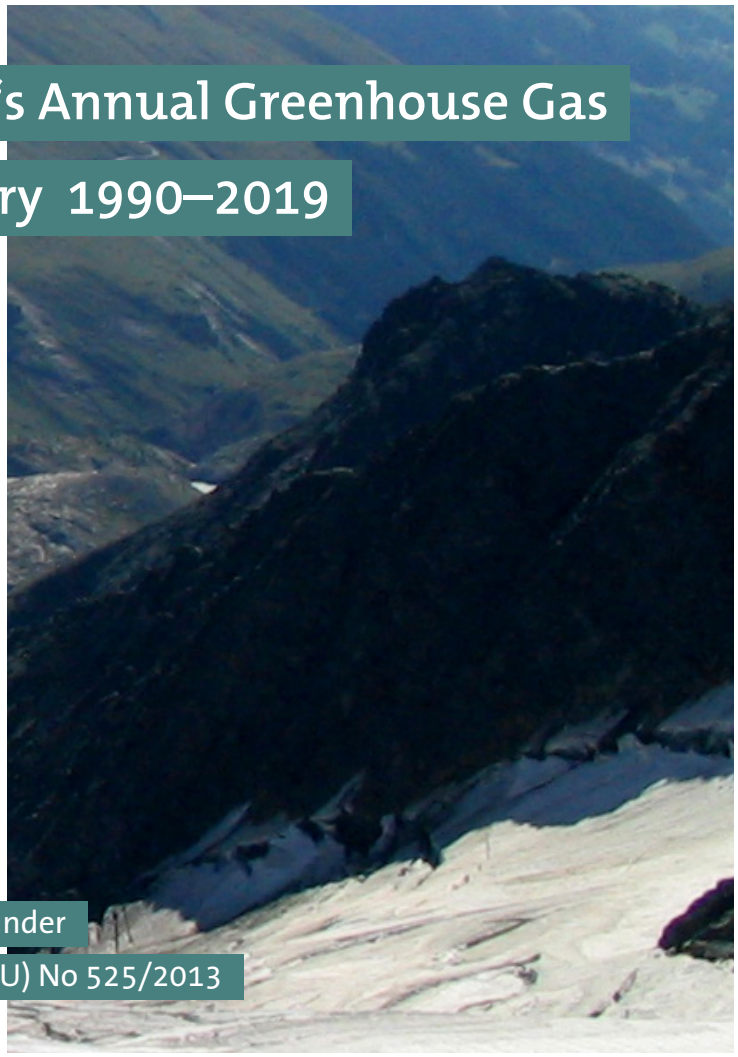
ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

Austria's Annual Greenhouse Gas Inventory 1990–2019



Submission under Regulation (EU) No 525/2013

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AUSTRIA'S ANNUAL GREENHOUSE GAS INVENTORY 1990–2019

Submission under Regulation (EU) No 525/2013

REPORT
REP-0751
Vienna 2021

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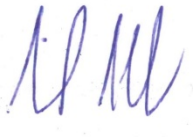
Date 15.01.2021	Responsible for the content of this report  DI Michael Anderl (Head of the inspection body)
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VORWORT

Dieser Bericht

Der vorliegende Bericht präsentiert die neuesten Daten der Emissionen von Treibhausgasen (THG) Österreichs. Diese Daten betreffen die Emissionen des Jahres 2019 sowie die aktualisierte Zeitreihe der Jahre 1990 bis 2018. Damit liefert der Bericht Daten für die ersten sieben 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 und diese

[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

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 21.–26.09.2020 statt, und konnte erfolgreich abgeschlossen werden. Ergebnisse dieser Prüfung, inkl. Empfehlungen zur Verbesserung, werden auf der Website der UNFCCC veröffentlicht[3].

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

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-2020

[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 2020	13. Jänner 2021	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 2019. It presents GHG data for the first seven 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_2021') as well as the completed MMR IR reporting templates are not part of this report but submitted separately by uploading at EIONET/CDR.

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

[8] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R1999&qid=1610553048239&from=EN

[9] https://www.ozone.unep.org/treaties/montreal-protocol

[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].

Reporting Obligation	Format	Inventory	Version
Mechanism for monitoring Community greenhouse gas emissions	Common Reporting Format (CRF)	OLI 2020	January 13th 2021

Table 1: Status of the present report.

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 2019 Austria's total greenhouse gas (GHG) emissions (without Land Use, Land Use Change and Forestry - LULUCF) amounted to 79.8 Mt CO_2 equivalents (CO_2e). Compared to the base year[13] 1990 GHG emissions increased by 1.8%, compared to 2018 GHG emissions increased by 1.5%.

Greenhouse gas emissions according to Article 2(1) of Decision No. 406/2009/EC amounted to 50.2 Mt CO_2 equivalents in 2019 (see 'MMR-IR_AnnexX_ESD_AT_2021'), which is 0.1% (0.1 Mt CO_2e) more than in 2018.

Table 2: Emissions and status of ESD-target achievement

Mio. t CO_2-Äquivalent	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Total GHG emissions without LULUCF	79.8	76.2	78.5	79.5	81.9	78.6	79.8
Total verified emissions from stationary installations under Directive 2003/87/EC2	29.9	28.1	29.5	29.0	30.6	28.4	29.6
GHG emissions according to Article 2(1) of Decision No. 406/2009/EC ("ESD emissions")[14]	50.1*	48.2*	49.3*	50.6*	51.7*	50.3*	50.2
Annual Emission Allocations (AEA)	52.6	52.1	51.5	51.0	49.5	48.9	48.3
Deviation from AEA	-2.5	-3.9	-2.2	-0.4	+2.1	+1.4	+1.9

** based on the results of the comprehensive and annual inventory reviews referred to in Article 19(1) or 19(2) of Regulation (EU) No 525/2013, published in the following COMMISSION IMPLEMENTING DECISIONS (EU): 2016/2132, 2017/1015, 2017/2377, 2018/1855, 2019/2005, 2020/1834.*

Emissions 2019, 2018 and 2017 were above, emissions for 2013, 2014, 2015 and 2016 were below their respective annual emission allocation (AEA[15]).

[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] Defined as: Total greenhouse gas emissions without LULUCF minus NF3 emissions minus total verified emissions from stationary installations under Directive 2003/87/EC ("ETS emissions") minus CO2 emissions from 1.A.3.a civil aviation.

[15] 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

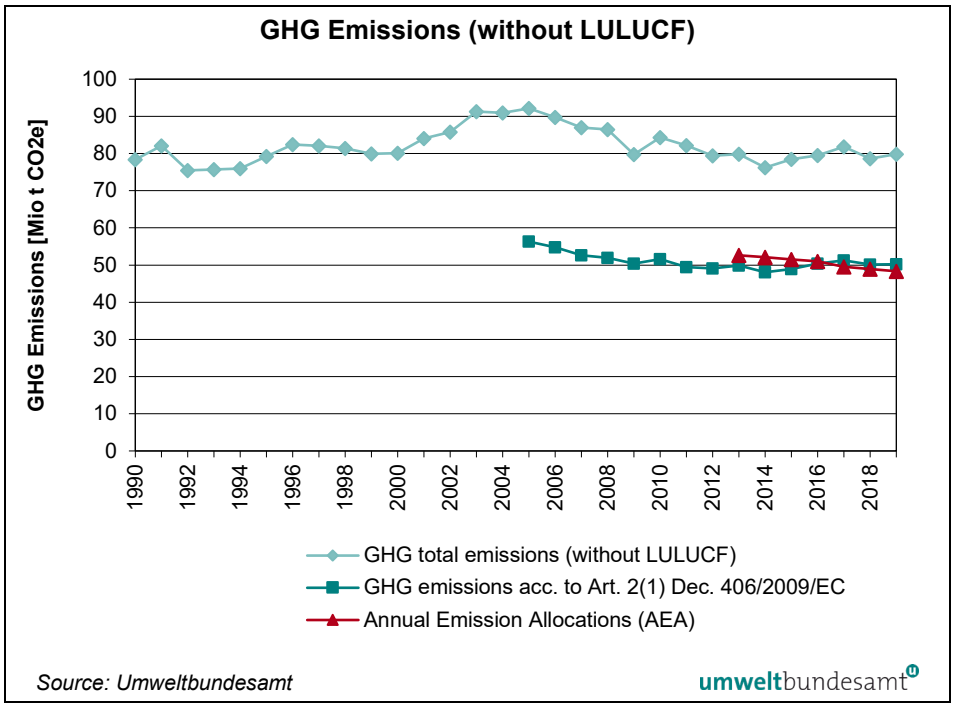


Figure 1: Trend in GHG emissions 1990–2019 without LULUCF.

Trend 2018–2019

The key drivers for the emissions increase between 2018 and 2019 were increases in the sectors *Industrial Processes and Other Product Use (CRF 2)* (+912 kt CO_2e; +5.9%) and *Energy (CRF 1)* (+456 kt CO_2e; +0.8%).

Emissions from *Industrial Processes and Other Product Use (CRF 2)* increased, mainly due to a higher production of iron and steel (after a maintenance shutdown of a blast furnace in 2018). Reasons for the emissions growth in sector *Energy (CRF 1)* is the higher electricity production from natural gas power plants (*CRF 1.a.1.a*) and the higher use of natural gas and gasoil in households due to the increased heating demand in 2019 (*CRF 1.A.4 Other sectors).*

Net removals from *LULUCF* (*CRF 4*) show a decrease by 9.6% (491 kt CO_2e) from 2018–2019, mainly caused by the decrease in the harvested wood products sink.

Emissions from *Agriculture (CRF 3)* decreased by 1.4% (−102 kt CO_2e) from 2018 to 2019, 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 3.9% (−51 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	52 804	13 570	8 120	-12 154	3 926	NO*
1995	54 280	13 508	7 797	-13 336	3 653	NO
2000	55 254	14 495	7 415	-16 597	2 965	NO

Table 3: Summary of Austria's anthropogenic greenhouse gas emissions by sector.

