ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

Austria's Annual Greenhouse Gas Inventory 1990—2016

Submission under Regulation (EU) No 525/2013

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

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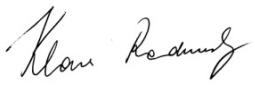
Date 11.01.2018	Responsible for the content of this report  Dr. Klaus Radunsky (Head of the inspection body)
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TABLE OF CONTENTS

VORWORT

Dieser Bericht

Der vorliegende Bericht präsentiert die neuesten Daten der Emissionen von Treibhausgasen (THG) Österreichs. Diese Daten betreffen die Emissionen des Jahres 2016 sowie die aktualisierte Zeitreihe der Jahre 1990 bis 2015. Damit liefert der Bericht Daten für die ersten vier Jahre der zweiten Kyoto-Verpflichtungsperiode sowie für die ersten vier Jahre der Zielperiode 2013–2020 unter der „Effort Sharing-Entscheidung" (2009/406/EG).

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

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

Rechtlicher Hintergrund

Als Vertragsstaat der Klimarahmenkonvention (*Rahmenübereinkommen der Vereinten Nationen über Klimaänderungen* (UN Framework Convention on Climate Change – UNFCCC, BGBl. Nr. 414/1994[2]) ist Österreich verpflichtet, jährlich seine Emissionen und Senken bezüglich der direkten Treibhausgase CO_2, CH_4, N_2O, HFC, PFC, SF_6 und NF_3, sowie der indirekten Treibhausgase NO_x, NMVOC, CO und SO_2 zu erheben und zu berichten. Die dafür anzuwendende Methodik ist in einem umfassenden Regelwerk entsprechend den Beschlüssen der Vertragsstaatenkonferenz der UNFCCC festgelegt.

Auch die Europäische Union (EU) ist Vertragsstaat der Klimarahmenkonvention. Die EU Inventur wird aus der Summe der Mitgliedsstaaten-Inventuren errechnet. Deshalb hat die EU mit dem o. g. THG-Überwachungssystem die Anforderungen, die an die EU gestellt werden, an die Mitgliedsstaaten weitergegeben

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

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

und diese dazu verpflichtet, Daten und Informationen, die für die Erstellung der EU Inventur benötigt werden, rechtzeitig zur Verfügung zu stellen. Mit dem vorliegenden Bericht kommt Österreich dieser Berichtspflicht nach.

Die Erhebung der Daten berücksichtigt außerdem die Ergebnisse der jährlichen Überprüfung durch internationale FachexpertInnen im Rahmen der so genannten UNFCCC-Reviews. Eine solche Tiefenprüfung fand zuletzt von 26.09.–01.10.2016 statt, und konnte erfolgreich abgeschlossen werden. Ergebnisse dieser Prüfung, inkl. Empfehlungen zur Verbesserung, wurden am 31.Mai 2017 auf der Website der UNFCCC veröffentlicht. Die Empfehlungen wurden in der vorliegenden Inventur bzw. im Bericht umgesetzt.

Am 20. April 2017 wurde der Review Bericht über den „Stufe 1-ESD-Review" an Österreich übermittelt. Da bei dem Review keine kritischen Punkte identifiziert wurden, konnte der Review nach dieser ersten Stufe der Überprüfung 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[3] 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[4].

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

[4] 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[5] 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 2017	10. Jänner 2018	Common Reporting Format (CRF)

Tabelle B: Datengrundlage des vorliegenden Berichts.

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

ZUSAMMENFASSUNG

Die in dieser Zusammenfassung dargestellte Entwicklung der Emissionen der Treibhausgase in Österreich folgt in der Einteilung den Sektoren des Klimaschutzgesetzes. Die Sektoreinteilung in den übrigen Teilen dieses Berichts entspricht hingegen dem international festgelegten Format für die Berichterstattung unter der Klimarahmenkonvention (UNFCCC), wodurch diese Zahlen geringfügig von jenen in der Zusammenfassung abweichen.

Treibhausgas-Bilanz 2016

Im Jahr 2016 wurden in Österreich rd. 79,7 Mio. Tonnen Treibhausgase (THG) emittiert. Gegenüber 2015 bedeutet das einen Anstieg um 1,0 % bzw. + 0,8 Mio. Tonnen CO_2-Äquivalent. Im Emissionshandelsbereich sanken die THG-Emissionen gegenüber dem Jahr 2015 um 0,5 Mio. Tonnen, im Nicht-EH-Bereich stiegen diese um 1,3 Mio. Tonnen an.

Quantitative Ziele auf nationalstaatlicher Ebene sind im Klimaschutzgesetz nur für Emissionen festgelegt, die nicht dem Emissionshandel unterliegen. Die entsprechende Obergrenze für das Jahr 2016 beträgt 51,0 Mio. Tonnen CO_2-Äquivalent, die tatsächlichen Emissionen (Nicht-Emissionshandelsbereich) betrugen 50,6 Mio. Tonnen CO_2-Äquivalent und lagen damit 0,4 Mio. Tonnen CO_2-Äquivalent unter dem Ziel.

Energie und Industrie: − 3,6 % seit 1990

Der Sektor Energie und Industrie ist im Jahr 2016 mit ca. 35,2 Mio. Tonnen CO_2-Äquivalent der größte Emittent an Treibhausgasen in Österreich. Gegenüber 2015 sind die Emissionen um − 1,6 % (ca. 0,6 Mio. Tonnen CO_2-Äquivalent) gesunken.

<u>Emissionshandelsbereich</u>

Die Emissionshandelsbetriebe verursachten im Jahr 2016 Emissionen an Treibhausgasen im Ausmaß von 29,0 Mio. Tonnen (Energie: 9,0 Mio. Tonnen CO_2-Äquivalent, Industrie: 20,0 Mio. Tonnen CO_2-Äquivalent). Das ist um − 1,7 % (− 0,5 Mio. Tonnen) weniger als 2015. Die Emissionen der Industriebetriebe sanken um 1,0 % (− 0,2 Mio. Tonnen), die Emissionen der Energiebetriebe um 3,0 % (− 0,3 Mio. Tonnen CO_2-Äquivalent).

Wesentlich für den geringfügigen Rückgang der Emissionen bei den Energiebetrieben im Jahr 2016 war die Schließung eines Kohlekraftwerkblocks (insgesamt – 0,9 TWh weniger Strom-Erzeugung aus Kohlekraftwerken), obwohl die Stromproduktion aus Erdgas (+1 TWh) und Öl (+0,1 TWh) höher ausfiel.

Zu wesentlichen Änderungen bei den Emissionshandelsbetrieben kam es bei Kraft- und Fernwärmewerken (– 0,2 Mio. Tonnen), der Eisen-und Stahlindustrie (– 0,3 Mio. Tonnen) sowie der Mineralverarbeitenden Industrie (+ 0,1 Mio. Tonnen).

Nicht-Emissionshandelsbereich

Die sektoralen Emissionen des Nicht-EH Bereichs sind im Jahr 2016 gegenüber 2015 um – 0,1 Mio. Tonnen CO_2-Äquivalent (– 1,5 %) gesunken. Die diffusen Emissionen, welche ebenfalls in diesem Sektor enthalten sind, nahmen von 2015 auf 2016 ab, was vorrangig auf den reduzierten Rohgasdurchsatz bei der Entschwefelung von Erdgas zurückzuführen ist (– 0,03 Mio. Tonnen).

Verkehr: + 66,7 % seit 1990

Der Sektor Verkehr weist im Jahr 2016 THG-Emissionen im Ausmaß von 23,0 Mio. Tonnen CO_2-Äquivalent auf. Im Vergleich zu 2015 sind die Emissionen um 4,2 % (+ 0,9 Mio. Tonnen CO_2-Äquivalent) gestiegen.

Grund für diesen Anstieg ist der stark gestiegene fossile Kraftstoffabsatz. Es wurden zwar 0,1 % weniger Benzin-, aber 4,2 % mehr Dieselkraftstoffe im Vergleich zum Vorjahr abgesetzt (inkl. Beimengung von Biokomponenten). Der Absatz von Biokraftstoffen – pur wie beigemengt – ist 2016 erstmals massiv eingebrochen. Es zeigt sich bei den Biokraftstoffen ein Absatzminus von 16,3%. Der seit 2005 sinkende Trend der THG-Emissionen im Verkehrssektor hat sich damit eindeutig umgekehrt.

Gebäude: − 37,2 % seit 1990

Auf den Sektor Gebäude entfallen im Jahr 2016 ca. 8,1 Mio. Tonnen an THG-Emissionen. Das entspricht einem Anstieg um 2,7 % (+ 0,2 Mio. Tonnen CO_2-Äquivalent) gegenüber dem Jahr 2015. Der verstärkte Einsatz erneuerbarer Energieträger (Biomasse + 1,5 %, Umgebungswärme & Solarthermie: + 4,0 %) und Fernwärme (+ 1,8 %) sowie der Rückgang beim Verbrauch von Heizöl (– 1,7 %) und Kohle (– 7,7 %) konnten den deutlichen Anstieg beim Erdgasverbrauch (+ 7,9 %) nicht kompensieren.

Die Anzahl der Heizgradtage stieg nach zwei überdurchschnittlich warmen Jahren um 4,1 % an und befindet sich jedoch im langjährigen Trend.

Landwirtschaft: − 14,1 % seit 1990

Im Vergleich zu 2015 sind die THG-Emissionen aus der Landwirtschaft um 1,5 % (+ 0,1 Mio. Tonnen) gestiegen und betragen 8,2 Mio. Tonnen im Jahr 2016. Wesentlichste Ursache für diese Zunahme sind die gestiegenen N_2O Emissionen aus dem Einarbeiten von Ernterückständen am Feld aufgrund der deutlich höheren Erntemengen im Jahr 2016. Gemäß Grünem Bericht 2017 war die Getreideernte des Jahres 2016 eine der höchsten der letzten zehn Jahre (+ 17% im Vergleich zu 2015) aufgrund der günstigen klimatischen Bedingungen mit moderater Wärme und ausreichend Niederschlag. Größere Düngemengen sowie eine höhere Anzahl an Milchkühen bei steigender Milchleistung trugen ebenfalls zum Anstieg der sektoralen THG-Emissionen im Jahr 2016 bei.

Abfallwirtschaft: − 28,1 % seit 1990

Im Jahr 2016 wurden vom Sektor Abfallwirtschaft 3,1 Mio. Tonnen CO_2-Äquivalent emittiert und damit etwas mehr (+1,8 % bzw. 0,05 Mio. Tonnen) als 2015.

Dieser Anstieg ist auf die steigenden Emissionen aus der Abfallverbrennung zurückzuführen, da Abfälle mit hohem organischen Kohlenstoffgehalt nicht mehr, bzw. nicht mehr ohne Vorbehandlung, deponiert werden, sondern zunehmend thermisch (vor)behandelt werden. Emissionen aus der Abfalldeponierung sind weiterhin rückläufig.

Fluorierte Gase: + 26,4 % seit 1990

Im Jahr 2016 wurden in Österreich F-Gase im Ausmaß von 2,1 Mio. Tonnen CO_2-Äquivalent emittiert. Damit liegen die Emissionen um 5,0 % bzw. 0,1 Mio. Tonnen CO_2-Äquivalent über dem Niveau von 2015.

Hauptverursacher des Anstiegs von 2015 auf 2016 ist ein Sprung in der Produktion von Schallschutzfenstern im Jahr 1991. Es wird eine durchschnittliche Lebensdauer von 25 Jahren pro Fenster angenommen, daher resultiert dieser Anstieg in der Produktion in einer Zunahme der Emissionen von fast 90 kt CO_2 Äquivalenten.

