emissions from sector *Energy*, affected by a revised energy balance as well as the application of a new CO_2 emission factor for municipal solid waste based on a new study.

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

	National Total GHG emissions without LULUCF			
	Submission 2020	Submission 2019	Recalculation Difference	
	[kt CO_2e]	[kt CO_2e]	[kt CO_2e]	[%]
1990	78 493	78 670	–178	–0.23%
1991	82 157	82 349	–192	–0.23%
1992	75 524	75 750	–226	–0.30%
1993	75 771	75 932	–161	–0.21%
1994	76 017	76 207	–190	–0.25%
1995	79 383	79 584	–201	–0.25%
1996	82 605	82 875	–269	–0.32%
1997	82 176	82 405	–229	–0.28%
1998	81 512	81 702	–190	–0.23%
1999	79 931	80 105	–174	–0.22%
2000	80 262	80 415	–153	–0.19%
2001	84 152	84 324	–173	–0.20%
2002	85 907	86 111	–204	–0.24%
2003	91 545	91 788	–243	–0.26%
2004	91 140	91 383	–243	–0.27%
2005	92 438	92 567	–128	–0.14%
2006	90 064	90 117	–53	–0.06%
2007	87 381	87 473	–92	–0.11%
2008	86 792	86 816	–25	–0.03%
2009	80 222	80 329	–107	–0.13%
2010	84 674	84 753	–79	–0.09%
2011	82 348	82 460	–113	–0.14%
2012	79 592	79 811	–219	–0.27%
2013	80 034	80 353	–318	–0.40%
2014	76 409	76 680	–271	–0.35%
2015	78 575	78 897	–323	–0.41%
2016	79 531	79 596	–65	–0.08%
2017	82 086	82 261	–175	–0.21%

Table 6: Recalculations per sector.

	Submission 2020		Submission 2019		Recalculation Difference	
THG	**1990**	**2017**	**1990**	**2017**	**1990**	**2017**
	[Mt CO_2e]		**[Mt CO_2e]**		**[Mt CO_2e]**	
Total	**78.49**	**82.09**	**78.67**	**82.26**	**–0.18**	**–0.18**
Energy	52.82	56.08	52.95	56.27	–0.13	–0.20
IPPU	13.66	17.21	13.66	17.20	0.00	0.01
Agriculture	8.09	7.31	8.14	7.31	–0.05	0.01
Waste	3.93	1.49	3.93	1.48	0.00	0.00

without emissions from LULUCF

The following table presents the recalculation difference with respect to last years' submission for each gas (positive values indicate that this years' estimate is higher). Emissions of CH_4, N_2O and fluorinated compounds in 2017 were revised upwards, whereas emissions of CO_2 were revised downwards.

Recalculations of CH_4 are largely due to revised estimates in the sectors *Other Sectors* (*1.A.4) a*nd *Transport (1.A.3)*. Revisions in *Other Sectors* are driven by changes of the energy balance, in the sector *Transport* the latest version of the NEMO model in the road transport sector has been applied causing higher CH_4 emissions over the whole time period.

Recalculations of N_2O are largely attributable to revisions reported for source-category *Road Transport* (*1.A.3.b*) where a new version of the calculation model NEMO was applied, implementing up-to-date activity data and revised emission factors.

Table 7: Recalculations per gas.

	1990 (Base year)	2017
	Recalculation Difference [%]	
Total	**–0.23%**	**–0.21%**
CO_2	–0.32%	–0.41%
CH_4	0.27%	0.44%
N_2O	–0.19%	1.61%
HFC, PFC, SF_6, NF_3	0.00%	1.22%

without emissions from LULUCF

3.3 Sectoral recalculations

The following section provides explanations for sectoral recalculations. Further background information and a complete description of the recalculation for the period 1990–2017 will be given in Austria's National Inventory Report 2020.

3.3.1 Energy

3.3.1.1 Stationary sources

Update/Improvement of activity data

The energy balance was revised by Statistik Austria for the years 1990 to 2017 with the following main implications on energy consumption and CO_2 emissions:

- Natural gas gross inland consumption 2014 and 2015 has been revised by -1 to -1.8 TJ and shifted between sectors: For 2005 and 2006, about 1 to 1.2 PJ (56 to 71 kt CO_2) have been shifted from the power sector (1.A.1.a) to the commercial sector (1.A.4.a). For 2011, about 0.7 PJ (41 kt CO_2) have been shifted from the power sector (1.A.1.a) to the commercial sector (1.A.4.a). For 2013, about 1.7 PJ (94 kt CO_2) have been shifted from the commercial and residential sector (1.A.4.a and 1.A.4.b) to the industry sector (1.A.2). For 2014, about 1.1 PJ (60 kt CO_2) have been shifted from the residential and commercial sector (1.A.4.a and 1.A.4.b) to the industrial sector (1.A.2). For 2016, about 3 PJ (167 kt CO_2) have been shifted from petroleum refineries (1.A.1.b) to the residential and industry sector (1.A.4.b, 1.A.2).
- For liquid fuels, gross inland consumption has been revised between -0.1 to -2.2 PJ for the years 2005 to 2011 (crude oil input into refineries) and by -1.3 PJ for the year 2017, which does not have an effect on GHG emissions, because lower fuel imports have been counterbalanced by a higher refinery fuel output. The following CO_2 quantities have been shifted between sectors: For 2013 to 2017, between 81 to 337 kt of CO_2 emissions from liquid fuels have been shifted from the industry sector (1.A.2) to the residential (1.A.4.b) and commercial (1.A.4.a) sector.
- For solid fuels, gross inland consumption has been revised between +0.1 and +1.7 PJ for the years 2005 to 2017. The revision mainly affected the residential sector (between +9 to +91 kt CO_2 from solid fuels). For the years 2005 to 2011, between 32 to 55 kt of CO_2 emissions from solid fuels used in blast furnaces have been shifted from category 1.A.2.a to category 2.C.1.
- For ‘other fuels’ (municipal and industrial solid waste), the major revision took place for chemicals industries and the power plant sector. For the power sector (1.A.1.a) and the years 2012 to 2017, about 0.5 PJ have been allocated from industrial waste to biomass fuels. For chemical industries (1.A.2.c) and the years 2005 to 2017, industrial waste consumption has been revised between -0.2 and -1.6 PJ.

Other methodological improvements

- Based on a new study, the CO_2 emission factor for municipal solid waste have been revised (from 48.88 t/TJ to 43.45 t/TJ for the years from 2005 onwards and the national default CO_2 emission factor for industrial solid waste has been revised from 104.17 t/TJ to 75 t/TJ for the whole time series. Together with the revisions of the energy balance, this implies about -108 kt CO_2 from MSW and -240 kt CO_2 from Industrial waste.
- Fuel and technology specific N_2O and CH_4 emission factors have not been revised.

3.3.1.2 Mobile sources

Update of activity data

1.A.3.b Road transport

The domestic fuel consumption has fundamentally been updated with new specific mileage per vehicle category: For the first time, data from the periodic roadworthiness tests has been evaluated resulting in new age-related mileage data and improved data-accuracy. This affects the categories PC, LDV and MC.

1.A.3.c Railways

The activity (diesel and coal) was adjusted to new energy balance data.

Update/Improvement of methodology and emission factors

1.A.3.b Road transport

Using the most recent version of the emission calculation model NEMO of Graz University of Technology, updates and improvements of methodology and activity data always result in recalculations of all emission components. This year's total CO_2 emissions increase is generally due to an increase of mileage of each vehicle category. The domestic fuel consumption has fundamentally been updated and was mainly influenced by two factors:

- New specific mileage per vehicle category:

For the first time, data from the periodic roadworthiness tests has been evaluated resulting in new age-related mileage data. This affects the categories PC, LDV and MC.

- New and improved FC emissions factor for HDV:

The most recent version of the emission calculation model NEMO (TU-Graz) includes the recently released emission factor database HBEFA 4.1. Within this new software version, all consumption factors were checked or revised

According to the bottom-up /op-down methodology for the calculation of domestic fuel consumption and fuel export, an increased use of domestic diesel always results in a reduction of the quantities handled in fuel export. As fuel export is mainly characterised by truck traffic, the emission reduction is strongly reflected in subsector 1.A.3.b.3 Heavy duty trucks and buses.

Mobile Combustion (NRMM[15])

New improved CH_4 and N_2O emission factors for all NRMM have been implemented.

3.3.1.3 Fugitive Emissions

No recalculations have been performed.

[15] mobile agricultural machinery

3.3.2 Industrial Processes and Other Product Use

Update of activity data

2.B.1 Ammonia Production

Due to updated urea amounts used in road traffic (see below, *2.D.3*) from 2005–2017, the CO_2 emissions in sector 2.B.1 decreased by 6.17 kt CO_2e in 2017.

2.C.1.a Steel Basic Oxygen Furnace Steel Plant

Recalculations in the IEA Joint Questionnaire resulted in a changed time series from 2005 onwards (-0.22 kt CO_2 in 2017).

2.D.3.a Solvent Use

Following in depth QC activities time series inconsistencies in the solvents model were removed: (i) the reporting categories of the import/export statistics for various ethers had changed over time and were now considered consistently and (ii) for antifreeze fluids, of which not all reported in the category are relevant for VOC emission, the same assumption as used in the years before was applied.

This improvement led to a decrease of emissions of -13.8 kt CO_2e in 2017.

2.D.3 Other: Urea used as a catalyst

Revision of activity data led to a change in emissions of +5.4 kt CO_2e in 2017.

2.E. Electronics industry

Updated information obtained from a report provided by a plant operator including information on measured emissions and the actual efficiency of exhaust-air plants was incorporated for the years 2013 and 2014. This update resulted in increased emissions of 0.45 kt CO_2e in 2013 and 0.85 kt CO_2e in 2014.