GHG source and sink categories	1. Energy	2. IPPU	3. Agriculture	4. LULUCF	5. Waste	6. Other
	CO_2 equivalents (kt)					
2001	59 474	14 359	7 363	-19 439	2 868	NO
2002	60 684	15 009	7 256	-14 399	2 866	NO
2003	66 204	15 130	7 103	-5 001	2 870	NO
2004	66 317	14 654	7 081	-9 343	2 933	NO
2005	66 869	15 467	7 017	-10 807	2 794	NO
2006	63 955	16 088	7 012	-5 049	2 675	NO
2007	60 596	16 770	7 071	-5 276	2 547	NO
2008	59 699	17 094	7 213	-3 984	2 435	NO
2009	56 515	13 753	7 243	-4 342	2 268	NO
2010	59 424	15 693	7 095	-5 700	2 125	NO
2011	57 095	15 864	7 173	-6 079	1 995	NO
2012	54 951	15 477	7 123	-5 428	1 882	NO
2013	55 159	15 792	7 113	-4 460	1 754	NO
2014	51 436	15 904	7 257	-4 327	1 642	NO
2015	53 085	16 552	7 274	-4 139	1 551	NO
2016	54 315	16 302	7 390	-3 990	1 464	NO
2017	56 023	17 114	7 341	-4 721	1 385	NO
2018	54 592	15 471	7 254	-5 102	1 311	NO
2019	55 048	16 383	7 152	-4 612	1 260	NO

** not occurring*

The most important GHG in Austria remains carbon dioxide (CO_2) with a share of 85% in 2019. The CO_2 emissions primarily result from combustion activities. Methane (CH_4), which mainly arises from stock farming and waste disposal, contributes 7.8% to total national GHG emissions; nitrous oxide (N_2O) with agricultural soils as the main source contributes another 4.3% in 2019. The remaining 2.8% 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 4: 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	62 140	10 394	4 231	2.4	1 183	471	0.0
1995	64 011	9 533	4 155	349	83	1 100	6.4
2000	66 139	8 395	4 232	691	88	575	11
2001	70 139	8 237	4 107	826	116	629	11
2002	71 943	8 095	4 112	939	102	613	11
2003	77 451	8 032	4 103	1 024	126	549	22
2004	77 668	8 035	3 517	1 097	158	484	27
2005	79 068	7 801	3 515	1 079	163	494	28
2006	76 796	7 701	3 523	1 050	172	453	33

GHG emissions	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3
	CO_2 equivalents (kt)						
2007	74 097	7 595	3 537	1 098	230	367	59
2008	73 472	7 470	3 719	1 144	208	373	53
2009	67 291	7 373	3 498	1 235	36	342	4.5
2010	72 000	7 272	3 303	1 343	78	336	4.1
2011	69 889	7 057	3 396	1 400	74	307	4.1
2012	67 263	6 943	3 365	1 490	51	312	8.6
2013	67 759	6 832	3 348	1 514	49	305	10
2014	64 161	6 694	3 436	1 570	53	314	11
2015	66 352	6 607	3 450	1 681	50	310	13
2016	67 215	6 544	3 536	1 726	50	393	6.1
2017	69 599	6 522	3 477	1 809	44	400	12
2018	66 565	6 326	3 447	1 854	33	386	17
2019	67 962	6 194	3 447	1 750	38	436	14

The dominant sector regarding GHG emissions in Austria is *Energy*, causing 69% of the total national GHG emissions in 2019 (67% in 1990), followed by the sector *Industrial Processes and Other Product Use* (21% in 2019) and *Agriculture* (9.0% in 2019).

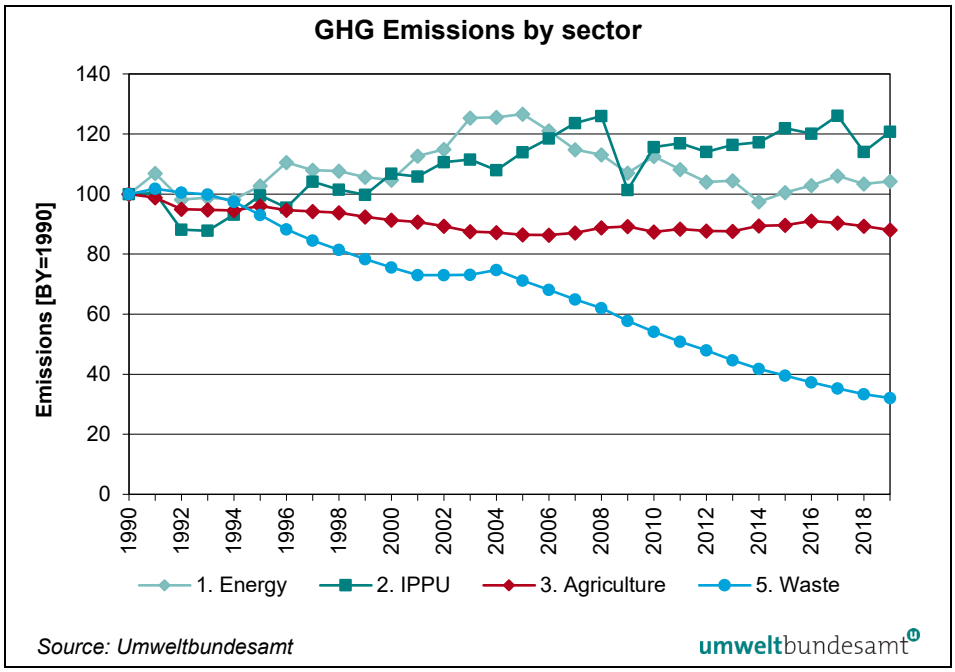
GHG	1990	2019	Trend 1990–2019	1990	2019
	Emissions [kt CO_2e]			Share [%]	
Total	**78 420**	**79 842**	**+1.8%**	**100%**	**100%**
Energy	52 804	55 048	+4.2%	67%	69%
IPPU	13 570	16 383	+21%	17%	21%
Agriculture	8 120	7 152	-12%	10%	9.0%
Waste	3 926	1 260	-68%	5.0%	1.6%

Total emissions without emissions from sector LULUCF

Table 5: Austria's greenhouse gas emissions (without LULUCF) by sector 1990 and 2019 as well as their share and trend.

In 2019 emissions from *Industrial Processes and Other Product Use* were 21% higher than in 1990. GHG emissions from *Energy* increased by 4.2% between 1990 and 2019. The other sectors show decreasing trends, with the most significant decrease in GHG emissions in the sector *Waste* (–68%).

Figure 2: Trend in emissions 1990–2019 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 2019, greenhouse gas emissions from sector *Energy* amounted to 55 048 kt CO_2 equivalents which corresponds to 68.9% of total national emissions. 99.4% 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 2019, followed by *manufacturing industries and construction* (19%), *energy industries* (19%) and the sub-category *other sectors* (17%). The most important **greenhouse gas** is CO_2, contributing 97.8% to total sectoral GHG emissions, followed by CH_4 (1%) and N_2O (1.2%).

From 2018 to 2019, emissions from this sector increased by 0.8% (+ 456 kt CO_2e), affected by increasing emissions from *energy industries* and *other sectors*.

Decreased emissions were reported for *manufacturing industries* (-79 kt CO_2e), mainly due to lower natural gas consumption. Increased emissions of the *transport sector* (+54 kt CO_2e) were mainly due to higher consumption of diesel oil.

Emissions from *energy industries* increased by 222 kt CO_2e, mostly because of decreased electricity production from natural gas power plants. The main driver for increasing emissions (+282 kt CO_2e) from *other sectors* in 2019 was the increased use of natural gas and gasoil due to increased heating demand of households (heating degree days increased by 1.4%).

The **overall trend** in GHG emissions from the sector *Energy* shows increasing emissions with a 4.2% rise from 1990 to 2019. 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 1990–2019 by sub-category

In 2019 emissions from sub-category ***energy industries*** were 27% 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% in 1990 to 25% in 2019. The contribution of hydro and wind power plants to total public electricity production increased from 69% in 1990 to 78% in 2019. 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 9% from 1990 to 2019, mainly in the chemicals industry and from off road vehicles, while emissions from iron & steel, pulp & paper and other manufacturing industries decreased since 1990. Fuel consumption increased by 36% 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 +9%) compared to the increase in fuel combustion.

Transport showed a strong increase in GHG emissions since 1990 (+76%) 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. GHG emissions from sector transport are gradually increasing since the year 2015.

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 2019 were 36% 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 13% since 1990.

Fugitive emissions decreased by 51% 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 2019 greenhouse gas emissions from *Industrial Processes and Other Product Use* amounted to 16 383 kt CO_2 equivalent, which correspond to 21% of total national emissions.

The most important **sub-categories** of this sector are *metal industry* and *mineral industry*, generating 63% and 17% of total sectoral emissions, respectively. The most important **greenhouse gas** of this sector is CO_2 with a contribution of 85% to total sectoral emissions, followed by HFCs with 11%, SF_6 with 2.7%, N_2O with 0.7%, CH_4 with 0.3% and PFCs with 0.2%. NF_3 contributes 0.1% to total emissions from this sector in 2019.

From 2018 to 2019, overall emissions from this sector increased by 5.9%, which is mainly caused by higher iron and steel production figures occurring after a maintenance shutdown of a blast furnace in 2018, and by an increased production in the integrated ammonia plant.

The **overall trend** in GHG emissions from *Industrial Processes and Other Product Use* is an increase of 21% from 1990 to 2019. Within this period, emissions fluctuated, with a minimum in 1993 and a maximum in 2017. **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 26% higher GHG emissions in 2019 compared to 1990 and (iv) a strong increase of HFC emissions in the period 1992 to 2019 from 5.6 to 1 750 kt CO_2 equivalent.