Daten: Sektoreinteilung und Revisionen

Die Sektoreinteilung folgt der des Klimaschutzgesetzes. Aufgrund der kontinuierlichen Verbesserung der THG-Inventur, die jeweils die ganze Zeitreihe (Daten von 1990 bis 2016) betrifft, können die Emissionen von bisher publizierten Daten abweichen.

1 INTRODUCTION

This report presents the latest results from Austrian greenhouse gas (GHG) inventory, which document the annual national GHG emissions for the years 1990 to 2016. It presents GHG data for the first four 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[6] ("*Monitoring Mechanism Regulation*"; MMR) repealing Decision No 280/2004/EC[7] ("*Monitoring Mechanism Decision*") concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol. The purpose of this decision is to monitor all anthropogenic greenhouse gas emissions not controlled by the Montreal Protocol[8] 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 *2006 IPCC Guidelines for National Greenhouse Gas Inventories*[9], and to submit information in accordance with the *Reporting Guidelines (Decision 24/CP.19)*[10] 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_2018') as well as the completed MMR IR reporting templates are not part of this report but submitted separately by upload at EIONET/CDR.

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

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

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

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

[10] 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[11].

Table 1: Status of the present report.

Reporting Obligation	Format	Inventory	Version
Mechanism for monitoring Community greenhouse gas emissions	Common Reporting Format (CRF)	OLI 2017	January 11th 2018

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*.

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

2 EMISSION TRENDS

In 2016 Austria's total greenhouse gas (GHG) emissions (without LULUCF) amounted to 79.7 Mt CO_2 equivalents (CO_2e). Compared to the base year[12] 1990 GHG emissions increased by 1.3 %, and when compared to 2015 GHG emissions increased by 1.0%.

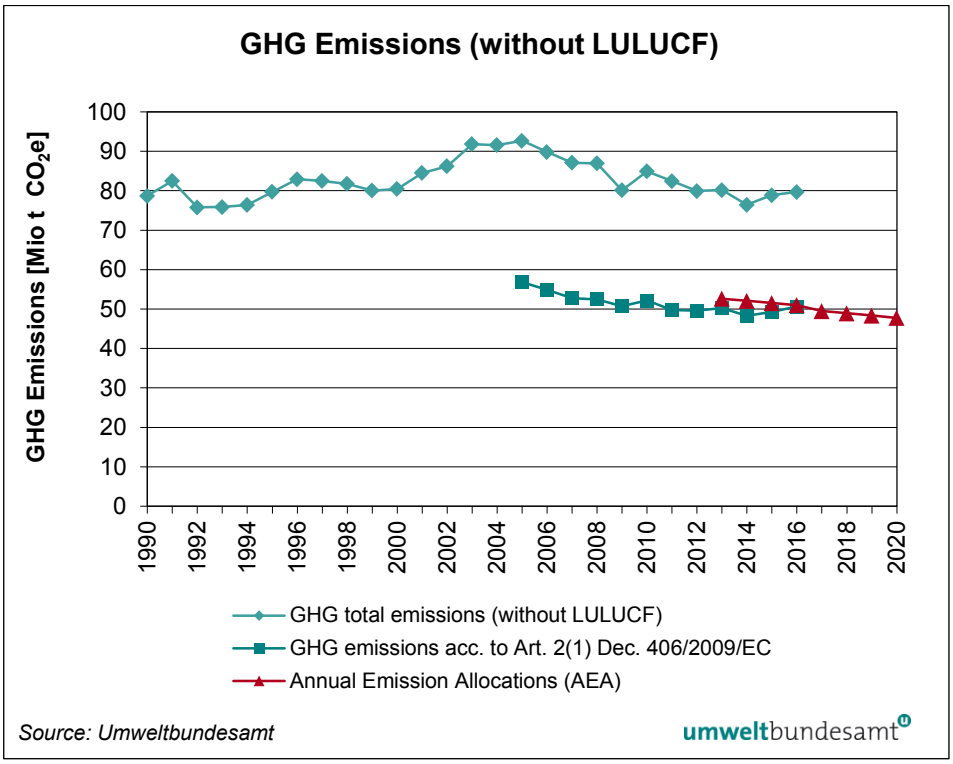
Greenhouse gas emissions according to Article 2(1) of Decision No. 406/2009/EC amounted to 50.6 Mt CO_2 equivalents in 2016 (see 'MMR_IR_Annex_ESD_AT_2018'), which is 2.7 % (1.3 Mt CO_2e) more than in 2015. Emissions were thus still below the annual emission allocation (AEA) for the year 2016 (–0.4 Mt CO_2e); this difference amounted in 2015 to −2.2 Mt CO_2e, in 2014 to −3.8 Mt CO_2e and in 2013 to −2.3 Mt CO_2e, the first year of the Effort-Sharing Decision target period[13].

[12] 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.

[13] 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 1990–2016 without LULUCF.



Trend 2015–2016

The key driver for the emissions increase between 2015 and 2016 was the increasing GHG emissions (+984 kt CO_2e) from *Energy (CRF 1)*. Within this sector *Road Transportation (CRF 1A3b)* contributed most – with an increase of 921 kt CO_2e due to the higher overall amount of (fossil) fuel sold in Austria. The use of biofuels decreased as a result of continuously low price levels of fossil fuel products and a decrease in pure biofuel sales. An increase also occurred in emissions due to use of natural gas for heating of households and commercial buildings (+210 kt CO_2e). Emissions from *Energy Industries* decreased by 180 kt CO_2e, mainly due to the closure of a coal power plant.

Emissions from *Industrial Processes and Other Product Use (CRF 2)* decreased by –1.2% (–199 kt CO_2e) from 2015 to 2016, mainly due to a decreased production volume of iron and steel.

Emissions from *Agriculture (CRF 3)* increased by 1.5 % (+109 kt CO_2e) from 2015 to 2016, mainly due to N_2O emissions resulting from more crop residues left on agricultural soils.

Net removals from LULUCF (CRF 4) show a decrease by 5.3% from 2015–2016 mainly caused by the decrease in the harvested wood products sink.

Sector *Waste (CRF 5)* continues with the declining emission trend of recent decades and shows a further decline by 4.5% (−75 kt CO_2e) as a result of reduced landfilling of waste and lower carbon content of deposited waste.

GHG source and sink categories	1. Energy	2. IPPU	3. Agriculture	4. LULUCF	5. Waste	6. Other
	CO_2 equivalents (kt)					
1990	52 914	13 662	8 189	-11 982	3 925	NO*
1995	54 436	13 605	8 038	-13 261	3 651	NO
2000	55 322	14 640	7 506	-16 364	2 963	NO
2001	59 675	14 521	7 449	-19 202	2 865	NO
2002	60 835	15 164	7 337	-14 166	2 863	NO
2003	66 457	15 305	7 189	-4 789	2 867	NO
2004	66 614	14 861	7 170	-9 118	2 930	NO
2005	67 150	15 610	7 104	-10 597	2 791	NO
2006	63 834	16 249	7 077	-5 116	2 671	NO
2007	60 503	16 938	7 119	-5 510	2 543	NO
2008	60 023	17 271	7 226	-4 276	2 431	NO
2009	56 642	13 947	7 245	-4 544	2 285	NO
2010	59 752	15 926	7 095	-5 878	2 158	NO
2011	57 306	15 955	7 146	-6 106	2 043	NO
2012	55 325	15 570	7 079	-5 476	1 942	NO
2013	55 400	15 887	7 063	-4 524	1 829	NO
2014	51 440	16 073	7 189	-4 725	1 739	NO
2015	53 352	16 669	7 178	-4 445	1 656	NO
2016	54 336	16 471	7 286	-4 208	1 581	NO

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

** not occurring*

The most important GHG in Austria is carbon dioxide (CO_2) with a share of 85% in 2016. The CO_2 emissions primarily result from combustion activities. Methane (CH_4), which mainly arises from stock farming and waste disposal, contributes 8.2% to the national total GHG emissions, and nitrous oxide (N_2O) with agricultural soils as the main source contributes another 4.5% in 2016. The remaining 2.6% 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.

GHG emissions	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3
	CO_2 equivalents (kt)						
1990	62 292	10 405	4 337	2	1 183	471	0
1995	64 206	9 561	4 420	353	83	1 100	6
2000	66 262	8 434	4 349	714	88	575	11
2001	70 391	8 274	4 226	863	116	629	11
2002	72 147	8 130	4 227	969	102	613	11
2003	77 764	8 067	4 216	1 072	126	549	22
2004	78 053	8 068	3 628	1 158	158	484	27
2005	79 367	7 830	3 627	1 146	163	494	28
2006	76 688	7 705	3 628	1 152	172	453	33

Table 3: Austria's anthropogenic greenhouse gas emissions by gas

GHG emissions	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3
	CO_2 equivalents (kt)						
2007	74 032	7 579	3 638	1 196	230	367	59
2008	73 806	7 446	3 815	1 249	208	373	53
2009	67 483	7 354	3 590	1 309	36	342	5
2010	72 383	7 255	3 391	1 483	78	336	4
2011	70 116	7 053	3 490	1 407	74	307	4
2012	67 661	6 943	3 456	1 486	51	312	9
2013	68 001	6 851	3 451	1 512	49	305	10
2014	64 253	6 709	3 520	1 583	53	313	11
2015	66 704	6 632	3 527	1 620	50	310	13
2016	67 402	6 567	3 614	1 643	50	393	6

The dominant sector regarding GHG emissions in Austria is *Energy*, causing 68% of the total national GHG emissions in 2016 (67% in 1990), followed by the sectors *Industrial Processes and Other Product Use* (21% in 2016) and *Agriculture* (9.1% in 2016).

Table 4: Austria's greenhouse gas emissions by sector 1990 and 2016 as well as their share and trend.

GHG	1990	2016	Trend 1990–2016	1990	2016
	Emissions [kt CO_2e]			Share [%]	
Total	**78 690**	**79 675**	**1,3%**	**100%**	**100%**
Energy	52 914	54 336	+2.7%	67%	68%
IPPU	13 662	16 471	+20.6%	17%	21%
Agriculture	8 189	7 286	–11.0%	10%	9.1%
LULUCF	–11 982	–4 208	–64.9%	–15%	–5.3%
Waste	3 925	1 581	–59.7%	5.0%	2.0%

Total emissions without emissions from sector LULUCF

In 2016 emissions from *Industrial Processes and Other Product Use* were 21% higher than in 1990. Greenhouse gas emissions from *Energy* increased by 2.7% between 1990 and 2016. The other sectors show decreasing GHG emissions. The most significant decreases in an emission source occurred in the sector waste, but also a decrease in *LULUCF* (decrease of net removals) is noted.