2.F.1. Refrigeration and Air Conditioning

2.F.1 a. Commercial Refrigeration

In the previous inventory refrigerant R 125a was not included in the top down sum from 2013 to 2017. This transcription error was corrected which resulted in increased emissions for subsector 2.F.1.a Commercial Refrigeration (+22.53 kt CO_2e in 2017).

2.F.1 c. Industrial Refrigeration

The correction of the same transcription error for R 125a from 2013 to 2017 resulted in an increase of emissions of 1.21 kt CO_2e in 2017.

2.F.1.f Stationary Air Conditioning

The same transcription error as described above, as well as an update in statistical data on the amount of sold heat pumps in Austria for 2017 resulted in increased emissions (+2.32 kt CO_2e in 2017).

2.F.3 Fire extinguisher

Emissions of the years 2014, 2016 and 2017 were recalculated based on new and more detailed information provided by an operator. This led to a very slight change in emissions (-0.0004 kt CO_2e in 2014, +0.0014kt CO_2e in 2016, and -0.0003kt CO_2e in 2017).

2.F.4 Aerosoles

The emission factor for the years 2016 and 2017 was corrected resulting in decreased emissions of 0.26 kt CO_2e in 2016 and 0.26 kt CO_2e in 2017.

2.G.1 Electrical equipment

The value for activity data for medium voltage was corrected by a factor 10 which resulted in an increase in emissions of 0.9 kt CO_2e in 2017.

3.3.3 Agriculture

Update of activity data

3.A Enteric Fermentation, 3.B Manure Management, 3.D Agricultural Soils

Livestock data

Livestock numbers of poultry and other animals (mainly deer) have been revised as new data has become available based on the final results of the farm structure survey 2016 (STATISTIK AUSTRIA 2018[16]). To avoid jumps in the time series, the years 2014 and 2015 have been interpolated. As currently no updated data is available for the respective livestock categories, for the years 2017 and 2018 the values of 2016 have been used.

Raw material balance

In 2019 new information on input materials for Austria's biogas plants became available (E-CONTROL 2019[17]) resulting in slightly revised amounts of digested manure and energy crops.

3.D.a.4 Crop Residues

There have been minor revisions of the harvested amounts of sugar beet in Austria's official harvest statistics for specific years resulting in slightly increased N_2O emissions for 2017 (+0.001 kt N_2O).

[16] STATISTIK AUSTRIA (2018): Agrarstrukturerhebung: Stichprobenerhebung 2016. Schnellbericht 1.17, Wien.

[17] E-CONTROL (2019): https://www.e-control.at/documents/1785851/1811582/%C3%96kostrombericht_FINAL.pdf/f689b909-2088-77b0-0c9e-eeb260effe7b?t=1569999423109 accessed in November 2019

3.D.a.5 Mineral Soils

For the year 2017 there have been slight revisions due to updated activity data (perennial cropland to annual cropland) (+0.05 t N_2O). Further information is included in chapter 3.3.4 on LULUCF.

Improvements of methodologies and emission factors

3.B Manure Management (CH_4, N_2O)

The correction of a linkage error resulted in slightly revised CH_4 emissions for cattle and swine from 2006 onwards. However, the main reasons for changed emissions (CH_4 and N_2O) are updated activity data, as described above.

The improvements resulted in revised CH_4 emissions of +0.06 kt CH_4 in 2017 and revised direct N_2O emissions of +0.002 kt N_2O in 2017.

3.B.5 Indirect N_2O emissions from Manure Management

Austria's agriculture model is based on the N-flow concept. Thus, revisions within Austria's air emission inventory affect calculation results in Austria's GHG inventory.

Main reason for revised indirect N_2O emissions (atmospheric deposition from manure management) is the implementation of the EMEP/EEA Guidebook 2019 into Austria's air emission inventory. The 2019 version of the Guidebook provides updated NH_3 emission factors for specific livestock categories as well as a revised calculation method of the fraction of TAN that is immobilised in organic matter (f_{imm}) when the manure is managed as a litter-based solid and the litter is straw.

Improved calculations resulted in lower NH_3-N losses from manure management. Consequently, indirect N_2O-emissions from manure management were revised downwards for the whole time series (–0.02 kt N_2O in 2017).

3.D Agricultural Soils (N_2O)

3.D.a.2.a Animal manure applied to soils

Improved methodologies in accordance with the EMEP/EEA Guidebook 2019 resulted in lower NH_3-N losses from manure management (see above). Thus, higher N amounts left for application on agricultural soils were calculated resulting in increased N_2O emissions for the whole time series (+0.04 kt N_2O in 2017).

3.D.b Agricultural Soils (indirect soil emissions – N_2O)

1. Atmospheric deposition: main reason for revised emissions is the implementation of new information on agriculture practice into Austria's air emission inventory. Improved calculations resulted in lower volatilization losses from synthetic fertiliser application due to the consideration of rapid incorporation of urea in Austria's ammonia model. As a consequence, indirect N_2O emissions from atmospheric deposition were revised downwards for the whole time series (–0.02 kt N_2O in 2017).

2. Nitrogen leaching and run-off: Higher amounts of organic N-inputs to soils (see above) resulted in slightly higher indirect N_2O emissions from N-leaching and run-off (+0.005 kt N_2O in 2017).

3.G Liming – Application of limestone and dolomite

In response to a question raised during the ESD review 2019 regarding the reporting of 'NO' for emissions from dolomite application, Austria carried out an investigation on that issue. As a result new activity data on the amounts of both, limestone and dolomite, have become available. New data are based on specific information from Austria's biggest trading company and on sales data. In previous submissions application amounts of limestone were estimated on the basis of annual area data (ha) and assumptions on limestone application. Revisions have a significant impact on level and trend of emissions. CO_2 emissions of this subcategory were revised downwards by -44 kt CO_2 in 1990 and upwards by +1.6 kt CO_2 in 2017.

3.3.4 Land Use, Land Use Change and Forestry (LULUCF)

Update of Activity Data

4.B Cropland

The improvements of the assessment of soil C stock changes in cropland remaining cropland which were started two years ago were continued. The methodological regime for separating the cropland into the different tillage and input types was further improved by a slight adjustment of the areas with cover crops.

The 2016 and 2017 values of the LUC areas between grassland and cropland were updated, which had an impact on the C stock changes and N_2O emissions due to land-use changes in these years.

An error in the vineyard biomass estimate for the years 2016 and 2017 was corrected.

The perennial cropland areas with soil erosion measures were updated for the years 2015, 2016 and 2017 which had an impact on the soil C stock changes.

The conversions between annual and perennial cropland in the year 2017 were updated.

All the recalculations in the cropland category resulted in changes in the time series of annual emissions/removals of this subcategory in the range of almost 0 to 118 kt CO_2e per year.

4.C Grassland

The 2017 values of the grassland areas as well as the LUC areas between grassland and cropland for 2016 and 2017 were updated which had an impact on the C stock changes in those years.

All the recalculations in the grassland category increased the annual emissions of this subcategory in 2016 and 2017 (+0.16 and +6.52 kt CO_2e).

4.E Settlements

The shares of cropland and grassland areas converted to settlement and contributing to the settlement area increase were slightly adjusted in the years 2016 and 2017 which led to different C stock changes in the settlement category in these years.

All the recalculations in the settlement category led to changes in the time series of annual emissions/removals of this subcategory of 0.01 and 0.19 kt CO_2e per year in the years 2016 and 2017.

4.G HWPs

The HWP production figures for the years 2006 to 2017 were updated in the most recent FAO statistic. Consequently, the removal figures for these years had to be updated accordingly.

The recalculations in the HWP category led to changes in the annual removals of this subcategory in the range of -31.7 to 2.8 kt CO_2e.

LULUCF KP estimates

The HWP production figures for the years 2006 to 2017 were updated in the most recent FAO statistics. Consequently, the HWP removal figures for afforestation and forest management for the years 2013 to 2017 had to be updated accordingly. The improvement resulted in revised annual HWP removals of afforestation in the range of -0.01 to 0.15 kt CO_2e and in revised annual HWP removals of forest management in the range of -0.73 to 8.40 kt CO_2e.

3.3.5 Waste

Update of activity data

5.D Wastewater Treatment and Discharge

For *5.D.1 domestic wastewater* recalculations were carried out due to availability of new data on connection rates, resulting in slightly decreased GHG emissions for 2015–2017 (–1.0 kt CO_2e in 2017). The effect is different for each gas (CH_4: -0.05 kt in 2017; N_2O: +0.001 kt in 2017) as higher connection rates to waste water treatment plants increases direct as well as indirect N_2O emissions but reduces CH_4 from septic tanks.

Moreover, more detailed information on flows and treatment practices of industrial wastewater in Austria became available, based on a study conducted 2019, making reporting on emissions (CH_4 and N_2O) under *5.D.2 industrial wastewater* possible for the first time (e.g. 1.3 kt CO_2e in 1990 and 3.9 kt CO_2e in 2017).

4 NATIONAL INVENTORY SYSTEM

The regulations under the UNFCCC and the Kyoto Protocol define the standard for national emission inventories related to transparency, consistency, comparability, completeness and accuracy (TACCC). Above this, each Party shall have in place a national system[18] 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 the 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 (QA/QC) to continuous improvement of the inventory.

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 data are transferred according to the IPCC Guidelines into the UNFCCC Common Reporting Format (CRF).

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[19], in Austria's NIR 2019[20] and in the NISA Implementation Report[21].

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, UKG[22]), which defines the main responsibility for inventory preparation and identifies the Umweltbundesamt as the single national entity with the overall responsibility for inventory preparation. To comply with the stringent requirements the Umweltbundesamt established the 'Inspection Body for Emission Inventories' which is entrusted with the preparation of emission inventories as assigned to the Umweltbundesamt under the UKG.