Trend 1990–2019 by sub-category

The largest increase in GHG emissions between 1990 and 2019 can be observed in the *metal industry* due to an increase in GHG emissions from iron and steel production (+55%). In sub-categories *mineral industry* and *chemical industry*, GHG emissions declined by 9.2% and 45% respectively during that period. Emissions from *non-energy products from fuels and solvent use* dropped by 58%, due to legal measures controlling the solvent content of products and their use.

Emissions of *fluorinated gases* increased by 35% since 1990, driven by increasing emissions of HFCs (+402% since 1995) used as cooling agents that replaced Ozone Depleting Substances (ODSs).

2.3 Agriculture

In 2019, greenhouse gas emissions from *Agriculture* amounted to 7 152 kt CO_2 equivalent, which correspond to 9.0% 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 2019 70% (8.1 kt N_2O) of total N_2O emissions and 74% (184 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 64% and N_2O with a share of 34%. CO_2 emissions account for 2.0% of the emissions from this sector.

From 2018 to 2019 GHG emissions decreased by 1.4%, mainly due to lower emissions from *enteric fermentation* and *agricultural soils*. Between 2018 and 2019 the number of cattle, dairy cows as well as other cattle, decreased. Additionally, a smaller amount of mineral fertilizers was applied on agricultural soils compared to the previous year.

The **overall trend** in GHG emissions from *Agriculture* shows a decrease of 12% from 1990 to 2019. 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 2019, net removals from sector *LULUCF* amounted to −4 612 kt CO_2 equivalent, which correspond to 5.8% of national total GHG emissions (without LULUCF) in 2019 compared to 15% in the base year.

With regard to the **overall trend** of net removals from *LULUCF*, the removals decreased by 62% 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 −4 271 kt CO_2 equivalent in 2019 (including indirect emissions). *Harvested Wood Products (4.G)* is the second largest sink category and contributed –1 481 kt CO_2 equivalent. In 2019, CH_4 and N_2O emissions together amounted to 152 kt CO_2 equivalent (including indirect emissions). Total net emissions arising from the other non-forest sub-sectors (excluding HWPs) amounted to 1 141 kt CO_2 equivalent in 2019 (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 −3 586 kt CO_2 equivalent in 2019 (including HWPs). Afforestation/reforestation (incl. HWPs) contribute to GHG removals as well (−2 208 kt CO_2 equivalents), whereas emissions from deforestation amount to 493 kt CO_2 equivalent in 2019 (both including indirect emissions).

2.5 Waste

In 2019, greenhouse gas emissions from sector *Waste* amounted to 1 260 kt CO_2 equivalent, which correspond to 1.6% of total national emissions.

The most important sub-category of *Waste* is *solid waste disposal*, which caused 70% of the emissions from this sector in 2019, followed by *waste water treatment and discharge* (15%) and *biological treatment of solid waste* (15%). The most important greenhouse gas is CH_4 with a share of 78% in emissions, mainly arising from *solid waste disposal*, followed by N_2O with 21% and CO_2 with 0.2%.

From 2018 to 2019 GHG emissions continued to decrease (−3.9%) 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 68% from 1990 to 2019. 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_2021').

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 0.09% (−72 kt CO_2e) lower than reported last year; the national total (excl. LULUCF) for 2018 is 0.41% (−323 kt CO_2e) lower than the value submitted last year.

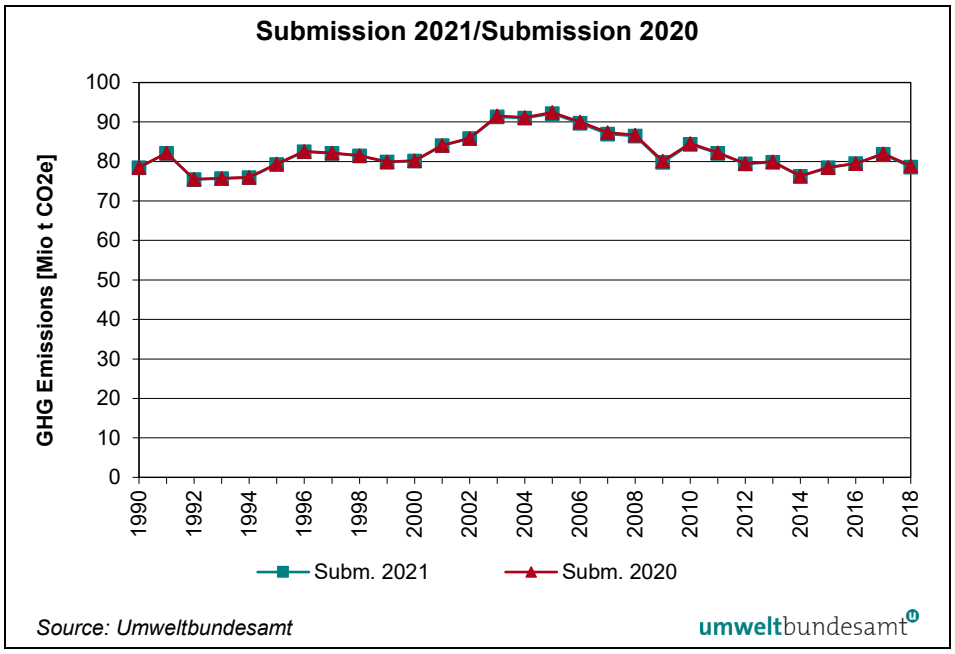


Figure 3: Comparison Submission 2021/Submission 2020 (Recalculations).

National total emissions (excluding LULUCF) for **1990** have been revised downwards since last years' submission (−72 kt CO_2e) mainly due to revised estimates reported for *Industrial Processes and Other Product Use*, in particular for category *2.G.3 N_2O from Product Uses,* where the amount of N_2O used for the production of capsules for whipped cream was revised in response to the ESD Review 2020. Further revisions are reported for *1.A.1.a* public *electricity and heat production* (following revisions of the national energy balance*), 1.A.3.b Road Transportation*, *3.I Other carbon-containing fertilizers* (reporting of CO_2 from calcium ammonium nitrate (CAN) fertilisers for the first time) and *LULUCF* (total areas adjusted).

Revised total emissions for **2018** are 0.41% lower (−323 kt CO_2e) than total emissions submitted for 2018 in the previous year. Revised emissions are reported for *Industrial Processes and Other Product Use*, mainly in *2.G.3 N_2O from Product Uses* (see above on recalculations 1990), *2.C.1 Steel production* and *1.A.2.g Other manufacturing industries (*following revisions of the national energy balance*)* as well as *5.A Solid Waste Disposal* (methodological adaption in response to the ESD Review 2020)

Table 6: Recalculation difference of Austria's GHG emissions compared to the previous submission.

	National Total GHG emissions without LULUCF			
	Submission 2021	**Submission 2020**	**Recalculation Difference**	
	[kt CO_2e]	**[kt CO_2e]**	**[kt CO_2e]**	**[%]**
1990	78 420	78 493	-72	-0.09%
1991	82 082	82 157	-75	-0.09%
1992	75 469	75 524	-55	-0.07%
1993	75 709	75 771	-62	-0.08%
1994	75 958	76 017	-59	-0.08%
1995	79 238	79 383	-145	-0.18%
1996	82 453	82 605	-153	-0.19%
1997	82 116	82 176	-60	-0.07%
1998	81 433	81 512	-79	-0.10%
1999	79 898	79 931	-33	-0.04%
2000	80 129	80 262	-133	-0.17%
2001	84 065	84 152	-87	-0.10%
2002	85 815	85 907	-92	-0.11%
2003	91 307	91 545	-239	-0.26%
2004	90 985	91 140	-155	-0.17%
2005	92 147	92 427	-280	-0.30%
2006	89 729	90 023	-294	-0.33%
2007	86 984	87 338	-354	-0.41%
2008	86 440	86 748	-308	-0.35%
2009	79 779	80 163	-384	-0.48%
2010	84 337	84 613	-276	-0.33%
2011	82 127	82 287	-160	-0.19%
2012	79 432	79 529	-96	-0.12%
2013	79 817	79 972	-155	-0.19%

	National Total GHG emissions without LULUCF			
	Submission 2021	Submission 2020	Recalculation Difference	
	[kt CO_2e]	[kt CO_2e]	[kt CO_2e]	[%]
2014	76 239	76 346	-107	-0.14%
2015	78 462	78 510	-48	-0.06%
2016	79 471	79 467	4	0.00%
2017	81 862	82 023	-161	-0.20%
2018	78 628	78 950	-323	-0.41%

	Submission 2021		Submission 2020		Recalculation Difference	
THG	**1990**	**2018**	**1990**	**2018**	**1990**	**2018**
	[Mt CO_2e]		[Mt CO_2e]		[Mt CO_2e]	
Total*	**78.42**	**78.63**	**78.49**	**78.95**	**-0.07**	**-0.32**
Energy	52.80	54.59	52.82	54.69	-0.01	-0.10
IPPU	13.57	15.47	13.66	15.61	-0.09	-0.14
Agriculture	8.12	7.25	8.09	7.22	0.03	0.03
LULUCF	-12.15	-5.10	-11.99	-5.15	-0.17	+0.05
Waste	3.93	1.31	3.93	1.42	0.00	-0.11

Table 7: Recalculations per sector.

** 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 CO_2, CH_4, and N_2O in 2018 were revised downwards, whereas emissions of fluorinated compounds were revised upwards.

Recalculations of CH_4 are largely attributable to a revised estimate provided in the sector *Waste*, where the method for estimating emissions from *5.A Solid Waste Disposal* has been slightly adopted in response to an issue raised during the comprehensive ESD Review 2020. Further, much smaller, revisions were reported in the categories *Domestic Wastewater* (*5.D.1*) and *Other Sectors* (*1.A.4)*.