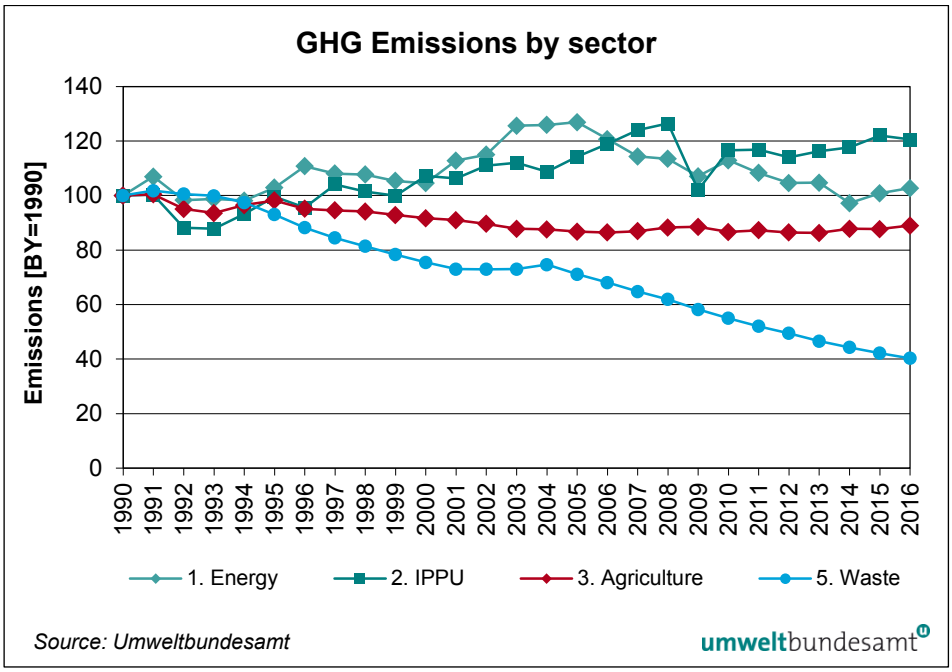


Figure 2: Trend in emissions 1990–2016 by sector in index form (1990 = 100).

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

2.1 Energy

In 2016, greenhouse gas emissions from sector *Energy* amounted to 54 336 kt CO_2 equivalents which correspond to 68% of the total national emissions. 99% of the emissions from this sector originate from fuel combustion (1.A), fugitive emissions from fuels (1.B) are of minor importance.

The most important **sub-category** is *transport* with a share of 43% in 2016, followed by, *manufacturing industries and construction* (20%), *energy industries* (19%) and the sub-category *other sectors* (17%). The most important **greenhouse gas** is CO_2, contributing 98% to the total sectoral GHG emissions, followed by CH_4 (1.1%) and N_2O (1.1%).

From 2015 to 2016, emissions from this sector increased by 1.8% (–984 kt CO_2e). The main increase occurred in the transport sector due to higher consumption of fossil fuels, in particular diesel. The increase in emissions of *manufacturing industries* was mainly driven by higher natural gas and coal consumption. The main driver for increasing emissions from *other sectors* was the compared to 2015 higher use of natural gas and increased heating demand of households (heating degree days increased by 4.1%). Only emissions from *energy industries* show a decrease due to the closure of a coal power plant.

The **overall trend** in GHG emissions from the sector *Energy* shows increasing emissions with a 2.7% rise from 1990 to 2016. Greenhouse gas emissions from road transport are 68.5% higher than 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)

Trend 1990–2016 by sub-category

In 2016 emissions from sub-category ***energy industries*** were 24.9% below the level in 1990. Emissions from power plants are quite continuously decreasing since 2005, mainly because of the growing contribution of renewable energy sources, the substitution of solid and liquid fuels by natural gas and biomass as well as improvements in efficiency. The share of biomass used as a fuel in this sector increased from 0.9% (1990) to 26.9% (2016), the contribution of hydro and wind power plants to total public electricity production increased from 69% (1990) to 79% (2016). Electricity consumption increased by 48.3% since 1990 but since 2002 the increase is mainly covered by electricity imports.

Energy related GHG emissions from ***manufacturing industries and construction*** increased by 9.4% from 1990 to 2016, mainly in the chemical and other manufacturing industries, while emissions from iron & steel and pulp & paper industries decreased since 1990. Fuel consumption increased by 43% 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 +9.4%) compared to the increase in fuel combustion.

Transport showed a strong increase in GHG emissions since 1990 (+68%) 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 2015 GHG emissions were decreasing due to lower amounts of fuel sold together with an increased use of biofuels and the gradual replacement with newer, lower fuel consumption vehicles. The year 2016 is now the second year showing an increase in GHG emissions from *transport*. Moreover, 2016 is the first year with higher total fuel sales compared to 2005.

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 2016 were 37% 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 15% since 1990.

Fugitive emissions decreased by 44% 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 2016, greenhouse gas emissions from *Industrial Processes and Other Product Use* amounted to 16 471 kt CO_2 equivalents, 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 (2016). The most important **greenhouse gas** of this sector is CO_2 with a contribution of 86% to total sectoral emissions (2016), followed by HFCs with 10%, SF_6 with 2.4%, N_2O with 1.0%, PFCs and CH_4 with 0.3% each. NF_3 contributes 0.04% to total emissions from this sector.

From 2015 to 2016, overall emissions from this sector decreased by 1.2%, mainly due to a decrease in production of iron and steel. The sub-category *metal industry* contributes mostly to this decrease between 2015 and 2016 (−3.4%), primarily due to a decrease in steel production.

The **overall trend** in GHG emissions from *Industrial Processes and Other Product Use* is an increase in emissions of 21% from 1990 to 2016. Within this period, emissions fluctuated, with a minimum in 1993 and a maximum in 2008. **Main drivers** for the trend in emissions from this sector were (i) the termination of primary aluminium production in 1993, (ii) the introduction of N_2O abatement technologies in the chemical industry in 2004 and in 2009 (which became fully operational in 2010), (iii) increasing metal production resulting in 28% higher GHG emissions in 2016 compared to 1990 and (iv) a strong increase of HFC emissions in the period 1992 to 2016 from 5.6 to 1 643 kt CO_2 equivalents.

Trend 1990–2016 by sub-category

The largest increase in GHG emissions between 1990 and 2016 can be observed in the *metal industry* due to an increase in emissions from iron and steel production (+58%). In sub-categories *mineral industry* and *chemical industry*, emissions declined by 10% and 48% respectively during that period. Emissions of *fluorinated gases* increased by 26% since 1990, brought on by increasing emissions of HFCs (+365% since 1995) used as cooling agents that replaced Ozone Depleting Substances (ODSs). Emissions from *solvent use* dropped by 43%, due to legal measures controlling the solvent content of products and their use.

2.3 Agriculture

In 2016, greenhouse gas emissions from *Agriculture* amounted to 7 286 kt CO_2 equivalent, which correspond to 9.1% of the total national emissions.

The **most important sub-categories** of this sector are *enteric fermentation* (57%) and *agricultural soils* (29%). The sector agriculture is the largest source for both N_2O and CH_4 emissions: in 2016 72% (8.7 kt N_2O) of total N_2O emissions and 70% (183 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 63%, N_2O with 35%. CO_2 emissions account for 1.6% of the emissions from this sector.

From 2015 to 2016 emissions increased by 1.5%, mainly due to rising GHG emissions from agricultural soils. In 2016 Austria's crop production was significantly higher compared to the previous year, because of the good growth conditions (moderate temperatures and sufficient precipitation). The cereal harvest in 2016 was one of the highest of the past ten years, but also soy, sugar beet and vegetable production increased compared to the previous year which resulted in higher N_2O emissions from crop residues. Furthermore, in 2016 a higher amount of mineral fertilizer was applied on agricultural soils.

Other drivers for the rise of GHG emissions in 2016 were the slight increase in the number of dairy cows and the higher milk yields of Austria's dairy cows.

The **overall trend** in GHG emissions from *Agriculture* shows a decrease of 11% from 1990 to 2016. The **main drivers** for this trend are decreasing livestock numbers and lower amounts of N-fertilizers applied on agricultural soils. Fluctuations, which can be seen in particular in the first half of the 1990s, result from the variation in sales of mineral fertilizer due to the volatility in price.

2.4 LULUCF

In 2016, net removals from the category LULUCF amounted to −4 208 kt CO_2 equivalents, which correspond to 5.3 % of the national total GHG emissions (without LULUCF) in 2016 compared to 15% in the base year.

With regard to the **overall trend** of net removals from LULUCF, the removals decreased by 65 % 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 −4 292 kt CO_2 equivalents in 2016. *Harvested Wood Products (4.G)* is the second largest sink category and contributed −1 042 kt CO_2 equivalents. In 2016, CH_4 and N_2O emissions together amounted to 159 kt CO_2 equivalents. Total net emissions arising from the other non-forest sub-sectors (excluding HWPs) amounted to 1 128 kt CO_2 equivalents in 2016.

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 −3 270 kt CO_2 equivalents in 2016 (including HWPs). Afforestation/reforestation (incl. HWPs) contribute to GHG removals as well (−2 097 kt CO_2 equivalents), whereas emissions from deforestation amount to 512 kt CO_2 in 2016.

2.5 Waste

In 2016, greenhouse gas emissions from *Waste* amounted to 1 581 kt CO_2 equivalent, which correspond to 2.0% of total national emissions.

The most important sub-category of the waste sector is *solid waste disposal*, which caused 77% of the emissions from this sector in 2016, followed by *waste water treatment and discharge* (12%) and *biological treatment of solid waste* (11%). The most important greenhouse gas is CH_4 with a share of 83% in emissions mainly from *waste disposal* (2016), followed by N_2O with 17% and CO_2 with 0.1%.

From 2015 to 2016 GHG emissions continued to decrease (−4.5%) as a result of low waste volumes as well as decreasing carbon content of waste deposited in previous years.

The **overall trend** in GHG emissions from *waste* is decreasing, with a decrease of 60% from 1990 to 2016. 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_2018').

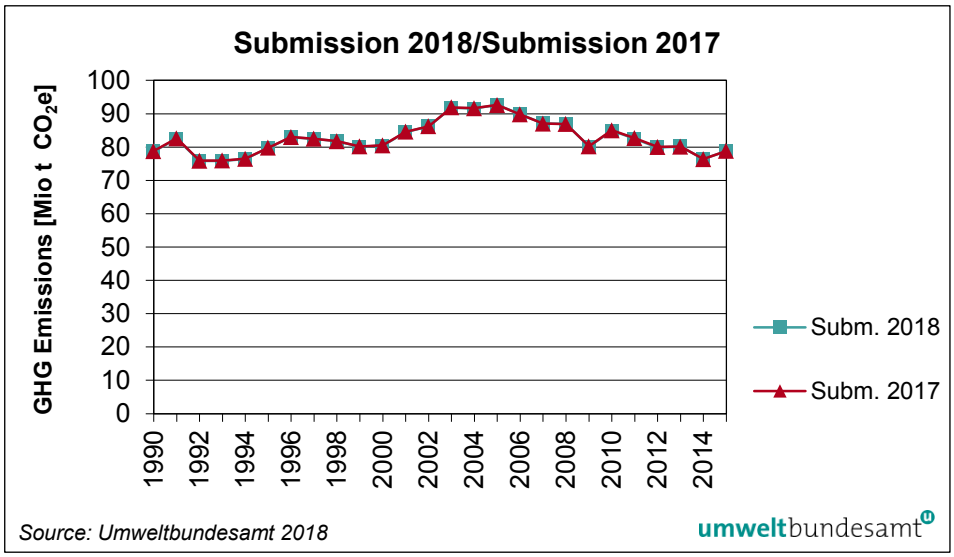
3.1 Background

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 differs only slightly from the data submitted last year. The national total (excl. LULUCF) for the base year is 0.15% (115 kt CO_2e) lower than reported last year; the national total (excl. LULUCF) for 2015 is 0.01% (5 kt CO_2e) higher than the value submitted last year.

Figure 3: Comparison Submission 2018/Submission 2017 (Recalculations).



National total emissions (excluding LULUCF) for the base year **1990** have been slightly revised downwards since last years' submission (−115 kt CO_2e), mainly because of the revised estimate submitted for *Energy* due to methodological improvements.