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[18] 19/CMP.1 Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol; FCCC/KP/CMP/2005/8/Add.3. http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf

[19] 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.

[20] UMWELTBUNDESAMT (2019): Austria's National Inventory Report 2019, Submission under the United Nations Framework Convention on Climate Change and under the Kyoto Protocol. Reports, Bd. REP-0677. Umweltbundesamt, Vienna.

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

[22] „Umweltkontrollgesetz" – Bundesgesetz über die Umweltkontrolle und die Einrichtung einer Umweltbundesamt Gesellschaft mit beschränkter Haftung; Federal Law Gazette I 152/1998 (as amended by Federal Law Gazette I No. 40/2014)

Inspection Body for Emission Inventories
ID No. 0241

Umweltbundesamt GmbH, Environment Agency Austria
DI Michael Anderl (Head of Inspection Body), Mag. Katja Pazdernik (Deputy)
Spittelauer Lände 5
1090 Wien, Austria

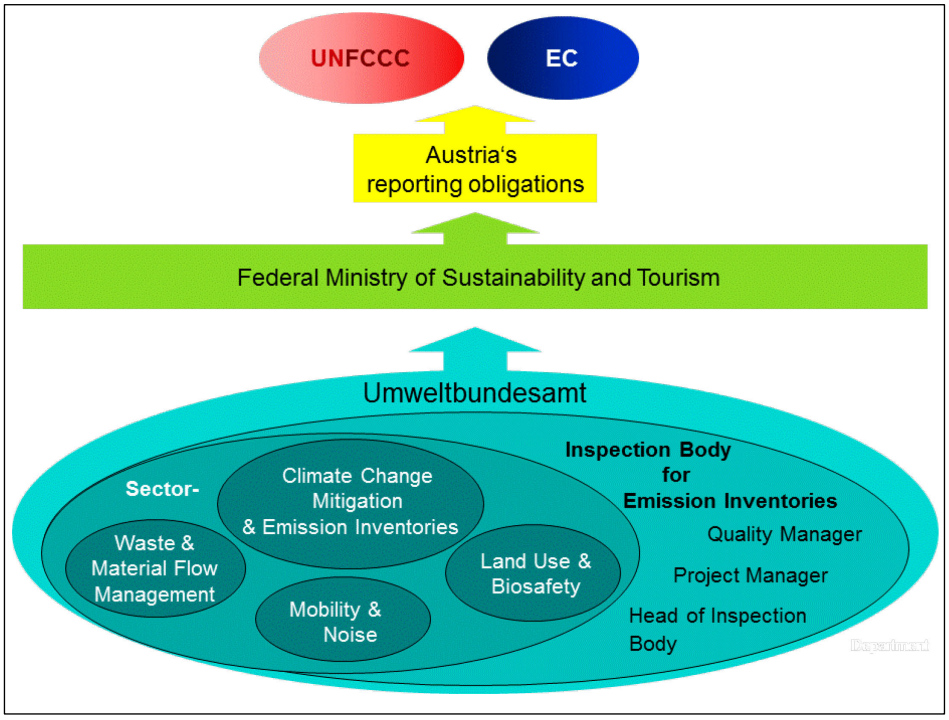

Figure 4: Responsibilities within the Austrian National Inventory System Austria.

The personnel of the Inspection Body for Emission Inventories (IBE) is made up of staff from various organisational units of the Umweltbundesamt (Environment Agency Austria), who in the course of their inspection activity for the IBE are assigned to the IBE and therefore under the head of the inspection body. The head of the inspection body supervises the project manager, who is responsible for coordinating the IBE staff when carrying out their inspections.

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 competent ministries 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.

4.1 Legal and institutional arrangements

The Umweltbundesamt is designated as Single National Entity responsible for inventory preparation including QA/QC.

LEGAL ARRANGEMENT: ENVIRONMENTAL CONTROL ACT[23]

- § 5 (regulates responsibilities of the Umweltbundesamt)
  Regulates responsibilities regarding environmental control in Austria and is also the basis for the outsourcing of the 'Umweltbundesamt GmbH'
- § 6 (regulates tasks of the Umweltbundesamt)
  (2)15 …the *Umweltbundesamt* is obliged to prepare "technical expertise for *compliance* with UNECE/LRTAP convention […] and with the UNFCCC and the Kyoto Protocol, including the preparation of emission inventories, evaluation of the impact of measures, and assistance in preparation of reports regarding climate".
- § 11 (regulates financing of the Umweltbundesamt)
  …ensures financial resources for preparation of tasks as referred to in para 6.
- § 7 (regulates issues related to data security)
  … in processing the legally assigned tasks the Umweltbundesamt is seen as a public authority and can therefore process (confidential) personal data and can exchange these data with other public authorities.

To ensure the availability of data necessary for the annual compilation of the GHG inventory further legal and institutional arrangements have been made.

Due to the above mentioned ENVIRONMENTAL CONTROL ACT the following **INSTITUTIONAL ARRANGEMENTS** with data providers were agreed:

1. Statistik Austria

- Statistical yearbook (public)
- National Energy balance (comprehensive/detailed Energy balance and IEA/Eurostat questionnaire)
  - **Long-term Contract** with the competent ministries
- Production/Import/Export statistics for solvents, F-gases
  - **Contract on annual basis** with the Federal Ministry of Sustainability and Tourism (BMNT)
- Agricultural statistics (public)
- Transport statistics (public)
  Procedural arrangement:
  - close cooperation Umweltbundesamt – Statistic Austria on definition of data format and specification
- Data flow is organised through (encrypted) communication (e-mail) or in case of confidential data through personal handover of CD/DVD
- Harmonisation of data: elimination of discrepancies

[23] „Umweltkontrollgesetz" – Bundesgesetz über die Umweltkontrolle und die Einrichtung einer Umweltbundesamt Gesellschaft mit beschränkter Haftung; Federal Law Gazette I 152/1998 (as amended by Federal Law Gazette I No. 40/2014)

2. Federal Ministry of Sustainability and Tourism (BMNT)

As of 8 January 2018 BMNT (previously Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW)) as representative of the Republic of Austria owns (100%) the Umweltbundesamt, which has the legal status of a limited liability company. As superior authority and in the framework of the ENVIRONMENTAL CONTROL ACT the following institutional agreements regarding access to data of different reporting obligations were agreed:

- Data on emissions and activity data from installations under the EU ETS (Federal law gazette 118/2011 establishing a scheme for greenhouse gas emission allowance trading)
- Activity data of certain F-gases (Austrian Fluorinated Compounds Ordinance 139/2007 regarding prohibitions and restrictions of HFCs, PFCs, SF_6)
- Activity data from landfill sites (Austrian Landfill Ordinance No. 39/2008) – EDM (Electronic Data Management)
- Activity data regarding waste incineration (Austrian Waste Incineration Ordinance No. 35/2013)
- Emissions data collected in the framework of E-PRTR (Austrian Ordinance No. 380/2007 concerning the establishment of the European Pollutant Release and Transfer Register)
- Emissions data (SO_2, NO_x, dust) and activity data from steam boiler installations (Federal law gazette 127/2013 establishing integrated pollution prevention and control)
- Forest fire statistics

  Procedural arrangement: The access to the data is organised for free via the EDM – Electronic Data Management – http://edm.gv.at, which is an information network which allows enterprises and authorities to handle registration and notification obligations in the waste and environment sectors online.

  - EDM aimed at sustainably reducing the administrative burden of enterprises and authorities to efficient, electronic recording and notification systems and to ensure a high level of environmental protection in Austria.
  - EDM was set up by Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management, BMLFUW and operated by Umweltbundesamt

3. Austrian Research Centre for Forests (BFW)

- National Forest inventory
  - **Contract on a regular interval** with the Federal Ministry of Sustainability and Tourism (BMNT)
- Forest soil condition survey (of all federal provinces)
- Forest soil modelling

  Procedural arrangement: close cooperation Umweltbundesamt – BFW on definition of data format and specification;

4. Research institutions:

a. TU Graz (Graz University of Technology)

- NEMO – Emission model road (IPCC sector 1.A.3.b): calculation of road emissions
- GEORG – Emission model of non-road mobile machinery (NRMM): calculation of mobile off-road emissions
  - Contract on annual basis with Umweltbundesamt
    Procedural arrangement: close cooperation Umweltbundesamt – TU Graz

b. University of Natural Resources and Life Sciences Vienna (BOKU) / Leibniz Institute for Agricultural Engineering Potsdam-Bornim (ATB)

- Agricultural model: calculation of emissions
  - Contract on a regular interval with Umweltbundesamt
    Procedural arrangement: close cooperation Umweltbundesamt – BOKU

5. Austrian Economic Chambers and Associations of the Austrian Industries as well as Individual plant operators/companies

- Activity data, emission data and relevant parameters; information on the process and abatement technology
  - No formal agreements were made but it is good practice in Austria to have a good cooperation and exchange of knowledge regarding the requirements of GHG and Air pollutants Inventory on a continuing basis
    Procedural arrangement: close cooperation

6. AustroControl

- Flight movements per aircraft type and airports (non-standard analysis)
  - *Procedural arrangement*: close cooperation Umweltbundesamt – AustroControl on definition of data format and specification

4.2 Data Sources

The following table presents the main data sources used for activity data (for unpublished studies a detailed description of the methodologies is given in the NIR):

Table 8: Main data sources for activity data.