Recalculations of N_2O are largely attributable to source category *2.G.3 N_2O from Product Uses*, where the amount of N_2O used for the production of capsules for whipped cream was revised, in accordance with the results of the ESD Review 2020.

	1990 (Base year)	2018
	Recalculation Difference [%]	
Total	**-0.09%**	**-0.41%**
CO_2	0.02%	-0.23%
CH_4	0.02%	-1.75%
N_2O	-2.08%	-2.25%
HFC, PFC, SF_6, NF_3	0.00%	1.05%

Table 8: Recalculations per gas.

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 1990–2018 will be given in Austria's National Inventory Report 2021.

3.3.1 Energy

3.3.1.1 Stationary sources

Update/Improvement of activity data

Revision of the energy balance

Federal statistics office "Statistik Austria" revised the energy balance for the years 1990 to 2018 with the following main implications for energy consumption as used in the inventory:

- Natural gas gross inland consumption has been revised for 1999–2004 (between –0.3 to 1.3 PJ), 2014–2016 (between 1 to 5.2 PJ) and 2018 (–1.3 PJ). However, natural gas consumption has been shifted between the 'energy sector use' and final energy consumption for the years 1994–1996 (between 0.1 to 1.3 PJ), and 1999–2018 (up to 2.6 PJ in 2018). Furthermore, final energy consumption has been shifted between sectors. The main implications for CO_2 emissions 2005 were: –72 kt from 1.A.1.a, +176 for 1.A.4.a and –103 kt for 1.A.4.b. The main implications for CO_2 emissions 2018 were: –16 kt from 1.A.1.a, –186 kt from 1.A.2, +58 kt from 1.A.4.a, –16 kt from 1.A.4.b. The highest recalculations occurred for the year 2016, were +148 kt CO_2 emissions from natural gas have been reported for 1.A.1.b which replaced the same amount of CO_2 emissions from liquid fuels.

  For liquid fuels, gross inland consumption has been revised for the year 2018 and for motor gasoline only (by –0.2 PJ).

  In the inventory, considerably large amounts of LPG consumption have been removed from category 1.A.1.a for 1990 to 2018 because these amounts are used by oil refinery instead (use of energy sector). This results in –146 kt lower CO_2 emissions for 2005, –15 kt lower CO_2 emissions in 2018 and –250 kt lower CO_2 emissions in 2009.
- For solid fuels, gross inland consumption has been revised for the years 2017 (+0.2 PJ) and 2018 (+0.7 PJ), mainly because of an increased amount of hard coal associated to category 1.A.2 manufacturing industries.
- For solid biomass fuels, gross inland consumption has been revised for 2005–2018 (between –1.7 and +1.6 PJ). Main revisions 2018 affected category 1.A.1.a (+1.1 PJ of wood waste), category 1.A.2 (–1.4 PJ of wood waste) and 1.A.4.b (–2.6 PJ of wood waste, + 3.6 PJ of pellets).

3.3.1.2 Mobile sources

Update of activity data

1.A.3.b Road Transport

By adapting the energy data (LPG, biogas) to the energy balance, the mileage model of the vehicle categories had to be recalibrated. This lead to a change in activity data and GHG emissions per vehicle category over the entire time series (–44 kt CO_2e in 2018).

1.A.3.d domestic navigation

Domestic fuel consumption data have slightly been updated on the basis of a new study on Austria's off-road emissions. A special focus was placed on the shipping, in detail on passenger ships. These ships have not been adequately analysed and pictured until now because of the poor data availability. The activity data was revised upwards, causing increased emissions over the entire time series (+72 kt CO_2e in 2018).

1.A.4.b.2 Residential – mobile combustion

The activity data was adjusted according to the new study mentioned above. The update for garden tools caused a noticeable change in fuel consumption (FC) over the whole time series, leading to revised GHG emissions over the whole time series (–16 kt CO_2e in 2018).

Update/Improvement of methodology and emission factors

1.A.3.d domestic navigation

Specific FC emission factors for freight and passenger transport were applied according to the new off-road study, leading to a lower specific energy consumption (FC/tkm, g/kWh). The increase in fuel consumption and CO_2 emissions can be attributed to the higher activity and the increase in performance on passenger ships.

3.3.1.3 Fugitive Emissions

No recalculations have been performed.

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 2005–2018, the CO_2 emissions in sector *2.B.1* increased by +0.19 kt CO_2e in 2018.

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 (–76.7 kt CO_2 in 2018). These emissions are now allocated to *1.A*.

2.D.3.a Solvent Use

Due to the Covid pandemic and its economic impact it was decided to base the update of bottom-up data on information for 2019 rather than 2020. All district authorities were contacted for solvent balances available from companies that are obliged to report under the IED directive. This led to an estimated return rate of approximately 85% of all balances, which was higher than for the last bottom up survey for the year 2015. In the course of updating the model for 2019 the allocation of companies to the different categories was re-evaluated. As scaling up (for sectors where not all companies are obliged to report) is performed using economic sectors, the allocation was improved and now follows the economic rather than the technical activity of the companies (e.g. a company producing printed cardboards is now allocated to cardboard production and not to the printing sector), wherever necessary.

The resulting changes in allocation were made consistently for 2015 and 2019. The improved allocation is also more consistent with the approach for 2000. Data between 2001 and 2015, and 2015 and 2019 were interpolated as before. This led to a change of allocation of AD and emissions per NFR category and therefore also EF/category for all years from 2001 onwards.

Due to the improved allocation and scaling up, total AD from the bottom-up estimate, together with AD for domestic solvent use based on statistical data equalled 96% (in 2019) of the top-down total solvent consumption taken from statistics. For 2015 the gap previously equalled 18%, and is now 13%. In a final step, the “missing” 4% of the AD were then added to those categories where no full survey had taken place. Emissions were calculated with the IEFs from the bottom up survey.

It has to be noted, that for all years there was no change in total AD compared to the last submission. Changes in emissions result from improved allocation of the AD to the different categories, with higher/lower IEFs: e.g. for 2005 emissions were –1.8 kt CO_2e lower, for the end of the time series the improved methodology led to an increase in emissions (e.g. +4.2 kt CO_2e for 2018).

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

Revision of activity data led to a change in emissions of –0.19 kt CO_2e in 2018.

2.F.1. Refrigeration and Air Conditioning

Several improvements affected the total HFC consumption in Austria as well as the allocation to sub categories, and led to a recalculation affecting the sub categories stationary air conditioning, commercial and industrial refrigeration:

- An in-depth research on stationary air conditioning allowed an improved emission estimate for this sub sector: previously a fixed share of total HFC consumption was attributed to large air conditioning installations (chillers and VRF). Now the amounts of refrigerants of these installations are estimated using a “bottom up” approach, applying market data and information on refrigerant type and amounts filled in (this approach has already been applied before for heating pumps and small air conditioning devices).
- Investigations regarding HFC imports revealed that most amounts of R134a filled into MACs of passenger cars in Austria were not bought from the Austrian market but were directly imported. These amounts are now considered in addition to the amounts imported by HFC retailers (this affects the years 2011ff).
- Frst fillings of heating pumps are now subtracted from remaining national consumption that is assigned to the categories industrial and commercial refrigeration, previously these amounts – about 4% - were double counted.

2.F.1.a. Commercial Refrigeration

The improvements explained above indirectly also affected emissions from this sub category for the years from 1992 onwards (+25 kt CO_2e in 2018).

2.F.1 c. Industrial Refrigeration

The improvements explained above indirectly also affected emissions from this sub category for the years from 1994 onwards (+21 kt CO_2e in 2018).

2.F.1.f Stationary Air Conditioning

The improvements explained above led to recalculations for the years from 1992 onwards (–3.8 kt CO_2e in 2018).

2.F.1.d Transport Refrigeration

The estimation of stock was revised using data and information from transport refrigeration companies for the years from 2011 onwards (the years 2008-2010 were interpolated), for 2018 emissions are now 34 kt CO_2e lower.

2.F.1.e MACs

After additional QC conducted, some minor corrections were made leading to minor changes in emissions (in the range from +0.004 kt CO_2e in 2014 to –0.7 kt CO_2e in 2018).

2.F.3 Fire Protection

Following an issue raised during the ESD Review 2020 a falsely reported notation key has now been eliminated and emissions are now reported correctly. For 2018 this led to +12 kt CO_2e in 2018.

2.G.1 Electrical Equipment

The correction of a transcription error led to an increase of emissions of +4 kt CO_2e in 2018.

2.G.3 N_2O from Product Uses

Following an issue raised during the UNFCCC review 2020, the amount of N_2O used for the production of capsules for whipped cream was reviewed: amounts of N_2O that are being exported are now not accounted for any more. Emission estimation is now based on consumption in Austria which is estimated using data from producers as well as retail sales data. This led to a decrease of –92 kt CO_2e for all years.

Improvements of methodologies and emission factors

2.B.2 Nitric acid production

Rounded data on N_2O delivered by a production company were replaced by unrounded data from the ETS for the years 2013, 2014 and 2016 to improve accuracy. The N_2O emissions in sector 2.B.2 increased by +0.0004 kt N_2O in 2016.

2.C.3 Aluminium Production

ETS emission data for the years 2016, 2017 and 2018 of secondary aluminium production became available and led to –0.22 kt CO_2 in 2018.

2.A.4.d Other process uses of carbonates

CO_2 emissions from urea used for denitrification were removed from this category from 2013 onwards. Emissions were double counted, as they are already reported under 2.B.1. (–0.89 kt CO_2 in 2018).