Revised total emissions for **2015** are 0.01% higher (+5 kt CO_2e) than the value submitted last year, mainly because of updated activity data in the Agriculture Sector.

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

	National Total GHG emissions without LULUCF			
	Submission 2018	**Submission 2017**	**Recalculation Difference**	
	[kt CO_2e]	**[kt CO_2e]**	**[kt CO_2e]**	**[%]**
1990*	78 690	78 805	–115	–0.15%
1991	82 496	82 631	–135	–0.16%
1992	75 796	75 925	–129	–0.17%
1993	75 855	75 968	–113	–0.15%
1994	76 393	76 501	–108	–0.14%
1995	79 730	79 815	–85	–0.11%
1996	82 924	83 031	–107	–0.13%
1997	82 461	82 494	–33	–0.04%
1998	81 757	81 790	–33	–0.04%
1999	80 055	80 171	–116	–0.14%
2000	80 432	80 534	–102	–0.13%
2001	84 510	84 584	–74	–0.09%
2002	86 199	86 251	–52	–0.06%
2003	91 817	91 908	–90	–0.10%
2004	91 575	91 674	–99	–0.11%
2005	92 655	92 642	13	0.01%
2006	89 832	89 798	33	0.04%
2007	87 103	87 072	30	0.03%
2008	86 951	86 923	28	0.03%
2009	80 119	80 249	–130	–0.16%
2010	84 931	85 059	–128	–0.15%
2011	82 450	82 697	–247	–0.30%
2012	79 917	80 038	–121	–0.15%
2013	80 178	80 150	28	0.03%
2014	76 442	76 381	60	0.08%
2015	78 856	78 851	5	0.01%

Table 6: Recalculations per sector.

	Submission 2018		Submission 2017		Recalculation Difference	
THG	**1990**	**2015**	**1990**	**2015**	**1990**	**2015**
	[Mt CO_2e]		**[Mt CO_2e]**		**[Mt CO_2e]**	
Total	**78.69**	**78.86**	**78.80**	**78.85**	**–0.11**	**0.005**
Energy	52.91	53.35	53.03	53.35	–0.11	0.00
IPPU	13.66	16.67	13.66	16.68	0.00	–0.01
Agriculture	8.19	7.18	8.19	7.17	0.00	0.01
Waste	3.93	1.66	3.93	1.66	0.00	0.00

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 N_2O and CH_4 in 2015 were revised upwards, whereas emissions of CO_2 and fluorinated compounds were slightly revised downwards.

Table 7: Recalculations per gas.

	1990 (Base year)	2015
	Recalculation Difference [%]	
Total	**–0.15%**	**0.01%**
CO_2	0.00%	–0.03%
CH_4	–1.03%	0.86%
N_2O	–0.12%	0.28%
HFC, PFC, SF_6, NF_3	0.00%	–2.04%

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 1990–2015 will be given in Austria's National Inventory Report 2018.

3.3.1 Energy

3.3.1.1 Stationary sources

Update/Improvement of activity data

In previous versions of the energy balance the category 1.A.4.a has been used as a 'residual' sector for the amount of fuels which could not be attributed to sectors by default. For the years 2012 to 2015 a new systematic has been applied by Statistik Austria for gasoil, residual fuel oil, LPG, natural gas, wood pellets and briquettes. The new systematic considers the amount of fuel which is not covered by bottom up statistics or census data in a different way. These amounts of fuels are now distributed to final energy consumption of 1.A.2 Manufacturing industries and 1.A.4 'other sectors' subcategories, depending on the estimated incompleteness (e.g. small companies which are not obliged to report energy consumption) or uncertainty (census data) of the fuel consumption in

these sectors. These methodological changes do not affect total final consumption but imply shifts between 1.A.2 and 1.A.4 subcategories.

The energy balance was revised by Statistik Austria for the years 2003 to 2015 with the following main implications on energy consumption and CO_2 emissions:

- Natural gas has been shifted between final energy consumption, other energy industries and transformation input to power plants for the years 2011−2015 (between −0.1 to 3.1 PJ). As a result of the 2015 energy data revision this leads to −141 kt CO_2 from '1.A.1.c other energy industries', −29 kt CO_2 from '1.A.1.a public electricity and heat', +298 kt CO_2 from '1.A.2 manufacturing industries' and −129 kt CO_2 from '1.A.4 Other sectors'. Total 1.A natural gas consumption has not been affected in any year.
- For liquid fuels minor revisions have been made 2005 to 2015 (mainly shifts between 1.A.2 and 1.A.4 subcategories). As a result of the 2015 energy data revision, this leads to –36 kt CO_2 from '1.A.2 manufacturing industries' and +37 kt CO_2 from '1.A.4 Other sectors'.

  For 1999−2004, up to 81 kt CO_2 from liquid fuels have been shifted to gaseous fuels within category 1.A.1.b refinery because of the revision of refinery fuels within the energy balance.
- For solid fuels minor revisions have been made for the years 2002−2004 and category '1.A.1.a public electricity and heat production' (between +2 and +5 kt of CO_2). For 2005–2015 minor revisions have been made for category '1.A.2 manufacturing industries' (−74 kt CO_2 in 2015, of which about 41 kt have been shifted to category '2.C.1 Iron and Steel'), and category '1.A.4 Other sectors' (−16 kt CO_2 in 2015).
- For 'other fuels' the major revision of the energy balance took place for the years 2005 to 2013, which resulted in +48 kt higher CO_2 emissions from 'other fuels' in category 1.A.1.a public electricity and heat production in 2013. Other revisions of the energy balance resulted in +81 kt higher CO_2 emissions from 1.A.2.c Chemicals Industries – other fuels for the year 2015 and –129 kt lower CO_2 emissions for the year 2009.

Other methodological improvements

Other fuels (industrial waste) have been shifted from category 1.A.4.a to category 1.A.1.a for the years 1990 to 2000 in order to increase time series consistency of those sectors.

For 1.A.4.c – biomass the IPCC default CH_4 emission factor has been selected (previously a country specific factors has been used), which leads to +28 kt CO_2-equivalent in 1990 and +34 kt CO_2-equivalent in 2015.

CH_4 emissions from 1.A.4.a and 1.A.4.b – biomass are now based on a new energy demand model for space heating. The model considers more detailed technologies (boilers, ovens) and provides an improved time series consistency. The change in emissions is about −139 kt CO_2-equivalent in 1990 and +22 kt CO_2-equivalent in 2015.

3.3.1.2 Mobile sources

Update/Improvement of methodology, activity data and emission factors

Aviation (1.A.3.a)

Update of the aviation emission model for calculating emissions of 2016 including the newest EMEP/EEA 2016 (Annex 5) emission factors. Flight movement data and the calculation of distances between airport pairs have been improved.

As a recalculation of the whole time series (1990−2015) with the updated emission model is not possible due to a lack of detailed data needed from now on and budgetary resources the result for 2016 cannot be compared with the result for 2015 of the submission 2017. An application of the updated emission model to all inventory years or a calibration to ensure a consistent time series is planned for the next submission in 2019.

Revision 2015: −0.13 kt CO_2e

Road transport (1.A.3.b)

Refined calibration of specific CO_2 emissions of newly registered PCs and LDVs registrations of all years by taking into account the special characteristics of fuels used in the type approval process. Increase in inland driving performance (on average +1%) due to an increase in specific moped mileage. From 2010 onwards revision of specific passenger car mileage for cars based on the latest statistical national survey.

For the year 2015 marginal changes in emissions are caused by a downward revision of the levels for liquefied petroleum gas (LPG) in the national energy balance.

The mentioned improvements lead to an overall increase of emissions (+17 kt CO_2e) for the year 2015.

Rail transport (1.A.3.c)

For the year 2015 changes in emissions (−12.7 kt CO_2eq) are caused by revised levels for diesel in the national energy balance.

3.3.1.3 Fugitive Emissions

1.B.2.b.2 production

Recalculations in CO_2 emissions in the category 1.B.2.b.2 (production) for the years 2003–2015 are due to revision of data reported *by the Association of the Austrian Petroleum Industry*). Since 2003 emissions from this source were erroneously reported including not only fugitive emissions but also pyrogenic emissions by one company. This error was corrected and led to a total reduction of CO_2e emissions from this source of −52.5 kt CO_2e in 2015 (cumulative 680 kt CO_2e between 2003 and 2015).

3.3.2 Industrial Processes and Other Product Use

Update of activity data

2.B.1 Ammonia Production

Due to updated data of urea used in traffic (see below, 2.D.3)) as well as in agriculture (3.H) from 2005–2015, the time series for CO_2 emissions in sector 2.B.1 also changed to +5.2 kt CO_2e in 2015.

2. B.10.2 Other Chemical Industry

Due to a transcription error emissions for 2015 changed (−7.1 kt CO_2e).

2.D.3. Other

Carbon dioxide emissions from the use of urea in selective catalytic reduction in the transport sector, which had previously been reported under 2.G.4, are now reported under 2.D.3, in line with footnote 6 in CRF Table2 (I).A-Hs2. The revision resulted in 2015 in +21.7 kt CO_2e.
The slight changes in CO_2 emissions from this use (marginal increases up to 2011, reductions from 2011 onwards) are not caused by changes in vehicle technology but by the use of the latest NEMO version. The use of the newest NEMO version (4.0.0 from November 2016) results in slight shifts between fuel consumption in inland and fuel export, which causes revised AdBlue© consumptions in fuel export due to the fact of the specific fleet composition in fuel export.

2.F.1. Refrigeration and Air Conditioning

Due to information provided by railway and tramway companies, refills of air conditioning with 134a during the lifetime of the equipment happens on a regular basis. Thus, 134a used for refills during the lifetime of equipment of railed vehicles was subtracted from total R 134a use, which affected amounts used in refrigeration and air conditioning (Commercial Refrigeration as well as Industrial Refrigeration). The change amounts to −41.6 kt CO_2e in 2015, and –129.3 kt CO_2e in 2011)

2.F.1.d Transport Refrigeration

A transcription error was amended, which led to an increase of emissions in 2015 of 17.1 kt CO_2e

2.F.4. Aerosols – Metered Dose Inhalers

Updated producer information provided information on two types of inhalers that contain R 227ea instead of R134a. Thus, numbers of units with R 227ea were re-allocated and the exact amount of gas used per inhaler used. Emissions in 2015 were updated by 0.1 kt CO_2e.

2.G.2 Other product manufacture and use

Updated numbers on SF_6 use for particle accelerators for 2015 led to an update of emissions in 2015 by +0.2 kt CO_2e.

2.G.4 Other

Carbon dioxide emissions from the use of urea in selective catalytic reduction are no longer reported under this category, but in category 2.D.3 instead, cf. above. For this reason emissions in 2015 are −26.5 kt CO_2e lower.

Improvements of methodologies and emission factors

2.C.3. Aluminium Production

Plant specific data have been updated from 2008 on. This lead to an improvement in the IEF from 2013 backwards. No change of 2014 and 2015 emissions.

2.C.1. Iron and Steel Production

The allocation for 2015 changed due to an update of the emissions, which were formerly occurring in the sector 1.A.2.a are now allocated to 2.C.1.a. This resulted in +41.1 kt CO_2e in 2015.

3.3.3 Agriculture

Update of activity data

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

Milk yield data for dairy cows for the years 1991−1993 and 2001 was updated on the basis of official data from the Ministry of Agriculture (BMLFUW 2017). The revision resulted in slightly higher emissions for the years 1991−1993 and slightly lower emissions for 2001.