Sector	Data Sources for Activity Data
Energy	• Energy Balance from Statistik Austria • EU-ETS • Steam boiler database • Small scale combustion market data • Direct information from industry or associations of industry
Transport	• Energy Balance from Statistik Austria • Yearly growth rates of transport performance on Austrian roads from Austrian Ministry for Transport, Technology and Innovation • ZBD: Zentrale Beguchtachtungsdatenbank (yearly specific mileage) • Flight movements from AustroControl

Sector	Data Sources for Activity Data
IPPU	• National production statistics • Import/export statistics • EU-ETS • Direct information from industry or associations of industry • Short term statistics for trade and services • Austrian foreign trade statistics • Structural business statistics • Surveys at companies and associations
Agriculture	• National studies • National agricultural statistics obtained from Statistik Austria • National fertilizer statistics obtained from Agrarmarkt Austria (AMA) • Distributing company (sales data)
LULUCF	• National forest inventory obtained from the Austrian Research Centre for Forests • National agricultural statistics and land use statistics obtained from Statistik Austria and from the IACS system • Wetland and settlement areas from the Real Estate Database
Waste	• Federal Waste Management Plan (Data sources: Database on landfills (1998–2007), Electronic Data Management (EDM) in environment and waste management) • EMREG-OW (Electronic Emission Register of Surface Water Bodies) • National studies

The main sources for emission factors are:

- National studies for country specific emission factors
- Plant-specific data reported by plant operators
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories[24]
- EMEP/EEA air pollutant emission inventory guidebooks[25]
- Handbook emission factors for road transport (HBEFA), Version 4.1
- National forest inventory obtained from the Austrian Research Centre for Forests
- Soil inventories by the Federal States and by the Austrian Federal Office and Research Centre for Forests
- Modelling of the forest soil C stock changes Austrian Research Centre for Forests

4.3 QA/QC Plan (QMS of IBE)

A Quality Management System (QMS) has been designed and implemented to fulfil all requirements of *good practice, i.e.* to improve transparency, consistency, comparability, completeness and accuracy as well as confidence in the national

[24] http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.htm

[25] Prepared by the UNECE/EMEP Task Force on Emissions Inventories and Projections (TFEIP) and published by the European Environment Agency (EEA). Latest update: https://www.eea.europa.eu/publications/emep-eea-guidebook-2019

inventory. Since December 2005 the inventory team at the Umweltbundesamt has been accredited as inspection body (ID No. 0241) in accordance with the Austrian Accreditation Law (AkkG)[26] by decree of Accreditation Austria[27]. 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 and integrity.

The implementation of QA/QC procedures as required by the IPCC supports 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 2006 GL Volume 1 'QA/QC and Verification', and goes beyond. It 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).

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.

The Austrian Quality Management System is described in detail in Austria's NIR 2019, some aspects and improvements compared to the previous submission are described below (QMS activities and improvements 2019).

The Quality Manual can be downloaded at:
http://www.umweltbundesamt.at/umweltsituation/luft/emissionsinventur/emi_akkreditierung/

Sector Experts

Within the inventory system specific responsibilities for the different emission source/sink categories ('Sector Experts') are defined. There are 8 sectors defined (Energy, Transport, Fugitive Emissions, Industrial Processes, Product Use, Agriculture, LULUCF and Waste). At least two experts form a sector team with one of them nominated as team leader ('Sector Lead'). Sector experts collect activity data, emission factors and finally estimate emissions. The sector experts are also responsible for the choice of methods, data processing, archiving, for contracting studies (if needed), and performing sector-specific Quality Assurance and Quality Control (QA/QC) activities.

In cases which exceed the IBE's capabilities or resources, some of its inventory activities are subcontracted, in some cases routinely (e.g. the emission inventory for road transport), in other cases as required (e.g. revision of methodologies

[26] *„Akkreditierungsgesetz"*; Federal Law Gazette I No. 28/2012 (as amended by Federal Law Gazette I No. 40/2014)

[27] first decree No. BMWA-92.715/0036-I/12/2005, issued by Accreditation Austria / Federal Ministry of Economics and Labour on 19 January 2006, valid from 23 December 2005

for a complex emission source). However, the final assessment of fulfillment of the requirements is made by the IBE.

Subcontracts have so far been concluded with:

- Technical University Graz (road and off-road transport)
- University of Natural Resources and Applied Life Sciences, Research Center Seibersdorf (Agriculture)
- Öko-Recherche, Büro für Umweltforschung und -beratung GmbH (f gases)
- Institute for Industrial Ecology (Product Use)
- Barbara Amon and Stefan Hörtenhuber (Agriculture)

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.

QMS activities and improvements 2019

In 2019 the number of experts involved in inventory work was again increased (the sector team for 'Product Use' is meanwhile formed by three experts). Each key position is at least double staffed now. Three generalists with long-term experience and four inventory support members supplement the team.

In 2019 another expert has passed the „Training programme for members of expert review teams participating in annual reviews under Article 8 of the Kyoto Protocol". Thus, in total six of our experts have already passed this course and 13 out of 16 experts the 'Basic Course for reviewers' (for one or even more sectors).

In 2019 two of our experts participated in the international review process gaining additional experience as reviewers.

4.4 Changes in the national inventory system

The national inventory system is unchanged compared to the description given in this chapter (4) and in the Austrian Initial Report under the Kyoto Protocol[28].

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

5 CHANGES IN THE NATIONAL REGISTRY

The following changes to the national registry of Austria have occurred in 2019. Note that the 2019 SIAR (SIAR/2019/AT/2/1) states that there are no recommendations and there were no recommendations from previous Annual Review report (FCCC/ARR/2018/AUT).

Table 9: Changes to the national registry of Austria in 2019.

Reporting Item	Description
15/CMP.1 annex II.E paragraph 32.(a) Change of name or contact	Neither the name and contact of the registry administrator as an institution nor the name of the registry administrator and the alternate registry administrator has changed.
15/CMP.1 annex II.E paragraph 32.(b) Change regarding cooperation arrangement	No change of cooperation arrangement occurred during the reported period.
15/CMP.1 annex II.E paragraph 32.(c) Change to database structure or the capacity of national registry	There have been no new EUCR releases after version 8.2.2 (the production version at the time of the last Chapter 14 submission). No change was therefore required to the database and application backup plan or to the disaster recovery plan. The database model is provided in Annex A. No change to the capacity of the national registry occurred during the reported period.
15/CMP.1 annex II.E paragraph 32.(d) Change regarding conformance to technical standards	No changes have been introduced since version 8.2.2 of the national registry. It is to be noted that each release of the registry is subject to both regression testing and tests related to new functionality. These tests also include thorough testing against the DES and are carried out prior to the relevant major release of the version to Production. No other change in the registry's conformance to the technical standards occurred for the reported period.
15/CMP.1 annex II.E paragraph 32.(e) Change to discrepancies procedures	No change of discrepancies procedures occurred during the reported period.
15/CMP.1 annex II.E paragraph 32.(f) Change regarding security	No changes regarding security occurred during the reported period.
15/CMP.1 annex II.E paragraph 32.(g) Change to list of publicly available information	No change to the list of publicly available information occurred during the reporting period.
15/CMP.1 annex II.E paragraph 32.(h) Change of Internet address	No change to the registry internet address occurred during the reported period.

Reporting Item	Description
15/CMP.1 annex II.E paragraph 32.(i) Change regarding data integrity measures	No change of data integrity measures occurred during the reporting period.
15/CMP.1 annex II.E paragraph 32.(j) Change regarding test results	No change during the reported period.

6 REPORTING UNDER ARTICLE 7 MMR

Information on Article 7(1) a – d of the MMR is provided in the respective CRF Tables and MMR IR reporting template ('MMR-IR_AnnexX_ESD_AT_2020. Emission trends 1990–2018 (Article 7(1) e) are described in Chapter 2. Changes to the national system and the national registry are presented in Chapter 4 (Article 7(1) n) and Chapter 5 (Article 7(1) o). Article 7(1) p-information is given in Chapter 4.3 (QA/QC Plan) and the respective MMR IR reporting template ('MMR-IRArticle14_Uncertainty_AT_2020').

Information on Article 7(1) f – m is given hereinafter:

6.1 Article 7 (1) f

Information on indicators, as set out in Annex III of the MMR, for the year 2017 is reported as a separate file ('Annex_II_AT_Indicators_2020') by EIONET/CDR upload. See also Annex II of this report.

6.2 Article 7 (1) g

Information from the national registry on acquisition, holding, transfer, cancellation, retirement and carry-over of AAUs, RMUs, ERUs, CERs, tCERs and lCERs for 2019 is reported as a separate file ('SEF_AT_CP2_2019_20190107') in xls and xml format by EIONET/CDR upload.

6.3 Article 7 (1) h

Summary information on concluded transfers pursuant to Article 3(4) and (5) of Decision No 406/2009/EC for the year 2019 has been reported as XML file in the directory 'Concluded transfers 2019' by EIONET/CDR upload.

6.4 Article 7 (1) i

Information on the use of joint implementation, of the CDM and of international emissions trading, pursuant to Articles 6, 12 and 17 of the Kyoto Protocol, or any other flexible mechanism provided for in other instruments adopted by the Conference of the Parties to the UNFCCC or the Conference of the Parties to the UNFCCC serving as the meeting of the Parties to the Kyoto Protocol, to meet their quantified emission limitation or reduction commitments pursuant to Article 2 of Decision 2002/358/EC and the Kyoto Protocol or any future commitments under the UNFCCC or the Kyoto Protocol is reported as a separate file ('AT_Art-7-1-i_Mechanisms_2020') by EIONET/CDR upload.

6.5 Article 7 (1) j

According to Article 9 of the Commission Implementation Regulation (EU) No 749/2014 Member States shall report on the status of implementation of each adjustment and each recommendation listed in the most recently published individual UNFCCC review report.

In 2019 Austria has not been subject to an UNFCCC Review, consequently there are no recommendations to be reported in the template.