3.3.3 Agriculture

Update of activity data

3.B Manure Management, 3.D Agricultural Soils

Raw material balance

In 2020 new information on input materials for Austria's biogas plants became available (E-CONTROL 2020[16]) resulting in slightly revised CH_4 and N_2O emissions for 2018 in source categories *3.B Manure Management* (–0.02 kt CH_4 and –0.0005 kt N_2O), *3.D.a.2.a Animal manure applied to soils* and *3.D.a.2.c Other organic fertilizers applied to soils* (+0.00003 kt N_2O and +0.01 kt N_2O).

3.D.a.4 Crop Residues

Revisions of the harvested amounts of sugar beet and salad in Austria's official harvest statistics for the years 2003 and 2018 resulted in marginally increased N_2O emissions for 2018 (+0.00003 kt N_2O).

3.D.a.5 Mineral Soils

Revisions of activity data (perennial cropland to annual cropland, for more information see chapter 3.3.4 on LULUCF) resulted in marginal revised emissions (+0.00001 kt N_2O for 2018).

Improvements of methodologies and emission factors

3.D Agricultural Soils (N_2O)

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

Atmospheric deposition: main reason for revised emissions is the implementation of a new NH_3 emission factor for N-stabilized fertilisers into Austria's air emission inventory. Improved calculations resulted in larger volatilization losses from synthetic fertiliser application in Austria's ammonia model. As a consequence, indirect N_2O emissions from atmospheric deposition were revised upwards for the whole time series (+0.003 kt N_2O in 2018).

N leaching and runoff: updated AD (see above) are the reason for slightly revised emissions (+0.001 kt N_2O in 2018).

3.F Field burning of agricultural residues

The correction of a linkage error for 2017 and 2018 resulted in a marginal revision of CH_4 and N_2O emissions downwards for both years (–0.002 kt CH_4 and –0.00004 kt N_2O for 2018).

[16] E-CONTROL (2020): https://www.e-control.at/documents/1785851/1811582/E-Control-Oekostrombericht_2020.pdf/053b8bbf-402e-c568-cb07-7315a6573c32?t=1600782405474 accessed in November 2020

New emission sources

3.I Other carbon-containing fertlizers

In response to a question raised during the ESD Review 2020, Austria estimated CO_2 emissions from calcium ammonium nitrate (CAN) for the first time. Austria's calculations were delivered as revised estimate and accepted by the TERT and are included into current submission (+26 kt CO_2 for 2018).

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

Update of Activity Data

4.A Forest land

Following a recommendation raised during the ESD Review 2020, the total forest area (previously rounded to kha) was slightly adjusted so that the net land use changes to/from Forest land (given in ha) exactly fits to the annual change of the Forest land area. This caused a change on the GHG emissions from mineral soil and litter of the remaining Forest land category and consequently on the removals of the Forest land category, which are in the range of –0.9 to 26 kt CO_2e per year different compared to the last submission in 2020.

4.B Cropland

Following a recommendation raised during the ESD Review 2020, the total areas of Cropland, Grassland and Settlement as well as the land-use change areas between these categories were adjusted so that the net land use changes to/from these categories exactly fits to the annual change of the total area of these categories. For this purpose, also smoothing operations of the trends of the total areas of these categories as well as different interpolations in between the years were carried out. These area changes had an impact on the emissions/removals of these categories. For Cropland the annual emissions/removals are in the range of –2.9 to 1.9 kt CO_2e per year different compared to the last submission in 2020.

4.C Grassland

Following a recommendation raised during the ESD Review 2020, the total areas of Cropland, Grassland and Settlement as well as the land-use change areas between these categories were adjusted so that the net land use changes to/from these categories exactly fits to the annual change of the total area of these categories. For this purpose, also smoothing operations of the trends of the total areas of these categories as well as different interpolations in between the years were carried out. These area changes had an impact on the emissions/removals of these categories. For Grassland the annual emissions are in the range of –0.1 to 0.6 kt CO_2e per year different compared to the last submission in 2020.

4.E Settlements

Following a recommendation raised during the ESD Review 2020, the total areas of Cropland, Grassland and Settlement as well as the land-use change areas between these categories were adjusted so that the net land use changes to/from these categories exactly fits to the annual change of the total area of these categories. For this purpose, also smoothing operations of the trends of the total areas of these categories as well as different interpolations in between the years were carried out. These area changes had an impact on the emissions/removals of these categories. For Settlements these area adjustments of the land-use change categories to Settlements had the highest impact on the annual emissions of this category. They are in the range of –14 to –263 kt CO_2e per year lower compared to the last submission in 2020.

4.E Other land

The decrease in grassland due to a stop in grassland management causes a conversion of such land to Forest land, but in the 2000ies years also to Other land. Therefore, for submission 2021 the areas of such land-use change Grassland to Other land as well as the emissions/removals of this land use change were estimated, which are in the range between 0 (no such land-use change) and 315 kt CO_2e per year.

4.G HWPs

The HWP production figures for the years 2017 and 2018 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 of 2.3 and 31.4 kt CO_2e for these two years.

LULUCF KP estimates

Following a recommendation raised during the ESD Review 2020, the total forest area (previously rounded to kha) was slightly adjusted so that the net land use changes to/from Forest land (given in ha) exactly fits to the annual change of the Forest land area. This caused a change on the GHG emissions from mineral soil and litter of the Forest management category and consequently on the removals of the Forest management category, which are –0.9 kt CO_2e per year higher for the years 2013 to 2018 compared to the last submission in 2020.

In addition, the HWP production figures for the years 2017 and 2018 were updated in the most recent FAO statistic. Consequently, the HWP removal figures for Afforestation and Forest management for the years 2017 and 2018 had to be updated accordingly. The improvement resulted in a difference of annual HWP removals for Afforestation of 0.04 and 0.52 kt CO_2e and in a difference of annual HWP removals for Forest management of 2.25 and 30.58 kt CO_2e for these two years compared to the last submission in 2020.

3.3.5 Waste

Update of activity data

5.A Solid Waste Disposal

In category 5.A Solid Waste Disposal the landfill gas calculation model was revised in response to an issue (PSI[17]) raised during the comprehensive ESD Review 2020. The fraction of CH_4 in the landfill gas formed (factor "F") was adjusted for 2009 and subsequent years to avoid a potential overestimation of emissions. The CS Factor “F” applied so far for the whole time series (0.55) was questioned, because – from the TERT's point of view – it was based on measured CH_4 in gas emitted from the solid waste disposal sites rather than related to the amount of landfill gas formed. As a robust argumentation for the CS factor was not possible based on the available literature, the following approach was finally taken and accepted by the TERT:

- From 2018 on, a factor “F” of 0.50 is applied, taken from the IPCC 2006 GL;
- For 2008 and historical years, the country-specific value (0.55) was retained as a higher methane concentration can be assumed in any case due to the landfilling of untreated waste until 2004 or without exception 2008 (before the Landfill Ordinance came into force);
- For the years between 2008 and 2018 a linear reduction was assumed for factor “F”

In addition, the method for extrapolating the landfill gas collected was improved. Both methodological improvements led to a revision of –106 kt CO_2e in 2018.

5.D Wastewater Treatment and Discharge

For 5.D.1 domestic wastewater recalculations were carried out due to availability of new data on the connection rate 2018 as well as revised data on waste water amounts and N-flows 2018, resulting in decreased GHG emissions for 2017 and 2018 (–1.4 kt CO_2e in 2017, –2.7 kt CO_2e in 2018). The effect is opposite for each gas (for 2018: CH_4: –123 t; N_2O: +1.1 t) as higher connection rates to waste water treatment plants increases direct (i.e. from municipal treatment plants) as well as indirect N_2O emissions but reduces CH_4 from septic tanks.

[17] Potential significant issue, i.e. an issue that can relate to a potential overestimation or underestimation of GHG emissions to the extent of at least 0.05% of total national emissions.

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 2020[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 (2020): Austria's National Inventory Report 2020, Submission under the United Nations Framework Convention on Climate Change and under the Kyoto Protocol. Report REP-0724. Umweltbundesamt, Vienna.

[21] UMWELTBUNDESAMT (2005): NISA National Inventory System Austria, Implementation Report, REP-0004; Umweltbundesamt, Vienna https://www.umweltbundesamt.at/fileadmin/site/publikationen/rep0004.pdf

[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

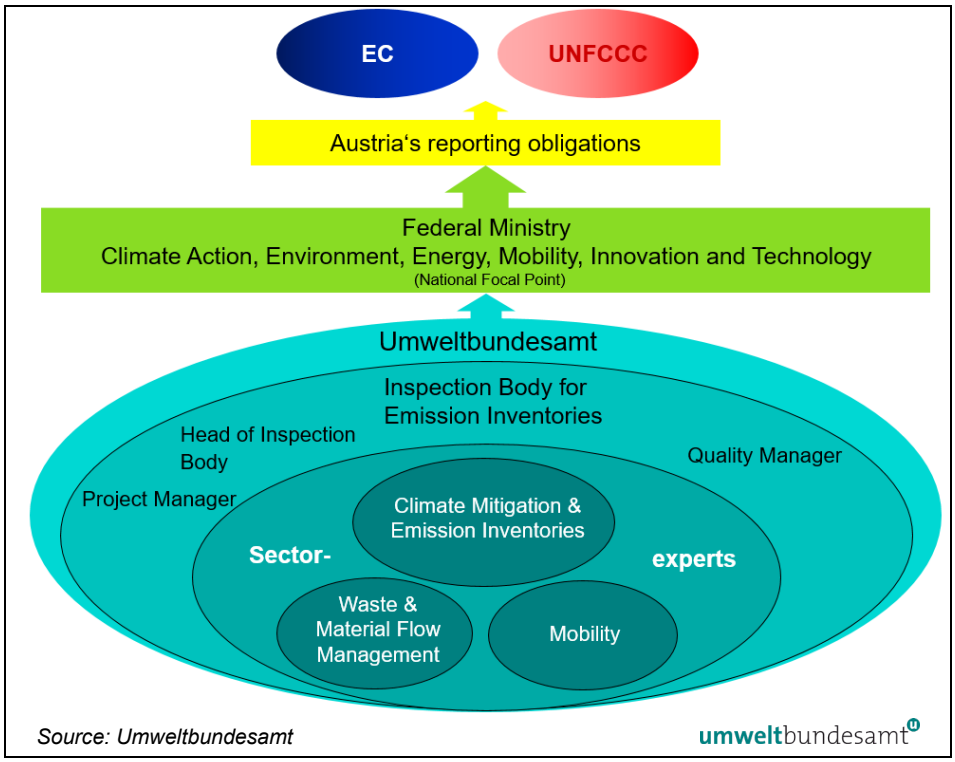

Figure 4: Responsibilities within the Austrian National Inventory System Austria.