In 2017 new information on input materials for Austria's biogas plants became available (raw material balances for 2014 and 2015). The updated data were taken from (E-Control 2017) and resulted in revised amounts of digested manure and energy crops from 2012 to 2015 (latest available raw material balance used in a previous inventory was for 2011).

3.D.a.5 Mineralization/immobilization

Revisions of land-use data within sector LULUCF resulted in slightly decreased N_2O emissions in all reported years (−0.002 kt N_2O in 2015).

3.G Liming

The cropland and grassland areas for the years 2014 and 2015 were revised according to the results of the farm structure survey 2016 resulting in higher CO_2 emissions for 2014 (+0.1 kt CO_2) and lower CO_2 emissions for 2015 (−0.2 kt CO_2).

3.H Urea Application

Revised 2015 data on urea consumption (AMA 2017) resulted in higher CO_2 emissions for the respective year (+2.9 kt CO_2).

Improvements of methodologies and emission factors

3.B Manure Management (CH_4)

Revised Tier 1 calculations of chicken and horses resulted in slightly increased emissions of CH_4 (+0.01 kt CH_4 in 2015)

3.D Agricultural Soils (N_2O)

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

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

The correction of a linkage error in the calculation of NO-N losses from sewage sludge application resulted in slightly increased indirect N_2O emissions from atmospheric deposition of managed soils for the whole time series. The higher amount of urea fertilizers in 2015 as well as the revised activity data, as described before (milk yields and input to digesters), are other reasons for the slight increase of indirect emissions (both, atmospheric deposition and N leaching from managed soils) in the years 1991−1993 and 2012−2015 (+0.01 kt N_2O 2015).

3.3.4 LULUCF

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

4.A Forest land

The wildfire area and emission estimates for the year 2014 required a minor adjustment on basis of the latest available statistics.

4.B Cropland

The estimate of the (shares of) land-use changes between annual cropland, perennial cropland and grassland on basis of the IACS system was slightly changed. The estimate is now based entirely on a subset of land parcels in IACS which show constant areas and codes throughout the time series. This led to changes of the LUC areas between annual, perennial cropland and grassland and consequently to changes in the related emissions and removals from biomass and soil.

The measurements of country specific orchard biomass and vineyard biomass were completed and the significantly too high default values of perennial biomass growth rates, stocks and turn-over periods were replaced by these country specific values. Consequently, the emissions and removals by perennial biomass in cropland changed.

The assessment of the soil C stock changes in cropland remaining cropland was improved. The results of the C stock change rates for the agricultural experimental plots and their allocations to different management types (management factors) like tillage types and input types were revisited and revised. The methodological regime for separating the cropland into the different tillage and input types was further adjusted, e.g. by separating into combinations of three tillage types and variations of the input types and input combinations of low/high plant residues input, with/without manure input and with/without input from cover crops. These improvements led to lower C stock changes in the mineral soil of cropland compared to the last submission.

The 2014 and 2015 values of the cropland areas had to be updated according to the most recent agricultural statistics.

All the recalculations in the cropland category led to changes in the time series of annual emissions/removals of this subcategory in the range of −61 to 59 kt CO_2e per year.

4.C Grassland

The estimate of the (shares of) land-use changes between annual cropland, perennial cropland and grassland on basis of the IACS system was slightly changed. The estimate is now based entirely on a subset of land parcels in

IACS which show constant areas and codes throughout the time series. This led to changes of the LUC areas between annual, perennial cropland and grassland and consequently to changes in the related emissions and removals from biomass and soil in the subcategory LUC from cropland to grassland.

The measurements of country specific orchard biomass and vineyard biomass were completed and the significantly too high default values of perennial biomass growth rates, stocks and turn-over periods were replaced by these country specific values. Consequently, the emissions by perennial biomass in the LUC subcategory perennial cropland to grassland changed.

The 2014 and 2015 values of the grassland areas had to be updated according to the most recent agricultural statistics.

All the recalculations in the grassland category reduced the annual emissions of this subcategory by -23 to −1 kt CO_2e per year.

4.D Wetlands

No revisions of the time series.

4.E Settlements

The estimates of the LUC shares from cropland and grassland to settlements were adjusted and led to minor changes in the emissions of the settlement subcategory (higher annual emissions of this subcategory by 0.1 to 17 kt CO_2e per year).

4.F Other lands

No revisions of the time series.

4.G HWPs

A calculation error in the HWP estimates related to veneer sheets was corrected and led to minor changes in the removals from HWPs.

The HWP production figures for 2015 were updated in the most recent FAO statistic. Consequently, the removal figures for this year had to be updated accordingly.

The estimate of paper production from domestic wood was expanded by the wood pulp production/import/export according to equations 2.8.2 and 2.8.4 of the IPCC (2014) KP Supplement and the HWP time series was recalculated accordingly.

All the recalculations in the HWP category led to changes in the time series of annual removals of this subcategory in the range of −182 to 342 kt CO_2e per year.

LULUCF KP estimates

The wildfire area and emission estimates for the year 2014 required a minor adjustment on basis of the newest statistics.

A calculation error in the HWP estimates related to veneer sheets was corrected and led to minor changes in the removals from HWPs.

The HWP production figures for 2015 were updated in the most recent FAO statistics. Consequently, the removal figures for this year had to be updated accordingly.

The estimate of paper production from domestic wood was expanded by the wood pulp production/import/export according to equations 2.8.2 and 2.8.4 of the IPCC (2014) KP Supplement and the HWP time series was recalculated accordingly.

All these recalculations led to changes in the annual removals of forest management for the years 2013 to 2015 in the range of −46 to 333 kt CO_2e per year.

3.3.5 Waste

Update of activity data

5.D Wastewater Treatment and Discharge

For the year 2015, actual data for the nitrogen content in the effluent from waste water treatment plants became available (based on EMREG), which have been used to update the 2015 data. The revision of 2015 data resulted in +0.002 kt N_2O.

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[14] 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[15], in Austria's NIR 2017[16] and in the NISA Implementation Report[17].

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[18]), 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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[14] 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

[15] 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.

[16] Umweltbundesamt (2016): Austria's National Inventory Report 2017, Submission under the United Nations Framework Convention on Climate Change and under the Kyoto Protocol. Reports, Bd. REP-0608. Umweltbundesamt, Vienna.

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

[18] „Umweltkontrollgesetz" – Bundesgesetz über die Umweltkontrolle und die Einrichtung einer Umweltbundesamt Gesellschaft mit beschränkter Haftung; Federal Law Gazette 152/1998.

Inspection Body for Emission Inventories
PSID 241

Umweltbundesamt GmbH, Environment Agency Austria
Dr. Klaus Radunsky (Head of Inspection Body), DI Michael Anderl (Deputy)
Spittelauer Lände 5
1090 Wien, Austria

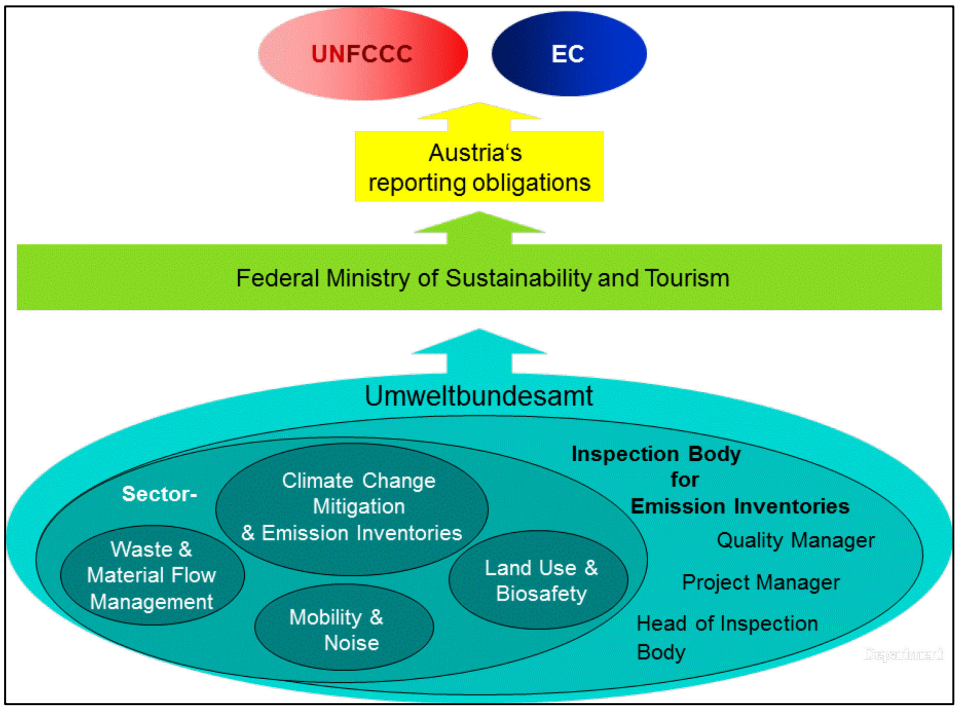

Figure 4: Responsibilities within the Austrian National Inventory System Austria.

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.

4.1.1 Legal and institutional arrangements

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

LEGAL ARRANGEMENT: ENVIRONMENTAL CONTROL ACT (FEDERAL LAW GAZETTE 152/1998

- § 5 (regulates responsibilities of the Umweltbundesamt)

  Regulates responsibilities regarding environmental control in Austria and is also the basis for the outsourcing of the 'Umweltbundesamt GmbH'
- § 6 (regulates tasks of the Umweltbundesamt)

  (2)15 …the *Umweltbundesamt* is obliged to prepare "technical expertise for *compliance* with UNECE/LRTAP convention […] and with the UNFCCC and the Kyoto Protocol, including the preparation of emission inventories, evaluation of the impact of measures, and assistance in preparation of reports regarding climate".
- § 11 (regulates financing of the Umweltbundesamt)

  …ensures financial resources for preparation of tasks as referred to in para 6.
- § 7 (regulates issues related to data security)

  … in processing the legally assigned tasks the Umweltbundesamt is seen as a public authority and can therefore process (confidential) personal data and can exchange these data with other public authorities.

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

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

1. Statistik Austria

- Statistical yearbook (public)
- National Energy balance (comprehensive/detailed Energy balance and IEA/Eurostat questionnaire)
  - **Long-term Contract** with the competent ministries
- Production/Import/Export statistics for solvents, F-gases
  - **Contract on annual basis** with the Federal Ministry of Sustainability and Tourism (BMNT)
- Agricultural statistics (public)
- Transport statistics (public)
- Flight movements per aircraft type and airports (non-standard analysis by Statistik Austria and AustroControl)

  Procedural arrangement:
  - close cooperation Umweltbundesamt – Statistik 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

2. Federal Ministry of Sustainability and Tourism (BMNT)

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

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

  Procedural arrangement: The access to the data is organised for free via the EDM – Electronic Data Management – http://edm.gv.at, which is an information network which allows enterprises and authorities to handle registration and notification obligations in the waste and environment sectors online.
  - EDM aimed at sustainably reducing the administrative burden of enterprises and authorities to efficient, electronic recording and notification systems and to ensure a high level of environmental protection in Austria.
  - EDM was set up by Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management, BMLFUW and operated by Umweltbundesamt

3. Austrian Research Centre for Forests (BFW)

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

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

4. Research institutions:

a. TU Graz (Graz University of Technology)

- NEMO – Emission model road (IPCC sector 1.A.3.b): calculation of road emissions
- GEORG – Emission model of off-road machinery: 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 in Austria good practice 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

4.1.2 Data Sources

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

Table 8: Main data sources for activity data.

