umweltbundesamt
ENVIRONMENT AGENCY AUSTRIA

Austria's Annual Greenhouse Gas Inventory 1990–2021

Submission under Regulation (EU) No 2018/1999

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REPORT
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CONTENTS

VORWORT

Dieser Bericht

Der vorliegende Bericht präsentiert die neuesten Daten der Emissionen von Treibhausgasen (THG) Österreichs. Diese Daten betreffen die Emissionen des Jahres 2021 sowie die aktualisierte Zeitreihe der Jahre 1990 bis 2020. Damit liefert der Bericht Daten für das erste Jahr der Zielperiode 2021-2030 unter der Effort-Sharing-Verordnung (ESR, 2018/842/EU[1]).

Der Bericht wird in Erfüllung der Governance Regulation (EU) 2018/1999[2] erstellt, welche in Artikel 26 („Annual Reporting") sowie in ihrer Durchführungsverordnung (EU) 2020/1208[3] die Anforderungen an Inhalt und Format festlegt. Neben den neuen THG-Emissionsdaten im „Common Reporting Format" (CRF) sowie des dazugehörigen Berichts werden zur Erfüllung der Berichtspflicht zusätzliche Informationselemente übermittelt, u.a. zur Umsetzung von Empfehlungen aus den Reviews, Unsicherheiten, Indikatoren und Konsistenzchecks. Die Umsetzung der Berichtsanforderungen wird gemäß Artikel 8 (2) bzw. Annex VII der Durchführungsverordnung[3] in Chapter 6 dargestellt.

Eine detaillierte Darstellung der Daten im Common Reporting Format (CRF) wird der Europäischen Kommission in digitaler Form übermittelt. Die Berichtsanhänge gemäß Durchführungsverordnung[3] sind nicht direkter Bestandteil des vorliegenden Berichts, sondern werden der Europäischen Kommission ebenfalls separat in elektronischer Form 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[4]) 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.

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[1] VERORDNUNG (EU) 2018/842 DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 30. Mai 2018 zur Festlegung verbindlicher nationaler Jahresziele für die Reduzierung der Treibhausgasemissionen im Zeitraum 2021 bis 2030 als Beitrag zu Klimaschutzmaßnahmen zwecks Erfüllung der Verpflichtungen aus dem Übereinkommen von Paris sowie zur Änderung der Verordnung (EU) Nr. 525/2013

[2] VERORDNUNG (EU) 2018/1999 DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 11. Dezember 2018 über das Governance-System für die Energieunion und für den Klimaschutz, zur Änderung der Verordnungen (EG) Nr. 663/2009 und (EG) Nr. 715/2009 des Europäischen Parlaments und des Rates, der Richtlinien 94/22/EG, 98/70/EG, 2009/31/EG, 2009/73,/EG, 2010/31/EU, 2012/27/EU und 2013/30/EU des Europäischen Parlaments und des Rates, der Richtlinien 2009/119/EG und (EU) 2015/652 des Rates und zur Aufhebung der Verordnung (EU) Nr. 525/2013 des Europäischen Parlaments und des Rates.

[3] DURCHFÜHRUNGSVERORDNUNG (EU) 2020/1208 DER KOMMISSION vom 7. August 2020 über die Struktur, das Format, die Verfahren für die Vorlage und die Überprüfung der von den Mitgliedstaaten gemäß der Verordnung (EU) 2018/1999 des Europäischen Parlaments und des Rates gemeldeten Informationen und zur Aufhebung der Durchführungsverordnung (EU) Nr. 749/2014 der Kommission

[4] 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

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

Die Erhebung der Daten berücksichtigt außerdem die Ergebnisse der jährlichen Überprüfung durch internationale FachexpertInnen im Rahmen der so genannten UNFCCC-Reviews. Eine solche Tiefenprüfung fand zuletzt als Centralized Review von 26.09.-01.10.2022 statt, und wurde erfolgreich abgeschlossen. Ergebnisse dieser Prüfungen, inkl. Empfehlungen zur Verbesserung, werden in Form von Review-Berichten (ARR, ‚Annual Review Reports') auf der Website der UNFCCC veröffentlicht. Der letzte verfügbare Bericht zur Prüfung der österreichischen TGH-Inventur stammt aus der Prüfung 2020[5]. 2021 fand kein UNFCCC Review der Österreichischen Treibhausgas-Inventur statt.

Auch auf EU Ebene wird die Österreichische THG-Inventur regelmäßig überprüft. Der letzte so genannte „ESD Review" unter der Effort-Sharing-Decision (EU) 2009/406[6] wurde im Jahr 2021 als sogenannter „annual review" durchgeführt und konnte ebenfalls erfolgreich abgeschlossen werden.[7]

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

[5] https://unfccc.int/process-and-meetings/transparency-and-reporting/reporting-and-review-under-the-convention/greenhouse-gas-inventories-annex-i-parties/inventory-review-reports-2020

[6] ENTSCHEIDUNG Nr. 406/2009/EG DES EUROPÄISCHEN PARLAMENTS UND DES RATES vom 23. April 2009 über die Anstrengungen der Mitgliedstaaten zur Reduktion ihrer Treibhausgasemissionen mit Blick auf die Erfüllung der Verpflichtungen der Gemeinschaft zur Reduktion der Treibhausgasemissionen bis 2020

[7] https://ec.europa.eu/clima/eu-action/effort-sharing-member-states-emission-targets/implementation-effort-sharing-decision_en

Zur Erfüllung der Anforderungen, die sich aus der Klimarahmenkonvention und vor allem aus dem Inkrafttreten des Kyoto-Protokolls[8] am 16. Februar 2005 ergeben haben, wurde entsprechend Artikel 5.1 des Kyoto-Protokolls ein Nationales System eingerichtet. Ziel war 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[9].