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 Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)
- 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 Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)

The BMK 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 is the Federal Ministry's central eGovernment initiative and is operated by the Umweltbundesamt
  - EDM aims 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.

3. Austrian Research Centre for Forests (BFW)

- National Forest inventory
  - **Contract on a regular interval** with the Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)
- 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 9: 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 Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) • ZBD: Zentrale Beguchtachtungsdatenbank (periodically updated 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

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

[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

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 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 2020, some aspects and improvements compared to the previous submission are described below (QMS activities and improvements 2020).

The Quality Manual can be downloaded at:
https://www.umweltbundesamt.at/klima/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

[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

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 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 2020

As pointed out above, the inventory team at the Umweltbundesamt has been accredited as Inspection Body in accordance with EN ISO/IEC 17020 and the Austrian Accreditation Law. In 2020 the team has undergone and successfully passed a reaccreditation audit by a quality expert team appointed by Accreditation Austria. The accreditation has been prolonged for a further period of five years.

Furthermore the number of sector experts of the agriculture and the LULUCF team was raised to three.

Five 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 2020.

Note that the 2020 SIAR (SIAR/2020/AT/2/1) states that there are no recommendations and there were no recommendations from previous Annual Review report (FCCC/ARR/2018/AUT).

Table 10: Changes to the national registry of Austria in 2020.

Reporting Item	Description
15/CMP.1 annex II.E paragraph 32.(a) Change of name or contact	The name and contact of the registry administrator as an institution has not changed. A change of the name of the registry administrator and alternate registry administrator was notified to the Secretariat in 2020.
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 has been a new EUCR release (version 11.5) after version 8.2.2 (the production version at the time of the last Chapter 14 submission). Due to the new release, some changes were applied to the database. The updated database model is provided in Annex A. No change was required to the application backup plan or to the disaster recovery plan. 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	The changes that have been introduced with version 11.5 compared with version 8.2.2 of the national registry are presented in Annex B. 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 (see Annex B). 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_2021. Emission trends 1990–2019 (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_2021').

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_2021') 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 2020 is reported as a separate file ('SEF_AT_CP2_2020_20210108') in xlsx 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 2020 has been reported as XML file in the directory 'Concluded transfers 2020' 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_2021') 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 2020 a desk review was conducted by the UNFCCC, but no review report has been provided yet. In 2019 no UNFCCC review took place, thus the information given in the template ('MMR_IR Article9_recommendations_AT_2021) can only refer to the UNFCCC review conducted in 2018 where Austria was subject to a desk review[29].

Austria was also subject to an „comprehensive ESD-Review", conducted pursuant to Article 4(3) of Regulation (EU) No 2018/842 and to Article 3 of Decision No 406/2009/EC. The status of implementation of the recommendations included in the Review report are also included in the template 'MMR_IR Article9_recommendations_AT_2021'.

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 2019 is reported as a separate file ('MMR-IRArticle10_ETS_AT_2021').

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 2020.

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.

[29] 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

Results of the checks performed for each air pollutant on the consistency of the data, for the year 2019 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 2019 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

BMK ..... Bundesministerium für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie
Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology

BMDW..... Bundesministerium für Wirtschaft und Arbeit
Federal Ministry for Digital and Economic Affairs (former BMWA)

BMWA ..... Bundesministerium für Wirtschaft und Arbeit
Federal Ministry for Economic Affairs and Labour

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

IED ..... Industrial Emissions Directive

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	2019
Total Emissions/Removals with LULUCF	**66 266**	**63 532**	**81 341**	**84 680**	**81 708**	**82 456**	**75 437**	**78 636**	**76 048**	**74 005**	**75 357**	**71 912**	**74 324**	**75 481**	**77 142**	**73 525**	**75 231**
Total Emissions without LULUCF	**78 420**	**80 129**	**92 147**	**89 729**	**86 984**	**86 440**	**79 779**	**84 337**	**82 127**	**79 432**	**79 817**	**76 239**	**78 462**	**79 471**	**81 862**	**78 628**	**79 842**
1. Energy	**52 804**	**55 254**	**66 869**	**63 955**	**60 596**	**59 699**	**56 515**	**59 424**	**57 095**	**54 951**	**55 159**	**51 436**	**53 085**	**54 315**	**56 023**	**54 592**	**55 048**
A. Fuel Combustion (Sectoral Approach)	52 103	54 757	66 432	63 489	60 124	59 267	56 035	58 956	56 634	54 476	54 687	50 998	52 661	53 923	55 596	54 222	54 701
1. Energy Industries	14 011	12 318	16 032	14 828	13 629	13 454	12 445	13 756	13 418	11 984	11 015	9 396	10 511	10 296	10 911	10 067	10 289
2. Manufacturing Industries and Construction	9 845	10 035	11 541	11 251	10 880	11 286	10 711	11 352	11 238	11 131	10 898	10 500	10 228	10 541	10 775	10 813	10 734
3. Transport	13 957	18 805	24 944	23 678	23 903	22 432	21 776	22 585	21 935	21 751	22 932	22 247	22 726	23 579	24 332	24 453	24 508
4. Other Sectors	14 253	13 558	13 871	13 687	11 666	12 048	11 056	11 216	9 996	9 561	9 792	8 805	9 146	9 457	9 527	8 836	9 118
5. Other	36	42	45	45	46	46	47	47	48	48	49	50	50	51	51	52	52
B. Fugitive Emissions from Fuels	702	496	437	465	472	432	480	468	461	474	472	438	424	392	427	370	347
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	NO, IE,NA
2. Oil and Natural Gas	369	469	437	465	472	432	480	468	461	474	472	438	424	392	427	370	347
C. CO_2Transport and Storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial Processes and Other Product Use	**13 570**	**14 495**	**15 467**	**16 088**	**16 770**	**17 094**	**13 753**	**15 693**	**15 864**	**15 477**	**15 792**	**15 904**	**16 552**	**16 302**	**17 114**	**15 471**	**16 383**
A. Mineral Industry	3 092	2 733	2 889	3 053	3 266	3 276	2 715	2 661	2 779	2 704	2 718	2 720	2 738	2 786	2 798	2 907	2 809
B. Chemical Industry	1 555	1 624	943	983	908	1 010	791	783	785	758	695	809	782	798	739	644	851
C. Metal Industry	8 177	8 480	9 627	10 101	10 589	10 782	8 416	10 266	10 298	9 954	10 311	10 254	10 806	10 368	11 144	9 452	10 302
D. Non-Energy Products from Fuels and Solvent Use	349	198	174	188	192	188	167	169	169	161	152	146	133	135	143	146	146

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
E. Electronics Industry	134	420	352	370	391	371	114	150	119	101	91	98	107	92	92	83	89
F. Product Uses as Substitutes for ODS	NO	686	1 074	1 044	1 089	1 135	1 233	1 341	1 398	1 488	1 512	1 568	1 678	1 724	1 805	1 849	1 746
G. Other Product Manufacture and Use	263	354	408	349	336	332	318	322	317	311	312	309	307	399	393	391	440
3. Agriculture	**8 120**	**7 415**	**7 017**	**7 012**	**7 071**	**7 213**	**7 243**	**7 095**	**7 173**	**7 123**	**7 113**	**7 257**	**7 274**	**7 390**	**7 341**	**7 254**	**7 152**
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	4 062
B. Manure Management	980	902	857	867	887	889	915	925	923	928	939	954	966	979	998	985	974
C. Rice Cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural Soils	2 237	2 047	1 926	1 916	1 931	2 062	2 011	1 877	1 995	1 960	1 938	2 042	2 039	2 120	2 043	2 003	1 971
E. Prescribed Burning of Savannas	NO	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	1
G. Liming	46	43	54	58	62	72	72	69	77	81	75	75	83	84	86	97	99
H. Urea application	4	8	12	15	18	17	22	20	18	22	22	25	26	31	30	24	19
I. Other carbon-containing fertilizers	31	27	20	20	20	27	23	15	21	22	22	24	27	29	26	26	25
4. Land Use, Land-Use Change and Forestry	**-12 154**	**-16 597**	**-10 807**	**-5 049**	**-5 276**	**-3 984**	**-4 342**	**-5 700**	**-6 079**	**-5 428**	**-4 460**	**-4 327**	**-4 139**	**-3 990**	**-4 721**	**-5 102**	**-4 612**
A. Forest Land	-10 835	-15 967	-8 773	-2 959	-1 931	-1 037	-4 475	-4 442	-4 409	-4 376	-4 343	-4 310	-4 303	-4 296	-4 289	-4 281	-4 274
B. Cropland	191	-10	-116	-107	-102	-80	-105	-106	-109	-114	-97	-68	18	78	105	128	148
C. Grassland	651	472	679	678	677	672	378	377	376	375	376	377	375	357	346	314	311
D. Wetlands	42	36	47	37	39	51	68	69	73	70	101	71	59	77	67	66	60
E. Settlements	450	370	475	527	507	571	443	412	395	416	383	479	462	438	355	351	366
F. Other Land	457	380	333	567	568	582	464	431	270	245	247	484	492	481	401	275	246