Sector	Data Sources for Activity Data
Energy	• Energy Balance from Statistik Austria; • EU-ETS; • Steam boiler database; • Direct information from industry or associations of industry
Transport	• Energy Balance from Statistik Austria • Yearly growth rates of transport performance on Austrian roads from Austrian Ministry for Transport, Technology and Innovation
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

Sector	Data Sources for Activity Data
Agriculture	• National Studies • National agricultural statistics obtained from Statistik Austria
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)

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[19]
- EMEP/EEA air pollutant emission inventory guidebooks[20]
- Handbook emission factors for road transport (HBEFA), Version 3.2 (KELLER, M./WÜTHRICH, P. 2014)
- National forest inventory obtained from the Austrian Research Centre for Forests
- Soil inventories by the Federal States and by the Austrian Federal Office and Research Centre for Forests
- Modelling of the forest soil C stock changes Austrian Research Centre for Forests

4.1.3 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.241) in accordance with the Austrian Accreditation Law (AkkG)[21] by decree of the Minister of Economics and Labour[22]. 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.

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

[20] Prepared by the UNECE/EMEP Task Force on Emissions Inventories and Projections (TFEIP) and published by the European Environment Agency (EEA). Latest update: http://www.eea.europa.eu/publications/emep-eea-guidebook-2016

[21] *„Akkreditierungsgesetz"*; Federal Law Gazette No. 28/2012

[22] No. BMWA-92.715/0036-I/12/2005, issued on 19 January 2006, valid from 23 December 2005

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 re-calculations, are taken by the sector experts.

The Austrian Quality Management System is described in detail in Austria's NIR 2017, some aspects and improvements compared to the previous submission are described below (QMS activities and improvements 2017).

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

Sector Experts

Within the inventory system specific responsibilities for the different emission source/sink categories ('Sector Experts') are defined. There are 8 sectors defined (Energy, Transport, Fugitive Emissions, Industrial Processes, Product Use, Agriculture, LULUCF and Waste). Two experts form a sector team, and one of them is 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 and archiving and for contracting studies (if needed), and perform 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)

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 2017

Only some minor changes of the Quality Manual and its quality and technical procedures were made in 2017, e.g. improvement of documentation of internal audits, updating the information sheet for external data suppliers, refining the submission process for draft review reports if e.g. layout is not finalised in time. Moreover, the IBE-team was again slightly re-arranged, overall increasing the number of experts involved in inventory work. To strengthen the technical competence of the inventory team, one IBE sector expert studied the Kyoto Protocol course for reviewers and eight attended the course for the Review of Biennial Reports (BRs) and National Communications (NCs). All team members passed their corresponding exams.

Moreover, the following QA/QC activity was undertaken in 2017:

- An emergency exercise on data management, i.e. compilation of emission data tables and preparing the submission, was successfully conducted by the deputy of the data manager of the IBE, with the aim of training the expert and testing the quality of the internal documentation on this issue. It is planned to conduct such a dummy inventory compilation as a training every two years to keep the deputy up-to-date and ready for a submission in case of an unplanned absence of the data manager.

4.1.4 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[23].

[23] 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 2017:

Table 9: Changes to the national registry of Austria in 2017.

Reporting Item	Description
15/CMP.1 annex II.E paragraph 32.(a) Change of name or contact	Neither the name and contact of the registry administrator as an institution nor the name of the registry administrator and the alternate registry administrator has changed.
15/CMP.1 annex II.E paragraph 32.(b) Change regarding cooperation arrangement	No change of cooperation arrangement occurred during the reported period.
15/CMP.1 annex II.E paragraph 32.(c) Change to database structure or the capacity of national registry	The version of the EUCR released after 8.0.7 (the production version at the time of the last Chapter 14 submission) introduced minor changes in the structure of the database. These changes were limited and only affected EU ETS functionality. No change was required to the database and application backup plan or to the disaster recovery plan. The database model is provided in Annex A. No change to the capacity of the national registry occurred during the reported period.
15/CMP.1 annex II.E paragraph 32.(d) Change regarding conformance to technical standards	Changes introduced since version 8.0.7 of the national registry are listed in Annex B. 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 were successfully 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 of the registry internet address occurred during the reporting period.
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.

Reporting Item	Description
15/CMP.1 annex II.E paragraph 32.(j) Change regarding test results	Changes introduced since version 8.0.7 of the national registry are listed in Annex B. Both regression testing and tests on the new functionality were successfully carried out prior to release of the version to Production. The site acceptance test was carried out by quality assurance consultants on behalf of and assisted by the European Commission.

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_2018'). Emission trends 1990–2016 (Article 7(1) e) are described in Chapter 2. Changes to the national system and the national registry are presented in Chapters 4 (Article 7(1) n) and 5 (Article 7(1) o). Article 7(1) p-information is given in Chapter 4.1.3 (QA/QC Plan) and the respective MMR IR reporting template ('MMR-IRArticle14_Uncertainty_AT_2018').

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 2016 is reported as a separate file ('Annex II_AT Indicators_2018') 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 2017 is reported as a separate file ('SEF_AT_CP2_2017_20180108') in xls and xml format by EIONET/CDR upload.

6.3 Article 7 (1) h

Summary information on concluded transfers pursuant to Article 3(4) and (5) of Decision No 406/2009/EC for the year 2017 has been reported as XML file in the directory 'Concluded transfers 2017' 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_2018') 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 2017, Austria was not reviewed by the UNFCCC. The results of the centralised review conducted in 2016, were published 31 May, 2017. The information on the implementation of recommendations is provided in the template ('MMR_IR Article9_recommendations_AT_2018').

As the initial check of ESD emissions in 2017, under Art. 19(2) of Regulation EU No 525/2012 did not identify any significant issues, Austria was not subject to a second step review, and no recommendations were made.

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 2016 is reported as a separate file ('MMR_IRArticle10_ETS_AT_2018').

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 2017.

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.

Checks for each air pollutant on the consistency of the data on air emissions could so far not be performed for the year 2016 as data on air emissions are not final yet. Only minor differences are expected 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 2016 with the energy data reported pursuant to Article 4 of Regulation (EC) No 1099/2008 show no differences of more than +/−2%.

7 ABBREVIATIONS

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

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

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

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

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

CDR ..... Central Data Repository

COP ..... Conference of the Parties

CORINAIR ..... Core Inventory Air

CRF ..... Common Reporting Format

EC ..... European Community

EEA ..... European Environment Agency

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

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

EN ..... European Norm

ETC ..... European Topic Centre

EU ..... European Union

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

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

GHG ..... Greenhouse Gas

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

GWP ..... Global Warming Potential

IBE ..... Inspection Body for Emission Inventories

IPCC ..... Intergovernmental Panel on Climate Change

IEA ..... International Energy Agency

ISO ..... International Standards Organisation

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

LULUCF ..... Land Use, Land-Use Change and Forestry – IPCC CRF Category 5

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
Total Emissions/Removals with LULUCF	**66 708**	**64 075**	**82 064**	**84 723**	**81 601**	**82 683**	**75 583**	**79 062**	**76 354**	**74 451**	**75 664**	**71 726**	**74 420**	**75 477**
Total Emissions withoutLULUCF	**78 690**	**80 432**	**92 655**	**89 832**	**87 103**	**86 951**	**80 119**	**84 931**	**82 450**	**79 917**	**80 178**	**76 442**	**78 856**	**79 675**
1. Energy	**52 914**	**55 322**	**67 150**	**63 834**	**60 503**	**60 023**	**56 642**	**59 752**	**57 306**	**55 325**	**55 400**	**51 440**	**53 352**	**54 336**
A. Fuel Combustion (SectoralApproach)	52 212	54 826	66 713	63 369	60 031	59 591	56 162	59 284	56 845	54 851	54 928	51 002	52 928	53 945
1.EnergyIndustries	14 076	12 319	16 280	15 138	13 862	13 695	12 644	13 989	13 807	12 398	11 362	9 627	10 757	10 578
2.ManufacturingIndustrie sandConstruction	9 889	10 081	11 819	11 446	11 073	11 457	10 809	11 424	11 346	11 315	11 198	10 644	10 742	10 821
3. Transport	13 973	18 817	24 933	23 625	23 829	22 408	21 728	22 534	21 882	21 667	22 825	22 184	22 592	23 488
4.OtherSectors	14 238	13 567	13 637	13 115	11 221	11 985	10 934	11 290	9 763	9 424	9 495	8 498	8 787	9 007
5. Other	36	42	45	45	46	46	47	47	48	48	49	50	50	51
B. Fugitive Emissions from Fuels	702	496	437	465	472	432	480	468	461	474	471	438	424	392
1. Solid Fuels	333	27	0	0	–	–	–	–	–	–	–	–	–	–
2. Oil and Natural Gas	369	469	437	465	472	432	480	468	461	474	471	438	424	392
C. CO_2TransportandStorage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial Processes and Other Product Use	**13 662**	**14 640**	**15 610**	**16 249**	**16 938**	**17 271**	**13 947**	**15 926**	**15 955**	**15 570**	**15 887**	**16 073**	**16 669**	**16 471**
A. Mineral Industry	3 092	2 733	2 889	3 053	3 266	3 276	2 715	2 661	2 779	2 704	2 720	2 722	2 740	2 788
B. Chemical Industry	1 555	1 624	943	983	908	1 012	792	785	788	762	699	814	792	805
C. Metal Industry	8 177	8 480	9 574	10 047	10 544	10 737	8 402	10 227	10 246	9 901	10 261	10 256	10 813	10 450
D. Non-Energy Products from Fuels and Solvent Use	349	228	210	209	213	212	207	207	210	216	202	202	201	205

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
E. Electronics Industry	134	420	352	370	391	371	114	150	119	101	90	97	107	92
F. Product Uses as Substitutes for ODS	NO	709	1141	1146	1187	1239	1307	1481	1405	1483	1510	1581	1618	1641
G. Other Product Manufacture and Use	355	446	500	441	428	424	410	414	409	403	404	401	399	491
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	**8 189**	**7 506**	**7 104**	**7 077**	**7 119**	**7 226**	**7 245**	**7 095**	**7 146**	**7 079**	**7 063**	**7 189**	**7 178**	**7 286**
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	4 136	4 131	4 147
B. Manure Management	1 025	943	897	894	902	892	904	901	888	880	878	878	877	876
C. Rice Cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural Soils	2 247	2 077	1 956	1 943	1 957	2 083	2 030	1 896	2 015	1 980	1 959	2 062	2 057	2 147
E. Prescribed Burning of Savannas	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
G. Liming	90	90	91	90	89	88	88	88	87	87	86	86	86	85
H. Urea application	4	8	12	15	18	17	22	20	18	22	22	25	26	31
I. Other carbon-containing fertilizers	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land Use, Land-Use Change and Forestry	**–11 982**	**–16 364**	**–10 597**	**–5 116**	**–5 510**	**–4 276**	**–4 544**	**–5 878**	**–6 106**	**–5 476**	**–4 524**	**–4 725**	**–4 445**	**–4 208**
A. Forest Land	–10 862	–15 975	–8 774	–2 959	–1 931	–1 036	–4 474	–4 441	–4 408	–4 375	–4 342	–4 309	–4 302	–4 295
B. Cropland	189	22	–84	–80	–200	–185	–215	–220	–224	–227	–207	–174	31	63
C. Grassland	650	472	679	678	677	672	378	377	376	375	376	377	375	357
D. Wetlands	42	36	47	37	39	51	68	69	73	70	101	71	59	77
E. Settlements	649	576	649	646	621	657	564	537	518	529	485	489	459	445