The 2019 initial check of ESD emissions under Art. 19(2) of Regulation EU No 525/2012 did not identify any significant issues. Consequently, Austria was not subject to the second step review and no recommendations are included in the 2019 final review report.

6.6 Article 7 (1) k

The allocation of the verified emissions reported by installations and operators under Directive 2003/87/EC to the source categories of the national greenhouse gas inventory and the ratio of those verified emissions to the total reported greenhouse gas emissions in those source categories for 2018 is reported as a separate file ('MMR-IRArticle10_ETS_AT_2020').

6.7 Article 7 (1) l

ETS reports are fully considered in the Austrian greenhouse gas inventory; consistency of data is thus given and the Article is not relevant for Austria.

For details, especially the methodology of consideration of ETS-data ('bottom up' data) see chapter 3.2.9.2 of the National Inventory Report 2019.

6.8 Article 7 (1)m (i)

The Austrian Air Emission Inventory (OLI) covers both, greenhouse gases and air pollutants reported under the NEC Directive 2001/81/EC and CLRTAP. Data basis (activity data and other relevant parameters) is thus consistent for NEC, CLRTAP and MMR reporting.

Results of the checks performed for each air pollutant on the consistency of the data, for the year 2018 show no differences of more than +/− 5% between the total emissions excluding LULUCF. Minor differences are solely due to different reporting requirements regarding air transport and international navigation.

6.9 Article 7 (1)m (ii)

There are no producers of F-gases in Austria, only a small number of companies applied for a quota for imports from outside the EU. Most imports are from inside the EU. Calculation of emissions of F-gases follows a top-down, bottom-up approach, where amounts of F-gases sold in Austria are collected from all importers.

6.10 Article 7 (1)m (iii)

Checks performed on the consistency of the data used to estimate emissions in preparation of the greenhouse gas inventory for 2018 with the energy data reported pursuant to Article 4 of Regulation (EC) No 1099/2008 show no differences of more than +/−2%.

7 ABBREVIATIONS

BFW ..... Bundesamt und Forschungszentrum für Wald
Austrian Federal Office and Research Centre for Forest

BMLFUW..... Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft
Federal Ministry of Agriculture, Forestry, Environment and Water Management

BMNT ..... Bundesministerium für Nachhaltigkeit und Tourismus
Federal Ministry of Sustainability and Tourism

BMWA..... Bundesministerium für Wirtschaft und Arbeit
Federal Ministry for Economic Affairs and Labour (renamed as BMWFJ)

BMWFJ ..... Bundesministerium für Wirtschaft, Familie und Jugend
Federal Ministry of Economy, Family and Youth (formerly called BMWA)

CDR ..... Central Data Repository

COP ..... Conference of the Parties

CORINAIR..... Core Inventory Air

CRF..... Common Reporting Format

EC ..... European Community

EEA..... European Environment Agency

EIONET..... European Environment Information and Observation NETwork

EMEP..... Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe

EN ..... European Norm

ETC..... European Topic Centre

EU ..... European Union

ERT..... Expert Review Team (in context of the UNFCCC review process)

FAME ..... Fatty Acid Methyl Ester (Fettsäuremethylester, Biodiesel)

FAO..... Food and Agricultural Organisation of the United Nations

GHG..... Greenhouse Gas

GLOBEMI..... Globale Modellbildung für Emissions- und Verbrauchsszenarien im Verkehrssektor
(Global Modelling for Emission- and Fuel consumption Scenarios of the Transport Sector) see (HAUSBERGER 1998)

GWP ..... Global Warming Potential

IBE ..... Inspection Body for Emission Inventories

IPCC ..... Intergovernmental Panel on Climate Change

IEA ..... International Energy Agency

ISO ..... International Standards Organisation

LTO ..... Landing/Take-Off cycle

LULUCF ..... Land Use, Land-Use Change and Forestry – IPCC CRF Category 4

MMR ..... Monitoring Mechanism Regulation

MM IR ..... Monitoring Mechanism – Commission Implementing Regulation

NEMO ..... Network Emission Model

NFI ..... National Forest Inventory

NFR ..... Nomenclature for Reporting (Format of Reporting under the UNECE/CLRTAP Convention)

NISA ..... National Inventory System Austria

OLI ..... Österreichische Luftschadstoff-Inventur Austrian Air Emission Inventory

QA/QC ..... Quality Assurance/Quality Control

QMS ..... Quality Management System

SNAP ..... Selected Nomenclature on Air Pollutants

TERT ..... Technical Expert Review Team (under the MMR)

UNECE/CLRTAP .. United Nations Economic Commission for Europe, Convention on Long-range Transboundary Air Pollution

UNFCCC ..... United Nations Framework Convention on Climate Change

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 GHG emissions (kt CO_2e).

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total Emissions/Removals with LULUCF	**66 504**	**63 871**	**81 816**	**84 906**	**81 983**	**82 634**	**75 773**	**78 897**	**76 343**	**74 245**	**75 638**	**71 806**	**74 136**	**75 261**	**77 234**	**73 862**
Total Emissions without LULUCF	**78 493**	**80 262**	**92 438**	**90 064**	**87 381**	**86 792**	**80 222**	**84 674**	**82 348**	**79 592**	**80 034**	**76 409**	**78 575**	**79 531**	**82 086**	**79 014**
1. Energy	**52 815**	**55 300**	**67 017**	**64 112**	**60 820**	**59 881**	**56 796**	**59 510**	**57 186**	**54 981**	**55 231**	**51 443**	**53 103**	**54 227**	**56 076**	**54 757**
A. Fuel Combustion (Sectoral Approach)	52 114	54 803	66 580	63 647	60 348	59 449	56 316	59 042	56 725	54 507	54 760	51 004	52 678	53 835	55 649	54 387
1. Energy Industries	14 034	12 370	16 251	15 048	13 898	13 712	12 691	13 844	13 532	12 030	11 066	9 423	10 564	10 332	10 968	10 098
2. Manufacturing Industries and Construction	9 844	10 026	11 539	11 248	10 882	11 270	10 737	11 340	11 237	11 131	10 950	10 496	10 190	10 430	10 717	10 937
3. Transport	13 976	18 822	24 965	23 723	23 942	22 462	21 815	22 632	21 977	21 800	22 982	22 280	22 759	23 611	24 369	24 484
4. Other Sectors	14 223	13 544	13 781	13 583	11 580	11 959	11 026	11 178	9 931	9 497	9 712	8 755	9 115	9 411	9 544	8 817
5. Other	36	42	45	45	46	46	47	47	48	48	49	50	50	51	51	52
B. Fugitive Emissions from Fuels	702	496	437	465	472	432	480	468	461	474	472	438	424	392	427	370
1. Solid Fuels	333	27	0	0	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,IE,NA	NO,IE,NA
2. Oil and Natural Gas	369	469	437	465	472	432	480	468	461	474	472	438	424	392	427	370
C. CO_2Transport and Storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial Processes and Other Product Use	**13 662**	**14 610**	**15 631**	**16 287**	**16 964**	**17 291**	**13 918**	**15 924**	**15 966**	**15 565**	**15 885**	**16 009**	**16 585**	**16 383**	**17 209**	**15 613**
A. Mineral Industry	3 092	2 733	2 889	3 053	3 266	3 276	2 715	2 661	2 779	2 704	2 720	2 722	2 740	2 788	2 800	2 908
B. Chemical Industry	1 555	1 624	943	983	908	1 011	792	783	785	759	696	810	784	799	740	644
C. Metal Industry	8 177	8 480	9 627	10 101	10 588	10 781	8 415	10 266	10 298	9 954	10 311	10 254	10 806	10 443	11 207	9 529
D. Non-Energy Products from Fuels and Solvent Use	349	198	176	190	193	188	165	166	164	155	145	138	128	130	140	142

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
E. Electronics Industry	134	420	352	370	391	371	114	150	119	101	91	98	107	92	92	83
F. Product Uses as Substitutes for ODS	NO	709	1 143	1 149	1 189	1 240	1 308	1 484	1 412	1 490	1 518	1 586	1 621	1 641	1 746	1 830
G. Other Product Manufacture and Use	355	446	500	441	428	424	410	414	409	403	404	401	399	491	485	478
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	**8 089**	**7 387**	**6 996**	**6 991**	**7 050**	**7 185**	**7 219**	**7 080**	**7 150**	**7 100**	**7 091**	**7 233**	**7 246**	**7 361**	**7 314**	**7 224**
A. Enteric Fermentation	4 821	4 387	4 147	4 135	4 151	4 145	4 200	4 190	4 137	4 110	4 117	4 137	4 131	4 147	4 157	4 118
B. Manure Management	980	902	857	867	887	889	915	925	923	928	939	954	966	979	998	986
C. Rice Cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural Soils	2 237	2 046	1 925	1 915	1 930	2 061	2 010	1 876	1 994	1 959	1 937	2 041	2 038	2 119	2 042	1 999
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
G. Liming	46	43	54	58	62	72	72	69	77	81	75	75	83	84	86	97
H. Urea application	4	8	12	15	18	17	22	20	18	22	22	25	26	31	30	24
I. Other carbon-containing fertilizers	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land Use, Land-Use Change and Forestry	**-11 988**	**-16 391**	**-10 622**	**-5 159**	**-5 398**	**-4 158**	**-4 449**	**-5 777**	**-6 005**	**-5 348**	**-4 396**	**-4 603**	**-4 439**	**-4 271**	**-4 852**	**-5 153**
A. Forest Land	-10 862	-15 975	-8 774	-2 959	-1 931	-1 036	-4 474	-4 441	-4 408	-4 375	-4 342	-4 309	-4 302	-4 295	-4 288	-4 280
B. Cropland	190	-9	-118	-106	-101	-79	-105	-106	-108	-114	-97	-68	18	78	105	128
C. Grassland	650	472	679	678	677	672	378	377	376	375	376	377	375	357	346	314
D. Wetlands	42	36	47	37	39	51	68	69	73	70	101	71	59	77	67	66