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
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	-1 719	-1 969	-1 481
5. Waste	**3 926**	**2 965**	**2 794**	**2 675**	**2 547**	**2 435**	**2 268**	**2 125**	**1 995**	**1 882**	**1 754**	**1 642**	**1 551**	**1 464**	**1 385**	**1 311**	**1 260**
A. Solid Waste Disposal on Land	3 644	2 667	2 438	2 314	2 184	2 074	1 909	1 766	1 635	1 519	1 399	1 281	1 185	1 090	1 013	939	882
B. Biological Treatment of Solid Waste	36	83	151	157	162	164	165	167	170	174	166	172	175	180	178	179	183
C. Incineration and Open Burning of Waste	28	12	12	10	8	6	4	2	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	192	191	192
6. Other *(please specify)*	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

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	2019
Total Emissions/Removals with LULUCF	**49 834**	**49 407**	**68 130**	**71 616**	**68 689**	**69 355**	**62 815**	**66 166**	**63 674**	**61 697**	**63 158**	**59 690**	**62 064**	**63 075**	**64 727**	**61 312**	**63 199**
Total Emissions without LULUCF	**62 140**	**66 139**	**79 068**	**76 796**	**74 097**	**73 472**	**67 291**	**72 000**	**69 889**	**67 263**	**67 759**	**64 161**	**66 352**	**67 215**	**69 599**	**66 565**	**67 962**
1. Energy	**51 160**	**53 997**	**65 641**	**62 697**	**59 342**	**58 455**	**55 287**	**58 124**	**55 832**	**53 662**	**53 868**	**50 216**	**51 849**	**53 068**	**54 730**	**53 375**	**53 840**
A. Fuel Combustion (Sectoral Approach)	51 058	53 833	65 481	62 517	59 157	58 293	55 082	57 940	55 652	53 478	53 677	50 047	51 687	52 937	54 592	53 248	53 722
1. Energy Industries	13 961	12 263	15 947	14 731	13 525	13 343	12 330	13 623	13 282	11 847	10 881	9 270	10 379	10 167	10 782	9 942	10 167
2. Manufacturing Industries and Construction	9 763	9 899	11 377	11 080	10 706	11 115	10 549	11 190	11 076	10 965	10 740	10 348	10 078	10 396	10 631	10 670	10 592
3. Transport	13 756	18 624	24 743	23 480	23 701	22 237	21 580	22 379	21 729	21 540	22 703	22 012	22 477	23 317	24 053	24 162	24 208
4. Other Sectors	13 543	13 005	13 371	13 182	11 180	11 553	10 578	10 702	9 519	9 078	9 305	8 369	8 705	9 007	9 076	8 423	8 704
5. Other	35	41	44	44	45	45	46	46	47	47	48	49	49	50	50	51	51
B. Fugitive Emissions from Fuels	102	165	160	180	185	162	205	184	180	184	191	169	162	131	138	127	118
1. Solid Fuels	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	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA
2. Oil and Natural Gas	102	165	160	180	185	162	205	184	180	184	191	169	162	131	138	127	118
C. CO_2 Transport and Storage	NO	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**	**13 329**	**13 996**	**14 647**	**14 896**	**11 883**	**13 771**	**13 938**	**13 475**	**13 770**	**13 819**	**14 363**	**14 002**	**14 724**	**13 041**	**13 977**
A. Mineral Industry	3 092	2 733	2 889	3 053	3 266	3 276	2 715	2 661	2 779	2 704	2 718	2 720	2 738	2 786	2 798	2 907	2 809
B. Chemical Industry	644	674	644	666	601	650	586	675	692	661	598	714	688	716	654	542	724
C. Metal Industry	6 786	8 445	9 622	10 089	10 588	10 781	8 415	10 266	10 298	9 949	10 302	10 238	10 804	10 366	11 129	9 447	10 299
D. Non-Energy Products from Fuels and Solvent Use	349	198	174	188	192	188	167	169	169	161	152	146	133	135	143	146	146

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
E. Electronics Industry	NO	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	NO
G. Other Product Manufacture and Use	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	NO,NA
3. Agriculture	**81**	**78**	**85**	**93**	**100**	**115**	**117**	**103**	**117**	**125**	**118**	**124**	**137**	**144**	**142**	**147**	**143**
A. Enteric Fermentation	NA	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	NA
C. Rice Cultivation	NO	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	NA
E. Prescribed Burning of Savannas	NO	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	NA
G. Liming	46	43	54	58	62	72	72	69	77	81	75	75	83	84	86	97	99
H. Urea application	4	8	12	15	18	17	22	20	18	22	22	25	26	31	30	24	25
I. Other carbon-containing fertilizers	31	27	20	20	20	27	23	15	21	22	22	24	27	29	26	26	25
4. Land Use, Land-Use Change and Forestry	**-12 306**	**-16 732**	**-10 938**	**-5 180**	**-5 408**	**-4 117**	**-4 475**	**-5 834**	**-6 215**	**-5 567**	**-4 600**	**-4 471**	**-4 288**	**-4 140**	**-4 872**	**-5 254**	**-4 764**
A. Forest Land	-10 866	-15 991	-8 797	-2 983	-1 955	-1 061	-4 499	-4 466	-4 433	-4 400	-4 367	-4 334	-4 327	-4 320	-4 314	-4 307	-4 300
B. Cropland	177	-24	-129	-121	-117	-97	-122	-123	-125	-132	-115	-87	-3	55	82	105	125
C. Grassland	627	449	655	654	653	648	354	353	352	351	352	353	351	334	322	290	287
D. Wetlands	42	36	47	37	39	51	68	69	73	70	101	71	59	77	67	66	60
E. Settlements	392	321	428	480	460	524	396	364	345	363	328	422	403	378	295	292	307
F. Other Land	444	366	320	554	556	571	453	421	261	236	238	476	485	474	394	268	239

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
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	-1 719	-1 969	-1 481
5. Waste	**28**	**12**	**12**	**10**	**8**	**6**	**4**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
A. Solid Waste Disposal on Land	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	NO,NA
B. Biological Treatment of Solid Waste	NA	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	2
D. Waste Water Treatment and Discharge	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
6. Other *(please specify)*	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

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	2019
Total Emissions/Removals with LULUCF	**415.76**	**335.81**	**312.04**	**308.03**	**303.81**	**298.79**	**294.92**	**290.87**	**282.28**	**277.73**	**273.27**	**267.74**	**264.29**	**261.78**	**260.88**	**253.04**	**247.77**
Total Emissions without LULUCF	**416.73**	**336.76**	**312.99**	**308.99**	**304.77**	**299.75**	**295.88**	**291.82**	**283.23**	**278.68**	**274.23**	**268.70**	**265.26**	**262.73**	**261.84**	**253.99**	**248.73**
1. Energy	**48.56**	**29.70**	**25.84**	**26.38**	**26.02**	**25.48**	**25.41**	**27.11**	**25.76**	**26.63**	**26.37**	**24.25**	**24.33**	**24.52**	**25.88**	**22.96**	**22.32**
A. Fuel Combustion (Sectoral Approach)	24.57	16.43	14.76	14.98	14.54	14.68	14.40	15.74	14.50	14.99	15.14	13.47	13.83	14.10	14.33	13.24	13.18
1. Energy Industries	0.33	0.39	0.62	0.70	0.74	0.82	0.89	1.00	1.00	1.03	1.00	0.96	1.03	1.03	1.04	1.01	0.99
2. Manufacturing Industries and Construction	0.54	0.65	0.82	0.85	0.87	0.86	0.83	0.86	0.87	0.90	0.86	0.83	0.82	0.80	0.81	0,79	0.78
3. Transport	2.97	1.25	1.11	0.99	0.94	0.84	0.79	0.75	0.71	0.68	0.67	0.66	0.68	0.73	0.79	0.84	0.86
4. Other Sectors	20.73	14.13	12.21	12.44	11.99	12.16	11.89	13.12	11.91	12.38	12.62	11.03	11.29	11.53	11.69	10.60	10.55
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	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	9.14
1. Solid Fuels	13.33	1.09	0.01	0.01	NA	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	9.14
C. CO_2 Transport and Storage	NO	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**	**1.86**
A. Mineral Industry	IE	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	1.86
C. Metal Industry	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	NO,NA,IE	NA,NO,IE	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,NA	NO,IE,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	2019
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	NA
E. Electronics Industry	NO	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	NO
G. Other Product Manufacture and Use	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	NO,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**	**186.51**	**184.04**
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	162.50
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	21.78	21.53
C. Rice Cultivation	NO	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	NA
E. Prescribed Burning of Savannas	NO	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	0.02
G. Liming	NA	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	NA
I. Other carbon-containing fertilizers																	
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**	**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	0.00
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	NO,IE
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	0.95
D. Wetlands	NO	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	2019
E. Settlements	NO	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	NO
G. Harvested Wood Products																	
5. Waste	**151.16**	**110.66**	**101.74**	**96.84**	**91.72**	**87.28**	**80.65**	**74.88**	**69.62**	**65.02**	**60.03**	**55.43**	**51.68**	**47.94**	**44.74**	**41.74**	**39.54**
A. Solid Waste Disposal on Land	145.76	106.67	97.51	92.55	87.36	82.94	76.37	70.64	65.40	60.77	55.94	51.25	47.42	43.62	40.54	37.57	35.30
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	3.34
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	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	0.97	0.91	0.91
6. Other *(please specify)*	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