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
F. Other Land	457	380	333	324	316	307	222	214	206	197	189	181	177	173
G. Harvested Wood Products	–3 122	–1 889	–3 461	–3 776	–5 046	–4 756	–1 102	–2 427	–2 659	–2 058	–1 141	–1 375	–1 257	–1 042
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	**3 925**	**2 963**	**2 791**	**2 671**	**2 543**	**2 431**	**2 285**	**2 158**	**2 043**	**1 942**	**1 829**	**1 739**	**1 656**	**1 581**
A. Solid Waste Disposal on Land	3 644	2 667	2 438	2 314	2 184	2 074	1 929	1 803	1 686	1 583	1 477	1 382	1 294	1 212
B.Biological Treatment of Solid Waste	36	83	151	157	162	164	165	167	170	174	166	172	175	180
C.Incineration and Open Burning of Waste	28	12	12	10	8	6	4	2	2	2	2	2	2	2
D.Waste Water Treatment and Discharge	217	201	189	190	189	187	187	186	185	184	183	183	185	187
E.Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other*(please specify)*	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Memo items:														
International bunkers	**950**	**1 793**	**2 069**	**2 148**	**2 281**	**2 281**	**1 978**	**2 148**	**2 259**	**2 164**	**2 070**	**2 067**	**2 207**	**2 407**
Aviation	896	1 713	1 980	2 070	2 199	2 205	1 913	2 071	2 191	2 095	1 996	1 998	2 150	2 345
Navigation	55	80	89	78	83	76	65	77	67	69	74	69	57	62
Multilateral operations	**950**	**1 793**	**2 069**	**2 148**	**2 281**	**2 281**	**1 978**	**2 148**	**2 259**	**2 164**	**2 070**	**2 067**	**2 207**	**2 407**
CO_2 emissions from biomass	**10 421**	**12 758**	**15 540**	**17 030**	**18 302**	**19 217**	**20 111**	**22 366**	**22 409**	**23 657**	**24 910**	**22 621**	**23 538**	**23 651**
CO_2 captured	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Long-term storage of C in waste disposal sites	**22 779**	**27 614**	**29 341**	**29 518**	**29 679**	**29 794**	**29 862**	**29 926**	**29 998**	**30 042**	**30 090**	**30 135**	**30 170**	**30 205**

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
Total Emissions/Removals with LULUCF	**50 142**	**49 739**	**68 615**	**71 418**	**68 368**	**69 375**	**62 782**	**66 349**	**63 854**	**62 029**	**63 321**	**59 372**	**62 100**	**63 035**
Total Emissions without LULUCF	**62 292**	**66 262**	**79 367**	**76 688**	**74 032**	**73 806**	**67 483**	**72 383**	**70 116**	**67 661**	**68 001**	**64 253**	**66 704**	**67 402**
1. Energy	**51 299**	**54 071**	**65 939**	**62 611**	**59 293**	**58 819**	**55 458**	**58 502**	**56 078**	**54 070**	**54 115**	**50 256**	**52 141**	**53 252**
A. Fuel Combustion (Sectoral Approach)	51 197	53 906	65 779	62 430	59 108	58 657	55 253	58 318	55 899	53 887	53 924	50 087	51 979	53 121
1. Energy Industries	14 025	12 264	16 195	15 039	13 757	13 582	12 526	13 852	13 667	12 256	11 225	9 500	10 624	10 449
2. Manufacturing Industries and Construction	9 807	9 945	11 660	11 280	10 902	11 287	10 648	11 264	11 182	11 151	11 026	10 484	10 584	10 791
3. Transport	13 777	18 645	24 749	23 444	23 645	22 228	21 549	22 347	21 695	21 477	22 622	21 981	22 384	23 274
4. Other Sectors	13 552	13 011	13 132	12 623	10 760	11 514	10 484	10 809	9 308	8 955	9 003	8 074	8 339	8 556
5. Other	35	41	44	44	45	45	46	46	47	47	48	49	49	50
B. Fugitive Emissions from Fuels	102	165	160	180	185	162	205	184	180	184	191	169	162	131
1. Solid Fuels	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2. Oil and Natural Gas	102	165	160	180	185	162	205	184	180	184	191	169	162	131
C. CO_2 Transport and Storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
2. Industrial Processes and Other Product Use	**10 871**	**12 080**	**13 312**	**13 963**	**14 624**	**14 876**	**11 911**	**13 772**	**13 930**	**13 481**	**13 777**	**13 884**	**14 449**	**14 162**
A. Mineral Industry	3 092	2 733	2 889	3 053	3 266	3 276	2 715	2 661	2 779	2 704	2 720	2 722	2 740	2 788
B. Chemical Industry	643	674	644	666	601	651	587	677	695	664	602	720	698	722
C. Metal Industry	6 786	8 445	9 569	10 034	10 544	10 737	8 401	10 227	10 246	9 897	10 253	10 240	10 811	10 447
D. Non-Energy Products from Fuels and Solvent Use	349	228	210	209	213	212	207	207	210	216	202	202	201	205

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
E. Electronics Industry														
F. Product Uses as Substitutes for ODS														
G. Other Product Manufacture and Use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
3. Agriculture	**94**	**99**	**103**	**105**	**107**	**105**	**110**	**107**	**106**	**108**	**108**	**111**	**112**	**116**
A. Enteric Fermentation														
B. Manure Management														
C. Rice Cultivation														
D. Agricultural Soils														
E. Prescribed Burning of Savannas														
F. Field Burning of Agricultural Residues														
G. Liming	90	90	91	90	89	88	88	88	87	87	86	86	86	85
H. Urea application	4	8	12	15	18	17	22	20	18	22	22	25	26	31
I. Other carbon-containing fertilizers	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land Use, Land-Use Change and Forestry	**–12 150**	**–16 522**	**–10 752**	**–5 271**	**–5 665**	**–4 432**	**–4 701**	**–6 035**	**–6 262**	**–5 632**	**–4 681**	**–4 882**	**–4 603**	**–4 368**
A. Forest Land	–10 892	–15 999	–8 797	–2 982	–1 954	–1 060	–4 498	–4 465	–4 432	–4 399	–4 366	–4 333	–4 326	–4 320
B. Cropland	175	9	–97	–94	–215	–201	–231	–236	–241	–244	–225	–192	9	39
C. Grassland	626	448	655	654	653	648	354	353	352	351	352	353	351	333
D. Wetlands	42	36	47	37	39	51	68	69	73	70	101	71	59	77
E. Settlements	577	506	581	578	554	589	496	468	449	459	417	421	391	379
F. Other Land	444	366	320	312	304	296	211	204	196	188	181	173	170	166

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
G. Harvested Wood Products	–3 122	–1 889	–3 461	–3 776	–5 046	–4 756	–1 102	–2 427	–2 659	–2 058	–1 141	–1 375	–1 257	–1 042
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	28	12	12	10	8	6	4	2	2	2	2	2	2	2
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	NA,NO	NO,NA	NO,NA
B. Biological Treatment of Solid Waste														
C. Incineration and Open Burning of Waste	28	12	12	10	8	6	4	2	2	2	2	2	2	2
D. Waste Water Treatment and Discharge														
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other *(please specify)*	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Memo Items:														
International bunkers	935	1 768	2 040	2 119	2 251	2 252	1 953	2 120	2 231	2 137	2 044	2 041	2 180	2 383
Aviation	886	1 696	1 960	2 049	2 176	2 182	1 893	2 050	2 168	2 073	1 975	1 977	2 128	2 325
Navigation	49	72	80	70	75	70	60	71	62	64	69	64	53	58
Multilateral operations	**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
Total Emissions/Removals with LULUCF	**417.19**	**338.31**	**314.14**	**309.14**	**304.13**	**298.79**	**295.14**	**291.16**	**283.06**	**278.67**	**274.99**	**269.31**	**266.24**	**263.64**
Total Emissions without LULUCF	**416.22**	**337.35**	**313.19**	**308.18**	**303.18**	**297.83**	**294.18**	**290.20**	**282.10**	**277.71**	**274.03**	**268.35**	**265.27**	**262.68**
1. Energy	47.33	29.78	25.73	25.81	25.19	24.89	24.71	26.29	25.27	26.27	26.68	24.07	24.67	24.74
A. Fuel Combustion (Sectoral Approach)	23.35	16.50	14.64	14.41	13.71	14.08	13.70	14.92	14.01	14.64	15.46	13.30	14.17	14.32
1. Energy Industries	0.33	0.40	0.61	0.71	0.76	0.83	0.91	1.03	1.03	1.07	1.02	0.98	1.04	1.04
2. Manufacturing Industries and Construction	0.54	0.65	0.79	0.83	0.89	0.88	0.84	0.87	0.90	0.90	0.98	0.90	0.91	0.93
3. Transport	2.71	1.17	0.96	0.86	0.79	0.70	0.65	0.60	0.56	0.53	0.49	0.46	0.44	0.42
4. Other Sectors	19.76	14.29	12.28	12.01	11.27	11.67	11.30	12.42	11.51	12.15	12.96	10.96	11.77	11.93
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
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
1. Solid Fuels	13.33	1.09	0.01	0.01	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NA,NO	NO,NA	NO,NA
2. Oil and Natural Gas	10.66	12.18	11.08	11.40	11.48	10.80	11.01	11.37	11.26	11.63	11.22	10.78	10.51	10.42
C. CO_2 Transport and Storage														
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**
A. Mineral Industry														
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
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
D. Non-Energy Products from Fuels and Solvent Use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Electronics Industry														

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
F. Product Uses as Substitutes for ODS														
G. Other Product Manufacture and Use	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NA,NO	NO,NA	NO,NA
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	**216.36**	**195.57**	**184.39**	**183.73**	**184.48**	**183.89**	**186.29**	**185.81**	**183.40**	**182.11**	**182.33**	**183.07**	**182.79**	**183.37**
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	165.45	165.23	165.87
B. Manure Management	23.48	20.06	18.48	18.30	18.38	18.04	18.27	18.19	17.88	17.68	17.61	17.59	17.53	17.48
C. Rice Cultivation	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
E. Prescribed Burning of Savannas	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
G. Liming														
H. Urea application														
I. Other carbon-containing fertilizers														
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land Use, Land-Use Change and Forestry	**0.97**	**0.96**	**0.95**	**0.96**	**0.95**	**0.96**	**0.96**	**0.96**	**0.96**	**0.96**	**0.96**	**0.96**	**0.96**	**0.95**
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
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
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
D. Wetlands	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
E. Settlements	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
F. Other Land	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
G. Harvested Wood Products														