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
E. Settlements	642	579	659	656	633	668	574	549	531	541	500	503	475	462	456	440
F. Other Land	457	380	333	324	316	307	222	214	206	197	189	181	177	173	170	166
G. Harvested Wood Products	-3 122	-1 889	-3 461	-3 803	-5 045	-4 755	-1 126	-2 452	-2 687	-2 055	-1 138	-1 372	-1 254	-1 137	-1 722	-2 001
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	**3 926**	**2 965**	**2 794**	**2 675**	**2 547**	**2 435**	**2 288**	**2 161**	**2 046**	**1 946**	**1 827**	**1 724**	**1 641**	**1 560**	**1 487**	**1 420**
A. Solid Waste Disposal on Land	3 644	2 667	2 438	2 314	2 184	2 074	1 929	1 803	1 686	1 583	1 472	1 364	1 275	1 186	1 114	1 045
B. Biological Treatment of Solid Waste	36	83	151	157	162	164	165	167	170	174	166	172	175	180	178	179
C. Incineration and Open Burning of Waste	28	12	12	10	8	6	4	2	2	2	2	2	2	2	2	2
D. Waste Water Treatment and Discharge	219	203	193	193	192	191	190	189	188	187	187	186	188	191	193	194
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other *(please specify)*	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo items:																
International bunkers	**950**	**1 793**	**2 069**	**2 148**	**2 281**	**2 281**	**1 978**	**2 148**	**2 259**	**2 164**	**2 070**	**2 066**	**2 206**	**2 407**	**2 330**	**2 599**
Aviation	896	1 713	1 980	2 070	2 199	2 205	1 913	2 071	2 191	2 095	1 996	1 998	2 149	2 344	2 265	2 551
Navigation	55	80	89	77	83	76	65	77	67	69	74	69	57	62	65	47
Multilateral operations	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
CO_2 emissions from biomass	**10 403**	**12 758**	**15 813**	**17 831**	**19 547**	**20 454**	**21 198**	**23 570**	**23 134**	**24 464**	**24 700**	**23 002**	**23 663**	**23 446**	**23 906**	**22 608**
CO_2 captured	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Long-term storage of C in waste disposal sites	**22 779**	**27 614**	**29 341**	**29 518**	**29 679**	**29 794**	**29 862**	**29 926**	**29 998**	**30 042**	**30 090**	**30 135**	**30 170**	**30 205**	**30 244**	**30 287**

TableA.I-2: Emission Trends CO_2 (kt).

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total Emissions/Removals with LULUCF	**49 968**	**49 612**	**68 425**	**71 625**	**68 751**	**69 317**	**62 945**	**66 138**	**63 796**	**61 766**	**63 253**	**59 386**	**61 749**	**62 746**	**64 680**	**61 473**
Total Emissions without LULUCF	**62 125**	**66 163**	**79 203**	**76 940**	**74 306**	**73 632**	**67 552**	**72 073**	**69 959**	**67 273**	**67 808**	**64 147**	**66 348**	**67 176**	**69 692**	**66 784**
1. Energy	**51 176**	**54 049**	**65 795**	**62 859**	**59 570**	**58 643**	**55 574**	**58 215**	**55 928**	**53 699**	**53 943**	**50 230**	**51 874**	**52 984**	**54 787**	**53 546**
A. Fuel Combustion (Sectoral Approach)	51 073	53 884	65 635	62 678	59 385	58 480	55 369	58 32	55 749	53 515	53 753	50 062	51 712	52 853	54 649	53 419
1. Energy Industries	13 984	12 314	16 165	14 950	13 794	13 601	12 576	13 712	13 396	11 893	10 932	9 298	10 431	10 202	10 838	9 973
2. Manufacturing Industries and Construction	9 762	9 891	11 374	11 075	10 706	11 097	10 572	11 176	11 073	10 966	10 790	10 343	10 043	10 284	10 571	10 792
3. Transport	13 777	18 645	24 769	23 530	23 746	22 273	21 626	22 433	21 779	21 595	22 760	22 055	22 521	23 358	24 097	24 200
4. Other Sectors	13 516	12 993	13 283	13 079	11 095	11 464	10 549	10 664	9 454	9 014	9 223	8 317	8 668	8 960	9 092	8 403
5. Other	35	41	44	44	45	45	46	46	47	47	48	49	49	50	50	51
B. Fugitive Emissions from Fuels	102	165	160	180	185	162	205	184	180	184	191	169	162	131	138	127
1. Solid Fuels	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2. Oil and Natural Gas	102	165	160	180	185	162	205	184	180	184	191	169	162	131	138	127
C. CO_2 Transport and Storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial Processes and Other Product Use	**10 871**	**12 051**	**13 330**	**13 998**	**14 648**	**14 895**	**11 880**	**13 768**	**13 933**	**13 469**	**13 766**	**13 814**	**14 362**	**14 075**	**14 786**	**13 115**
A. Mineral Industry	3 092	2 733	2 889	3 053	3 266	3 276	2 715	2 661	2 779	2 704	2 720	2 722	2 740	2 788	2 800	2 908
B. Chemical Industry	644	674	644	666	601	650	587	676	692	662	599	716	690	716	654	542
C. Metal Industry	6 786	8 445	9 622	10 089	10 588	10 781	8 414	10 266	10 298	9 949	10 302	10 238	10 804	10 441	11 192	9 524
D. Non-Energy Products from Fuels and Solvent Use	349	198	176	190	193	188	165	166	164	155	145	138	128	130	140	142

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
E. Electronics Industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Product Uses as Substitutes for ODS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Other Product Manufacture and Use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	**50**	**51**	**65**	**73**	**80**	**88**	**94**	**88**	**96**	**103**	**97**	**101**	**110**	**115**	**116**	**120**
A. Enteric Fermentation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B. Manure Management	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C. Rice Cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural Soils	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
G. Liming	46	43	54	58	62	72	72	69	77	81	75	75	83	84	86	97
H. Urea application	4	8	12	15	18	17	22	20	18	22	22	25	26	31	30	24
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land Use, Land-Use Change and Forestry	**-12 157**	**-16 551**	**-10 778**	**-5 315**	**-5 554**	**-4 316**	**-4 607**	**-5 936**	**-6 163**	**-5 506**	**-4 554**	**-4 761**	**-4 599**	**-4 431**	**-5 011**	**-5 311**
A. Forest Land	-10 892	-15 999	-8 797	-2 982	-1 954	-1 060	-4 498	-4 465	-4 432	-4 399	-4 366	-4 333	-4 326	-4 320	-4 313	-4 306
B. Cropland	176	-22	-131	-120	-116	-95	-121	-123	-125	-132	-115	-87	-3	56	82	105
C. Grassland	626	448	655	654	653	648	354	353	352	351	352	354	351	334	322	291
D. Wetlands	42	36	47	37	39	51	68	69	73	70	101	71	59	77	67	66

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
E. Settlements	570	509	589	587	565	599	504	479	460	470	430	433	406	394	389	375
F. Other Land	444	366	320	312	304	296	211	204	196	188	181	173	170	166	162	159
G. Harvested Wood Products	-3 122	-1 889	-3 461	-3 803	-5 045	-4 755	-1 126	-2 452	-2 687	-2 055	-1 138	-1 372	-1 254	-1 137	-1 722	-2 001
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	**28**	**12**	**12**	**10**	**8**	**6**	**4**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
A. Solid Waste Disposal on Land	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B. Biological Treatment of Solid Waste	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C. Incineration and Open Burning of Waste	28	12	12	10	8	6	4	2	2	2	2	2	2	2	2	2
D. Waste Water Treatment and Discharge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other *(please specify)*	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Memo Items:																
International bunkers	**935**	**1 768**	**2 040**	**2 119**	**2 251**	**2 252**	**1 953**	**2 120**	**2 231**	**2 137**	**2 044**	**2 041**	**2 180**	**2 383**	**2 306**	**2 574**
Aviation	886	1 696	1 960	2 049	2 176	2 182	1 893	2 050	2 168	2 073	1 975	1 977	2 127	2 325	2 246	2 530
Navigation	49	72	80	70	75	70	60	71	62	64	69	64	53	58	60	44

TableA.I-3: Emission Trends CH_4 (kt).