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	2019
Total Emissions/Removals with LULUCF	**14.63**	**14.57**	**12.15**	**12.18**	**12.23**	**12.85**	**12.11**	**11.45**	**11.77**	**11.68**	**11.63**	**11.93**	**12.00**	**12.29**	**12.09**	**11.99**	**12.00**
Total Emissions without LULUCF	**14.20**	**14.20**	**11.79**	**11.82**	**11.87**	**12.48**	**11.74**	**11.09**	**11.40**	**11.29**	**11.23**	**11.53**	**11.58**	**11.86**	**11.67**	**11.57**	**11.57**
1. Energy	**1.44**	**1.72**	**1.95**	**2.01**	**2.02**	**2.04**	**1.99**	**2.09**	**2.08**	**2.09**	**2.12**	**2.06**	**2.11**	**2.13**	**2.17**	**2.16**	**2.18**
A. Fuel Combustion (Sectoral Approach)	1.44	1.72	1.95	2.01	2.02	2.04	1.99	2.09	2.08	2.09	2.12	2.06	2.11	2.13	2.17	2.16	2.18
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	0.34	0.33
2. Manufacturing Industries and Construction	0.23	0.40	0.48	0.50	0.51	0.50	0.48	0.47	0.47	0.48	0.46	0.44	0.43	0.42	0.42	0.41	0.41
3. Transport	0.42	0.50	0.58	0.58	0.60	0.59	0.59	0.63	0.63	0.65	0.71	0.74	0.78	0.82	0.87	0.91	0.93
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	0.54	0.54	0.53	0.50	0.50
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	0.00
B. Fugitive Emissions from Fuels	NA	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	NA
2. Oil and Natural Gas	NA	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	NO
2. Industrial Processes and Other Product Use	**3.38**	**3.51**	**1.14**	**1.12**	**1.08**	**1.25**	**0.69**	**0.38**	**0.32**	**0.32**	**0.31**	**0.30**	**0.30**	**0.26**	**0.26**	**0.32**	**0.41**
A. Mineral Industry	IE	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	0.27
C. Metal Industry	NO	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	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	2019
E. Electronics Industry	NO	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	NO
G. Other Product Manufacture and Use	0.44	0.44	0.25	0.22	0.21	0.20	0.16	0.18	0.16	0.15	0.15	0.14	0.14	0.14	0.13	0.13	0.13
3. Agriculture	**8.97**	**8.34**	**7.91**	**7.87**	**7.94**	**8.37**	**8.22**	**7.77**	**8.15**	**8.03**	**7.96**	**8.32**	**8.31**	**8.59**	**8.35**	**8.20**	**8.08**
A. Enteric Fermentation	NA	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	1.46
C. Rice Cultivation	NO	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	6.75	6.30	6.69	6.58	6.50	6.85	6.84	7.11	6.86	6.72	6.62
E. Prescribed Burning of Savannas	NO	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	0.00
G. Liming	NA	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	NA
I. Other carbon-containing fertilizers																	
4. Land Use, Land-Use Change and Forestry	**0.43**	**0.37**	**0.36**	**0.36**	**0.36**	**0.37**	**0.37**	**0.37**	**0.38**	**0.39**	**0.39**	**0.40**	**0.42**	**0.43**	**0.43**	**0.43**	**0.43**
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	0.09
B. Cropland	0.05	0.05	0.04	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.08	0.08	0.08
C. Grassland	NO	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	NO
E. Settlements	0.19	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.17	0.18	0.18	0.19	0.20	0.20	0.20	0.20	0.20
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	0.02

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
G. Harvested Wood Products																	
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**	**0.90**
A. Solid Waste Disposal on Land	NA	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	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	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	0.57
6. Other *(please specify)*	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

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**	**2019**
Emissions of HFCs – kt CO_2 equivalent	**2.44**	**690.77**	**1 078.62**	**1 050.05**	**1 097.87**	**1 144.29**	**1 234.81**	**1 343.27**	**1 399.92**	**1 489.93**	**1 514.43**	**1 570.33**	**1 680.79**	**1 726.07**	**1 809.03**	**1 854.29**	**1 750.26**
HFC-23 (t)	NO,NA	0.03	6.40	4.93	6.13	12.78	12.78	12.78	12.74	12.74	12.74	12.74	12.74	12.74	12.74	12.74	12.75
HFC-32 (t)	NO,NA	4.00	11.96	13.34	14.77	16.64	18.16	21.52	27.08	29.66	33.25	37.29	40.93	43.21	43.78	51.26	52.82
HFC-43-10mee / act (t)	NO,NA	0.38	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
HFC-125 (t)	NO,NA	89.65	238.40	258.18	278.72	296.17	328.81	370.19	400.84	428.43	433.69	450.96	491.43	498.04	522.83	562.27	545.25
HFC-134a (t)	NO,NA	412.46	517.16	446.28	450.22	479.41	500.54	527.50	559.72	598.54	636.65	675.74	708.54	753.18	772.20	761.08	722.37
HFC-143a (t)	NO,NA	102.92	264.92	283.88	303.68	315.01	352.00	388.34	391.26	412.55	392.30	387.08	419.89	411.95	447.12	445.24	406.33
HFC-152a (t)	NO,NA	73.81	25.38	30.73	30.84	10.81	16.04	16.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
HFC-227ea (t)	NO,NA	0.01	1.00	2.02	0.34	0.01	0.28	0.29	2.38	2.16	0.00	0.92	1.38	1.39	2.50	13.29	2.07
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	2.59
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	2.02
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	4.04
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**	**38.45**
CF_4 (t)	1 014.74	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
C_2F_6 (t)	134.02	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
C $_3F_8$ (t)	0.00	0.00	0.00	1.82	1.48	0.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	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	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	38.45

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
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**	**386.32**	**436.42**
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	16.94	19.14
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**	**13.61**
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	0.79

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[30].

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, 2005–2019.

No	Indicator	1990	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
	Priority Indicators																	
1	Total CO_2 intensity of GDP [t CO_2/Mio Euro]	318	274	301	282	262	256	244	256	242	231	233	219	224	223	225	210	211
2	Energy related CO_2 intensity of GDP [t CO_2/Mio Euro]	261	223	249	230	210	203	200	206	193	184	184	171	175	175	177	168	167
3	Specific CO_2 emissions of passenger cars [g CO_2/km]	212	198	191	186	184	179	175	174	173	171	171	170	168	168	168	167	167
4	Energy related CO_2 intensity of industry [t/Mio Euro]	288	239	250	232	212	216	235	244	229	226	221	213	209	209	206	197	193
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	2.0	1.9	1.9	1.7	1.7	1.8	1.8	1.6	1.6
6	CO_2 intensity of the commercial and institutional sector [t CO_2/Mio Euro]	20	20	22	23	16	16	13	10	8.5	7.9	8.0	7.1	7.3	6.8	7.6	7.3	7.3
7	Specific CO_2 emissions of public and autoproducer power plants [t CO_2/TJ]	167	128	130	126	122	112	102	108	109	104	109	110	105	99	101	98	96
	Additional Priority Indicators																	
1	Freight transport on road [g CO_2/ton-km]	118	90	83	82	79	78	77	75	77	76	73	72	71	73	74	74	74
2	Total CO_2 intensity – iron and steel industry [t CO_2/Mio Euro]	2 321	1 672	2 258	2 336	2 238	2 189	4 089	3 989	4 027	3 594	3 848	3 589	3 630	3 685	3 912	3 369	3 736
3	Energy related CO_2 intensity – chemical industry [t CO_2/Mio Euro]	538	463	446	408	344	446	496	491	433	428	385	371	370	397	405	367	364
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	618	617	608

[30] 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	2019
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	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	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	169	168	167	168	167	165	167	168	168	168
2	Specific petrol related CO_2 emissions of passenger cars [g CO_2/ km]	216	207	203	202	197	186	181	179	177	173	173	171	169	168	167	165	165
3	Passenger transport on road [g CO_2/passenger-km]	156	161	161	157	156	152	149	149	148	147	148	147	146	146	147	146	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	83
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	134	144	155	126	114	108	104
6	Energy related CO_2 intensity – paper and printing industry [t CO_2/Mio Euro]	895	717	652	575	534	552	621	644	595	529	494	458	488	471	473	485	509
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	16
8	Specific CO_2 emissions of commercial and institutional sector for space heating [kg CO_2/m²]	21	23	25	26	18	19	15	11	9.3	8.3	7.9	7.0	7.2	6.7	7.4	7.2	7.3
9	Specific CO_2 emissions of public power plants [t CO_2/TJ]	166	133	116	110	103	95	85	88	88	82	80	75	77	72	74	70	67
10	Specific CO_2 emissions of autoproducer plants [t CO_2/TJ]	168	117	180	175	174	161	155	167	166	158	173	179	167	157	165	164	168
11	Carbon intensity of total power generation [t CO_2/TJ]	68	48	62	60	56	51	45	52	54	44	43	40	43	40	42	40	39
12	Carbon intensity of transport [t CO_2/TJ]	66	64	65	63	62	60	60	60	60	61	61	59	59	59	61	60	59
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	0.4
14	Carbon intensity in Industry [kt CO_2 /PJ]	46	40	38	36	34	36	35	35	35	34	34	34	33	33	33	34	34
15	Carbon intensity Households [kt CO_2 /PJ]	41	35	32	32	29	29	28	28	26	25	24	24	24	24	23	23	23

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In „Austria's Annual Greenhouse Gas Inventory 1990–2019" the Umweltbundesamt presents updated figures of greenhouse gas (GHG) emissions in Austria including the first seven years of the second commitment period under the Kyoto-Protocol. In 2019 GHG emissions amounted to 79.8 million tonnes of CO2 equivalents. This corresponds to a 1.8% increase against 1990 and a 1.5% increase compared to 2018. Key drivers for the development 2018–2019 were the higher production of iron and steel as well as the increasing electricity production from natural gas power plants.

GHG emissions according to Article 2(1) of Decision No. 406/2009/EC ("Effort Sharing Decision") amounted to 50.2 Mt CO2 equivalents in 2019 and were thus 1.9 Mt CO2 equivalents above the annual emission allocation for 2019. 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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