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
5. Waste	151.13	110.61	101.63	96.73	91.61	87.17	81.34	76.24	71.55	67.45	63.06	59.34	55.93	52.71
A. Solid Waste Disposal on Land	145.76	106.67	97.51	92.55	87.36	82.94	77.16	72.10	67.45	63.30	59.08	55.27	51.76	48.47
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
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
D. Waste Water Treatment and Discharge	4.85	2.68	1.64	1.48	1.39	1.29	1.20	1.10	1.05	1.00	0.96	0.92	0.93	0.94
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other *(please specify)*	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Memo Items:														
International bunkers	0.02	0.03	0.04	0.04	0.05	0.05	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.02
Aviation	0.01	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.04	0.04	0.04	0.05	0.02
Navigation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Multilateral operations	**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
Total Emissions/Removals with LULUCF	**15.03**	**15.05**	**12.61**	**12.61**	**12.65**	**13.25**	**12.49**	**11.83**	**12.15**	**12.04**	**12.02**	**12.25**	**12.29**	**12.58**
Total Emissions without LULUCF	14.55	14.60	12.17	12.17	12.21	12.80	12.05	11.38	11.71	11.60	11.58	11.81	11.84	12.13
1. Energy	1.45	1.70	1.90	1.94	1.95	1.95	1.90	1.99	2.00	2.01	2.07	1.96	2.00	2.00
A. Fuel Combustion (Sectoral Approach)	1.45	1.70	1.90	1.94	1.95	1.95	1.90	1.99	2.00	2.01	2.07	1.96	2.00	2.00
1. Energy Industries	0.14	0.15	0.23	0.27	0.29	0.31	0.32	0.37	0.38	0.39	0.37	0.35	0.36	0.34
2. Manufacturing Industries and Construction	0.23	0.40	0.47	0.49	0.50	0.49	0.47	0.47	0.47	0.47	0.50	0.46	0.45	0.46
3. Transport	0.43	0.48	0.54	0.53	0.55	0.54	0.55	0.58	0.58	0.59	0.64	0.64	0.66	0.68
4. Other Sectors	0.64	0.67	0.67	0.64	0.60	0.60	0.57	0.57	0.56	0.55	0.56	0.50	0.52	0.51
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
B. Fugitive Emissions from Fuels	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	NO,IE,NA	NO,IE,NA
1. Solid Fuels	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NO,NA	NA,NO	NO,NA	NO,NA
2. Oil and Natural Gas	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	NO,IE,NA	NO,IE,NA
C. CO_2 Transport and Storage														
2. Industrial Processes and Other Product Use	3.69	3.82	1.44	1.43	1.39	1.56	1.00	0.69	0.63	0.62	0.62	0.61	0.61	0.57
A. Mineral Industry														
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
C. Metal Industry	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
D. Non-Energy Products from Fuels and Solvent Use	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
E. Electronics Industry														

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
F. Product Uses as Substitutes for ODS														
G. Other Product Manufacture and Use	0.75	0.75	0.56	0.53	0.52	0.51	0.47	0.48	0.47	0.45	0.46	0.45	0.45	0.45
H. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
3. Agriculture	9.01	8.45	8.03	7.99	8.05	8.47	8.31	7.86	8.24	8.11	8.04	8.39	8.38	8.68
A. Enteric Fermentation														
B. Manure Management	1.47	1.48	1.46	1.46	1.49	1.48	1.50	1.50	1.48	1.47	1.47	1.47	1.47	1.47
C. Rice Cultivation														
D. Agricultural Soils	7.54	6.97	6.57	6.52	6.57	6.99	6.81	6.36	6.76	6.64	6.57	6.92	6.90	7.20
E. Prescribed Burning of Savannas	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
G. Liming														
H. Urea application														
I. Other carbon-containing fertilizers														
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
4. Land Use, Land-Use Change and Forestry	0.48	0.45	0.44	0.44	0.44	0.44	0.45	0.45	0.44	0.45	0.44	0.44	0.45	0.45
A. Forest Land	0.11	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09
B. Cropland	0.05	0.05	0.05	0.05	0.06	0.06	0.06	0.06	0.06	0.07	0.07	0.07	0.08	0.09
C. Grassland	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
E. Settlements	0.27	0.26	0.25	0.25	0.25	0.25	0.25	0.26	0.26	0.26	0.26	0.25	0.25	0.25
F. Other Land	0.05	0.05	0.05	0.05	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
G. Harvested Wood Products														
H. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5. Waste	0.40	0.62	0.80	0.81	0.82	0.82	0.83	0.84	0.84	0.85	0.84	0.85	0.86	0.88
A. Solid Waste Disposal on Land														
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
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
D. Waste Water Treatment and Discharge	0.32	0.45	0.50	0.51	0.52	0.52	0.53	0.53	0.53	0.53	0.53	0.54	0.54	0.55
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
6. Other *(please specify)*	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	
Memo Items:														
International bunkers	0.05	0.08	0.09	0.09	0.10	0.10	0.08	0.09	0.09	0.09	0.08	0.08	0.08	0.08
Aviation	0.03	0.06	0.07	0.07	0.07	0.07	0.06	0.07	0.07	0.07	0.07	0.07	0.07	0.06
Navigation	0.02	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01
Multilateral operations	**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
Emissions of HFCs – kt CO_2 equivalent	**2.44**	**713.63**	**1 145.81**	**1 152.47**	**1 195.89**	**1 248.53**	**1 308.77**	**1 483.45**	**1 406.67**	**1 485.51**	**1 511.62**	**1 583.08**	**1 620.32**	**1 642.93**
HFC-23 (t)	0.00	0.03	6.40	4.93	6.13	12.78	12.78	12.78	12.74	12.74	12.78	12.78	12.78	12.78
HFC-32 (t)	0.00	3.83	12.94	14.11	16.65	18.40	21.99	26.27	32.20	36.01	38.09	39.15	43.71	42.58
HFC-43-10mee / act (t)	0.00	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
HFC-125 (t)	0.00	91.10	240.48	264.40	280.51	308.71	344.53	408.57	391.78	418.39	426.15	445.91	465.48	449.66
HFC-134a (t)	0.00	430.52	585.86	538.45	556.79	563.88	560.73	603.06	623.17	663.90	685.01	714.58	733.52	788.16
HFC-143a (t)	0.00	106.44	260.35	287.13	291.46	320.48	346.50	410.12	338.49	348.62	343.80	365.01	358.53	343.22
HFC-152a (t)	0.00	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
HFC-227ea (t)	0.00	0.01	1.00	2.02	0.34	0.01	0.00	0.00	2.38	0.00	0.00	0.05	0.43	0.97
HFC-245fa (t)	0.00	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
HFC-365mfc (t)	0.00	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
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
Emissions of PFCs (kt CO_2 equivalent)	**1182.79**	**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**
CF_4 (t)	1014.74	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
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
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
C_4F_{10} (t)	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_5F_{12} (t)	0.00	0.55	5.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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
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**	**304.87**	**313.13**	**309.55**	**392.86**

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
SF_6 (t)	20.64	25.20	21.65	19.89	16.10	16.38	14.99	14.73	13.48	13.68	13.37	13.73	13.58	17.23
Emissions of NF_3 (kt CO_2 equivalent)	**0.00**	**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**
NF_3 (t)	0.00	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

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 and supplementary indicators is provided is provided[24].

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, 2005–2016.

No	Indicator	1990	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
	Priority														
1	Total CO_2 intensity of GDP [t CO_2/Mio Euro]	404	317	334	313	293	288	276	287	271	261	261	247	252	252
2	Energy related CO_2 intensity of GDP [t CO_2/Mio Euro]	263	212	237	218	199	194	190	197	184	176	176	162	166	167
3	Specific CO_2 emissions of passenger cars [g CO_2/km]	215	265	243	251	251	262	255	256	263	266	279	283	279	278
4	Energy related CO_2 intensity of industry [t/Mio Euro]	289	233	245	225	206	209	227	233	218	216	213	203	204	204
5	Specific CO_2 emissions of households [t CO_2/dwelling]	3,40	2,76	2,11	1,98	1,81	1,83	1,74	1,92	1,65	1,75	1,77	1,52	1,60	1,62
6	CO_2 intensity of the commercial and institutional sector [t CO_2/Mio Euro]	20,6	20,0	29,7	28,1	19,9	23,0	19,3	17,0	13,3	9,2	8,8	8,2	7,6	7,8
7	Specific CO_2 emissions of public and autoproducer power plants [t CO_2/TJ]	168	129	126	121	117	108	99	103	106	102	106	107	103	98
	Additional Priority														
1	Freight transport on road [g CO_2/ton-km]	109	79	74	73	71	70	69	68	70	70	66	66	66	68
2	Total CO_2 intensity – iron and steel industry [t CO_2/Mio Euro]	2320	1454	1967	2036	1951	1906	3560	3473	3506	3132	3365	3121	3255	3315
3	Energy related CO_2 intensity – chemical industry [t CO_2/Mio Euro]	567	405	431	379	320	413	430	409	366	370	351	320	327	307
4	Energy related CO_2 intensity – glass, pottery and building materials industry [t CO_2/Mio Euro]	609	528	552	567	597	648	686	626	623	637	626	619	618	625

[24] 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
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
6	Specific energy related CO_2 emissions of cement industry [t CO_2/t production]	0,4	0,4	0,4	0,4	0,4	0,3	0,3	0,4	0,3	0,3	0,4	0,4	0,3	0,3
	Supplementary														
1	Specific diesel related CO_2 emissions of passenger cars [g CO_2/ km]	186	182	179	172	172	171	168	167	166	165	168	166	165	167
2	Specific petrol related CO_2 emissions of passenger cars [g CO_2/ km]	215	265	243	251	251	262	255	256	263	266	279	283	279	278
3	Passenger transport on road [g CO_2/passenger-km]	154	161	160	156	155	151	148	147	146	145	149	147	146	147
4	Passenger transport by air [kg CO_2/passenger]	234	126	111	110	109	99	96	81	93	86	88	85	93	89
5	Energy related CO_2 intensity – food, drink and tobacco industry [t CO_2/Mio Euro]	182	156	161	151	123	137	154	154	160	154	153	139	149	148
6	Energy related CO_2 intensity – paper and printing industry [t CO_2/Mio Euro]	897	694	621	549	510	531	604	624	576	512	480	420	453	422
7	Specific CO_2 emissions of households for space heating [t CO_2/m²]	38	29	22	20	18	19	18	19	17	18	18	15	16	16
8	Specific CO_2 emissions of commercial and institutional sector for space heating [kg CO_2/m²]	22	24	35	34	24	28	22	20	16	11	10	9	9	9
9	Specific CO_2 emissions of public power plants [t CO_2/TJ]	166	133	116	109	102	95	85	86	89	85	83	78	80	76
10	Specific CO_2 emissions of autoproducer plants [t CO_2/TJ]	172	119	161	157	158	147	142	155	154	143	154	164	152	145
11	Carbon intensity of total power generation [t CO_2/TJ]	69	48	60	57	54	49	43	51	53	43	42	39	42	39
12	Carbon intensity of transport [t CO_2/TJ]	72	72	72	70	70	70	69	69	69	68	69	68	68	69
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	0,3
14	Carbon intensity in Industry [kt CO_2 /PJ]	46	40	39	37	36	37	36	36	35	35	34	34	34	33
15	Carbon intensity Households [kt CO_2 /PJ]	41	35	29	28	27	27	26	26	24	24	23	23	23	23

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In "Austria's Annual Greenhouse Gas Inventory 1990–2016" the Umweltbundesamt presents updated figures of greenhouse gas (GHG) emissions in Austria. In 2016 GHG emissions amounted to 79.7 million tonnes of CO_2 equivalents. This corresponds to a 1.3% increase against 1990 and a 1.0% increase compared to 2015. Key drivers for the increase of emissions in 2016 were the higher overall amount of fossil fuel sold in Austria and the higher use of natural gas for heating of households and commercial buildings.

GHG emissions according to Article 2(1) of Decision No. 406/2009/EC ("Effort Sharing Decision") amounted to 50.6 Mt CO_2 equivalents in 2016 and were thus 0.4 Mt CO_2 equivalents below the annual emission allocation (AEA) for 2016. Content and format of this report are in accordance with the obligations under the GHG Monitoring Mechanism Regulation (EU) No. 525/2013.

EMAS
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