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total Emissions/Removals with LULUCF	**416.63**	**336.68**	**312.95**	**308.97**	**304.76**	**299.74**	**296.68**	**293.30**	**285.29**	**281.23**	**277.24**	**272.05**	**269.05**	**266.66**	**266.00**	**258.50**
Total Emissions without LULUCF	**415.66**	**335.72**	**312.00**	**308.01**	**303.81**	**298.78**	**295.73**	**292.35**	**284.34**	**280.27**	**276.28**	**271.10**	**268.08**	**265.70**	**265.04**	**257.55**
1. Energy	**48.46**	**29.61**	**25.80**	**26.36**	**26.01**	**25.47**	**25.42**	**27.12**	**25.77**	**26.63**	**26.42**	**24.30**	**24.53**	**24.62**	**25.95**	**23.08**
A. Fuel Combustion (Sectoral Approach)	24.47	16.34	14.72	14.96	14.53	14.67	14.41	15.75	14.51	15.00	15.20	13.53	14.03	14.19	14.40	13.36
1. Energy Industries	0.34	0.40	0.62	0.70	0.75	0.82	0.90	1.00	1.00	1.03	1.00	0.96	1.03	1.04	1.04	1.00
2. Manufacturing Industries and Construction	0.54	0.65	0.82	0.86	0.89	0.87	0.85	0.88	0.89	0.90	0.87	0.83	0.81	0.81	0.82	0.81
3. Transport	2.98	1.26	1.11	0.99	0.93	0.84	0.79	0.75	0.71	0.68	0.67	0.65	0.68	0.73	0.79	0.84
4. Other Sectors	20.62	14.05	12.17	12.40	11.96	12.14	11.87	13.12	11.91	12.39	12.66	11.08	11.51	11.61	11.75	10.72
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive Emissions from Fuels	23.99	13.27	11.08	11.40	11.48	10.80	11.01	11.37	11.26	11.63	11.22	10.78	10.51	10.42	11.55	9.72
1. Solid Fuels	13.33	1.09	0.01	0.01	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2. Oil and Natural Gas	10.66	12.18	11.08	11.39	11.48	10.80	11.01	11.37	11.26	11.63	11.22	10.78	10.51	10.42	11.55	9.72
C. CO_2 Transport and Storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial Processes and Other Product Use	**1.40**	**1.40**	**1.45**	**1.92**	**1.90**	**1.88**	**1.84**	**1.87**	**1.87**	**1.87**	**1.96**	**1.87**	**1.88**	**1.86**	**1.86**	**1.83**
A. Mineral Industry	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
B. Chemical Industry	1.40	1.40	1.45	1.92	1.90	1.88	1.84	1.87	1.87	1.87	1.96	1.87	1.88	1.86	1.86	1.83
C. Metal Industry	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
D. Non-Energy Products from Fuels and Solvent Use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Electronics Industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Product Uses as Substitutes for ODS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Other Product Manufacture and Use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	**214.63**	**194.05**	**183.01**	**182.89**	**184.17**	**184.14**	**187.02**	**187.01**	**185.03**	**184.21**	**184.92**	**186.19**	**186.40**	**187.45**	**188.41**	**186.54**
A. Enteric Fermentation	192.82	175.47	165.86	165.38	166.06	165.81	167.99	167.59	165.50	164.41	164.69	165.46	165.25	165.89	166.29	164.71
B. Manure Management	21.76	18.54	17.10	17.46	18.07	18.28	18.99	19.39	19.51	19.78	20.20	20.70	21.12	21.53	22.10	21.80
C. Rice Cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural Soils [(2)]	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Field Burning of Agricultural Residues	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02
G. Liming	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
H. Urea application	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land Use, Land-Use Change and Forestry	**0.97**	**0.96**	**0.95**	**0.96**	**0.95**	**0.96**	**0.96**	**0.96**	**0.96**	**0.96**	**0.96**	**0.96**	**0.96**	**0.95**	**0.95**	**0.96**
A. Forest Land	0.02	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.01
B. Cropland	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	IE,NO	NO,IE	NO,IE	NO,IE	NO,IE	NO,IE

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
C. Grassland	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Other Land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Harvested Wood Products																
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	**151.16**	**110.66**	**101.74**	**96.84**	**91.72**	**87.28**	**81.44**	**76.35**	**71.66**	**67.56**	**62.98**	**58.73**	**55.28**	**51.78**	**48.83**	**46.10**
A. Solid Waste Disposal on Land	145.76	106.67	97.51	92.55	87.36	82.94	77.16	72.10	67.45	63.30	58.89	54.55	51.01	47.45	44.56	41.81
B. Biological Treatment of Solid Waste	0.52	1.25	2.48	2.70	2.86	2.94	2.98	3.03	3.06	3.15	3.02	3.15	3.24	3.30	3.24	3.26
C. Incineration and Open Burning of Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Waste Water Treatment and Discharge	4.88	2.73	1.75	1.59	1.50	1.41	1.30	1.21	1.16	1.11	1.07	1.03	1.02	1.02	1.03	1.03
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other *(please specify)*	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Memo Items:																
International bunkers	**0.02**	**0.03**	**0.04**	**0.04**	**0.04**	**0.05**	**0.04**	**0.04**	**0.05**	**0.05**	**0.04**	**0.05**	**0.05**	**0.02**	**0.02**	**0.02**
Aviation	0.01	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.04	0.04	0.04	0.05	0.02	0.01	0.02
Navigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TableA.I-4: Emission Trends N_2O (kt).

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total Emissions/Removals with LULUCF	**14.98**	**14.95**	**12.53**	**12.56**	**12.61**	**13.22**	**12.48**	**11.82**	**12.13**	**12.03**	**11.98**	**12.26**	**12.30**	**12.60**	**12.41**	**12.28**
Total Emissions without LULUCF	**14.50**	**14.49**	**12.09**	**12.12**	**12.16**	**12.77**	**12.02**	**11.37**	**11.68**	**11.58**	**11.53**	**11.81**	**11.84**	**12.15**	**11.95**	**11.83**
1. Energy	**1.44**	**1.71**	**1.94**	**1.99**	**2.01**	**2.02**	**1.97**	**2.07**	**2.06**	**2.07**	**2.10**	**2.03**	**2.06**	**2.10**	**2.15**	**2.13**
A. Fuel Combustion (Sectoral Approach)	1.44	1.71	1.94	1.99	2.01	2.02	1.97	2.07	2.06	2.07	2.10	2.03	2.06	2.10	2.15	2.13
1. Energy Industries	0.14	0.15	0.23	0.27	0.29	0.30	0.31	0.36	0.37	0.37	0.37	0.34	0.36	0.35	0.35	0.33
2. Manufacturing Industries and Construction	0.23	0.40	0.48	0.51	0.51	0.51	0.48	0.48	0.47	0.48	0.47	0.44	0.43	0.42	0.42	0.42
3. Transport	0.42	0.49	0.56	0.56	0.58	0.56	0.57	0.60	0.61	0.63	0.69	0.70	0.74	0.79	0.84	0.88
4. Other Sectors	0.64	0.67	0.65	0.65	0.63	0.64	0.61	0.62	0.60	0.58	0.58	0.54	0.53	0.54	0.53	0.49
5. Other	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B. Fugitive Emissions from Fuels	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1. Solid Fuels	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2. Oil and Natural Gas	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
C. CO_2 Transport and Storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial Processes and Other Product Use	**3.69**	**3.82**	**1.44**	**1.43**	**1.39**	**1.56**	**1.00**	**0.69**	**0.63**	**0.62**	**0.62**	**0.61**	**0.61**	**0.57**	**0.57**	**0.63**
A. Mineral Industry	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE
B. Chemical Industry	2.94	3.07	0.88	0.90	0.87	1.05	0.53	0.20	0.15	0.17	0.16	0.16	0.16	0.12	0.13	0.19
C. Metal Industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Non-Energy Products from Fuels and Solvent Use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
E. Electronics Industry	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Product Uses as Substitutes for ODS	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Other Product Manufacture and Use	0.75	0.75	0.56	0.53	0.52	0.51	0.47	0.48	0.47	0.45	0.46	0.45	0.45	0.45	0.44	0.44
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	**8.97**	**8.34**	**7.90**	**7.87**	**7.94**	**8.37**	**8.22**	**7.77**	**8.15**	**8.03**	**7.96**	**8.31**	**8.31**	**8.59**	**8.35**	**8.19**
A. Enteric Fermentation	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B. Manure Management	1.46	1.47	1.44	1.44	1.46	1.45	1.48	1.48	1.46	1.45	1.46	1.46	1.47	1.48	1.49	1.48
C. Rice Cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural Soils	7.51	6.87	6.46	6.43	6.48	6.92	6.74	6.29	6.69	6.57	6.50	6.85	6.84	7.11	6.85	6.71
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	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	0.00	0.00	0.00	0.00	0.00
G. Liming	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
H. Urea application	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land Use, Land-Use Change and Forestry	**0.48**	**0.45**	**0.44**	**0.44**	**0.45**	**0.45**	**0.45**	**0.45**	**0.45**	**0.45**	**0.45**	**0.45**	**0.46**	**0.46**	**0.45**	**0.45**
A. Forest Land	0.10	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.09
B. Cropland	0.05	0.04	0.04	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.08
C. Grassland	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
E. Settlements	0.24	0.24	0.23	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.23	0.23	0.23	0.22	0.22
F. Other Land	0.04	0.05	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02
G. Harvested Wood Products																
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	**0.40**	**0.62**	**0.80**	**0.82**	**0.82**	**0.83**	**0.83**	**0.84**	**0.85**	**0.85**	**0.84**	**0.85**	**0.86**	**0.88**	**0.89**	**0.89**
A. Solid Waste Disposal on Land	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B. Biological Treatment of Solid Waste	0.08	0.17	0.30	0.30	0.31	0.30	0.30	0.31	0.31	0.32	0.30	0.31	0.32	0.33	0.33	0.33
C. Incineration and Open Burning of Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
D. Waste Water Treatment and Discharge	0.32	0.45	0.50	0.51	0.52	0.52	0.53	0.53	0.53	0.54	0.54	0.54	0.55	0.56	0.56	0.56
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other *(please specify)*	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Memo Items:																
International bunkers	**0.05**	**0.08**	**0.09**	**0.09**	**0.10**	**0.10**	**0.08**	**0.09**	**0.09**	**0.09**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**	**0.08**
Aviation	0.03	0.06	0.07	0.07	0.07	0.07	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.06	0.06	0.07
Navigation	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01

TableA.I-5: Emission Trends HFCs, PFCs, SF_6 and NF_3

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Emissions of HFCs – kt CO_2 equivalent	**2.44**	**713.63**	**1 148.33**	**1 155.23**	**1 198.41**	**1 249.71**	**1 310.44**	**1 485.66**	**1 413.93**	**1 492.36**	**1 520.37**	**1 587.86**	**1 623.43**	**1 642.99**	**1 750.56**	**1 834.76**
HFC-23 (t)	NO,NA	0.03	6.40	4.93	6.13	12.78	12.78	12.78	12.74	12.74	12.78	12.78	12.78	12.78	12.78	12.78
HFC-32 (t)	NO,NA	3.83	13.22	14.42	16.94	18.51	22.24	26.69	33.16	37.08	39.29	40.49	45.24	43.71	52.83	58.81
HFC-43-10mee / act (t)	NO,NA	0.38	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
HFC-125 (t)	NO,NA	91.10	242.00	266.10	282.07	309.34	345.86	410.69	396.87	423.98	432.66	451.80	471.25	455.68	526.99	568.09
HFC-134a (t)	NO,NA	430.52	586.58	539.20	557.47	564.31	560.82	602.72	624.38	664.08	685.49	713.31	731.88	780.40	769.77	790.31
HFC-143a (t)	NO,NA	106.44	260.35	287.13	291.46	320.48	346.50	410.12	338.49	348.62	344.35	363.84	355.98	343.89	379.32	395.41
HFC-152a (t)	NO,NA	73.81	25.38	30.73	30.84	10.81	16.04	16.66	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
HFC-227ea (t)	NO,NA	0.01	1.00	2.02	0.34	0.01	0.00	0.00	2.38	0.00	0.00	0.05	0.43	0.96	1.01	0.95
HFC-245fa (t)	NO,NA	1.55	4.69	2.43	2.38	2.32	2.27	2.22	2.17	2.12	2.07	2.02	1.98	1.93	1.89	1.85
HFC-365mfc (t)	NO,NA	1.19	3.68	1.89	1.85	1.81	1.77	1.73	1.69	1.65	1.61	1.57	1.54	1.50	1.47	1.43
Unspecified mix of listed HFCs (kt CO_2 equivalent)	2.44	4.78	5.03	6.36	8.94	9.35	2.16	2.05	2.06	2.09	2.12	2.01	2.37	2.13	4.50	5.14
Emissions of PFCs (kt CO_2 equivalent)	**1 182.79**	**87.87**	**163.29**	**172.39**	**230.33**	**208.19**	**36.02**	**78.05**	**73.51**	**50.72**	**49.23**	**53.03**	**49.55**	**50.39**	**44.09**	**32.52**
CF_4 (t)	1 014.74	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
C_2F_6 (t)	134.02	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
C $_3F_8$ (t)	NO,NA	NO,NA,IE	NO,NA,IE	1.82	1.48	0.93	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE	NO,NA,IE
C_4F_{10} (t)	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA
C_5F_{12} (t)	NA,NO	0.55	5.50	NA,NO	NA,NO	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 (kt CO_2 equivalent)	34.03	87.32	157.79	170.57	228.85	207.25	36.02	78.05	73.51	50.72	49.23	53.03	49.55	50.39	44.09	32.52
Emissions of SF_6 (kt CO_2 equivalent)	**470.61**	**574.53**	**493.63**	**453.46**	**367.01**	**373.43**	**341.68**	**335.87**	**307.35**	**311.88**	**305.32**	**313.98**	**309.55**	**392.84**	**399.93**	**382.15**

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
SF_6 (t)	20.64	25.20	21.65	19.89	16.10	16.38	14.99	14.73	13.48	13.68	13.39	13.77	13.58	17.23	17.54	16.76
Emissions of NF_3 (kt CO_2 equivalent)	**NO,NA**	**10.51**	**28.16**	**32.73**	**59.39**	**53.47**	**4.54**	**4.12**	**4.10**	**8.56**	**9.75**	**10.56**	**13.46**	**6.14**	**12.01**	**16.51**
NF_3 (t)	NO,NA	0.61	1.64	1.90	3.45	3.11	0.26	0.24	0.24	0.50	0.57	0.61	0.78	0.36	0.70	0.96

ANNEX II: INDICATORS

This Annex presents the indicators pursuant to Article 7(1) f of Regulation (EU) No 525/2013 'Monitoring Mechanism Regulation'. Information on all priority indicators, additional priority indicators and supplementary indicators is provided[29].

Table A.III: Indicators pursuant to Article 7 (1) f of the Regulation No. 525/2013/EC 'Monitoring Mechanism Regulation' (MMR) for the years 1990, 2000, 2005–2018.

No	Indicator	1990	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	Priority Indicators																
1	Total CO_2 intensity of GDP [t CO_2/Mio Euro]	317	274	301	283	263	257	245	257	242	231	233	219	224	222	225	211
2	Energy related CO_2 intensity of GDP [t CO_2/Mio Euro]	261	224	249	230	210	204	201	207	193	184	185	171	175	175	177	168
3	Specific CO_2 emissions of passenger cars [g CO_2/km]	212	198	191	186	184	180	176	175	173	171	172	170	168	169	169	168
4	Energy related CO_2 intensity of industry [t/Mio Euro]	288	239	250	232	212	216	236	243	229	226	222	213	208	207	203	197
5	Specific CO_2 emissions of households [t CO_2/dwelling]	3.4	2.8	2.6	2.5	2.2	2.2	2.1	2.3	1.9	1.9	1.9	1.6	1.7	1.8	1.8	1.6
6	CO_2 intensity of the commercial and institutional sector [t CO_2/Mio Euro]	20	21	21	21	15	16	13	10	8.2	7.6	7.5	6.9	7.1	6.6	7.6	7.0
7	Specific CO_2 emissions of public and autoproducer power plants [t CO_2/TJ]	167	128	130	127	122	112	102	108	109	104	109	110	105	98	101	97
	Additional Priority Indicators																
1	Freight transport on road [g CO_2/ton-km]	89	75	71	69	66	64	63	63	63	62	61	59	58	60	61	60
2	Total CO_2 intensity – iron and steel industry [t CO_2/Mio Euro]	2 320	1 671	2 258	2 336	2 238	2 189	4 089	3 989	4 027	3 594	3 848	3 585	3 628	3 584	3 776	3 182
3	Energy related CO_2 intensity – chemical industry [t CO_2/Mio Euro]	538	463	440	407	344	440	493	477	424	421	385	364	368	385	395	356
4	Energy related CO_2 intensity – glass, pottery and building materials industry [t CO_2/Mio Euro]	609	564	590	606	639	692	734	670	666	681	669	661	658	648	626	627

[29] 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 for consistency reason.

No	Indicator	1990	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
5	Specific CO_2 emissions of iron and steel industry [t CO_2/t production]	2.2	1.9	1.8	1.8	1.7	1.8	1.9	1.8	1.7	1.7	1.7	1.7	1.7	1.8	1.7	1.8
6	Specific energy related CO_2 emissions of cement industry [t CO_2/t production]	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Supplementary Indicators																	
1	Specific diesel related CO_2 emissions of passenger cars [g CO_2/ km]	191	185	181	174	174	174	170	170	169	168	168	167	166	167	169	168
2	Specific petrol related CO_2 emissions of passenger cars [g CO_2/ km]	216	207	203	201	197	186	181	179	177	173	173	171	169	168	167	165
3	Passenger transport on road [g CO_2/passenger-km]	156	161	161	157	156	153	150	149	149	147	148	147	146	147	147	146
4	Passenger transport by air [kg CO_2/passenger]	234	126	111	110	109	99	96	81	93	86	88	85	93	92	76	78
5	Energy related CO_2 intensity – food, drink and tobacco industry [t CO_2/Mio Euro]	182	155	159	149	122	135	153	152	159	148	142	143	142	124	113	106
6	Energy related CO_2 intensity – paper and printing industry [t CO_2/Mio Euro]	895	717	652	575	534	552	628	652	602	536	494	454	484	468	460	493
7	Specific CO_2 emissions of households for space heating [t CO_2/m²]	37	29	26	25	22	22	21	22	19	18	19	16	17	18	17	16
8	Specific CO_2 emissions of commercial and institutional sector for space heating [kg CO_2/m²]	21	24	24	24	18	18	15	11	9.0	8.1	7.8	7.2	7.4	6.8	7.9	7.4
9	Specific CO_2 emissions of public power plants [t CO_2/TJ]	166	133	116	112	103	95	85	88	88	82	80	75	77	72	74	68
10	Specific CO_2 emissions of autoproducer plants [t CO_2/TJ]	168	117	180	175	174	161	154	165	164	156	171	176	167	157	165	164
11	Carbon intensity of total power generation [t CO_2/TJ]	68	48	62	60	56	51	45	52	54	43	43	40	43	39	42	40
12	Carbon intensity of transport [t CO_2/TJ]	66	64	65	63	62	60	60	61	61	61	61	59	59	60	61	60
13	Specific energy related CO_2 emissions of paper industry [t CO_2/t production]	0.8	0.5	0.5	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4
14	Carbon intensity in Industry [kt CO_2 /PJ]	46	40	38	36	34	36	35	35	35	34	34	34	33	32	33	33
15	Carbon intensity Households [kt CO_2 /PJ]	41	35	33	32	29	29	28	28	26	25	24	24	24	24	24	23

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In „Austria's Annual Greenhouse Gas Inventory 1990–2018" the Umweltbundesamt presents updated figures of greenhouse gas (GHG) emissions in Austria including the first six years of the second commitment period under the Kyoto-Protocol. In 2018 GHG emissions amounted to 79.0 million tonnes of CO_2 equivalents. This corresponds to a 0.7% increase against 1990 and a 3.7% decrease compared to 2017. Key drivers for the development 2017–2018 were the decreasing electricity production from natural gas power plants as well as lower production of iron and steel.

GHG emissions according to Article 2(1) of Decision No. 406/2009/EC ("Effort Sharing Decision") amounted to 50.5 Mt CO_2 equivalents in 2018 and were thus 1.6 Mt CO_2 equivalents above the annual emission allocation for 2018. Content and format of this report are in accordance with the obligations under the GHG Monitoring Mechanism Regulation (EU) No. 525/2013.

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