Der vorliegende Bericht wurde vom Umweltbundesamt auf Grundlage des Umweltkontrollgesetzes BGBl. Nr. 152/1998[10] 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.

Tabelle B: Datengrundlage des vorliegenden Berichts.

Inventur	Datenstand	Berichtsformat
OLI 2022	11. Jänner 2023	Common Reporting Format (CRF)

Wichtiger Hinweis:

Die in diesem Bericht dargestellten Emissionen in t CO_2-Äquivalent wurden mittels Anwendung der Global Warming Potentials („GWPs“) gemäß 5. Sachstandsbericht („AR5“ – „5th Assessment Report“) des Zwischenstaatlichen Ausschusses für Klimaänderungen (IPCC)[11] ermittelt. Dadurch haben sich die Angaben zu den CH_4-, N_2O- und F-Gas-Emissionen in Tonnen CO_2e gegenüber dem Vorjahresbericht (Short-NIR 2022) – in welchem die Umrechnung in t CO_2-Äquivalent noch gemäß 4. Sachstandsbericht („AR4“) erfolgte – deutlich geändert. Der Effekt ist in Chapter 3.1 separat dargestellt.

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

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

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

[11] Klimaänderung 2013: Die physikalischen wissenschaftlichen Grundlagen. Beitrag der Arbeitsgruppe I zum Fünften Sachstandsbericht des Zwischenstaatlichen Ausschusses für Klimaänderungen, Appendix 8.A. https://www.ipcc.ch/assessment-report/ar5/.

Mit dieser Umstellung erfüllt Österreich die ab 2023 geltenden Anforderungen der EU Governance Regulation[2] an THG-Inventuren, die in ihrer Delegierten Verordnung 2020/1044[12] Artikel 2 („Treibhausgaspotentiale") eine Verwendung der in Anhang 1 dieser Verordnung angeführten Treibhausgaspotentiale gemäß AR5 vorschreibt.

Da im Jänner 2023 die UNFCCC Reporter-Software zur Erstellung der CRF-Berichtstabellen noch keine Umrechnung in AR5 ermöglicht (eine entsprechende neue CRF-Reporter Version wird voraussichtlich für die Berichtspflicht am 15. März zur Verfügung stehen), beinhalten die CRF-Tabellen dieser Submission nach wie vor gemäß 4. Sachstandsbericht des IPCC in CO_2-Äquivalent umgerechnete Emissionsmengen. **Die im CRF angeführten Emissionswerte (CO_2e) für die Zeitreihe 1990–2021 entsprechen somit nicht den in diesem Bericht angeführten THG-Werten (CO_2e) nach AR5.**

[12] DELEGIERTE VERORDNUNG (EU) 2020/1044 DER KOMMISSION vom 8. Mai 2020 zur Ergänzung der Verordnung (EU) 2018/1999 des Europäischen Parlaments und des Rates im Hinblick auf die Werte für Treibhauspotenziale und die Inventarleitlinien und im Hinblick auf das Inventarsystem der Union sowie zur Aufhebung der Delegierten Verordnung (EU) Nr. 666/2014 der Kommission

1 INTRODUCTION

This report presents the latest results from the Austrian greenhouse gas (GHG) inventory, which documents the annual national GHG emissions for the years 1990 to 2021. By documenting annual emissions up to and including the year 2021, the report presents GHG data for the first year of the target period under the current EU Effort-Sharing-Regulation (ESR, Regulation (EU) 2018/842[13]) covering greenhouse gas emissions for sectors not covered by the emissions trading system.

The greenhouse gas inventory is submitted to the European Commission by the Austrian Federal Government in fulfilment of Austria's obligations under Article 26 of Regulation (EU) No 218/1999 ("*Governance Regulation*")[14] governing reporting of greenhouse gas inventory data by Member States from 2023 onwards. The purpose of this regulation is to monitor anthropogenic greenhouse gas emissions and to evaluate the progress towards meeting the Union greenhouse gas reduction commitments in accordance with the Paris Agreement.

According to the above mentioned regulation and the reporting requirements, which are in accordance with those under UNFCCC, Member States are obliged to determine their anthropogenic emissions by sources and removals by sinks applying the methods described in the *2006 IPCC Guidelines for National Greenhouse Gas Inventories*[15], and to submit information in accordance with the *Reporting Guidelines (Decision 24/CP.19)*[16] established by the Conference of the Parties to the UNFCCC.

The national greenhouse gas inventory has to be submitted to the European Commission (EC) every year no later than 15 January. Member States have to submit elements of their national inventory reports (NIR) covering greenhouse gas and inventory information as listed in Annex V referred to in Article 26(3) on 'Annual Reporting' of the EU Governance Regulation[14].

The 15 January submission might include preliminary data. Finalized data complemented with a comprehensive national inventory report shall subsequently be submitted by 15 March each year.

The elements of the so-called 'Short-NIR' are based on the information items referred to in Article 26 (3) and more specifically in Annex V, Part 1 (GHG Inventories Information) of Regulation (EU) 2018/1999[14] (Governance Regulation). In addition to the Governance Regulation, a Commission Implementing Regulation (EU) 2020/1208[17] was adopted, specifying the reporting obligations and

[13] REGULATION (EU) 2018/842 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 May 2018 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement and amending Regulation (EU) No 525/2013

[14] REGULATION EU) 2018/1999 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2018 on the Governance of the Energy Union and Climate Action, amending Regulations (EC) No 663/2009 and (EC) No 715/2009 of the European Parliament and of the Council, Directives 94/22/EC, 98/70/EC, 2009/31/EC, 2009/73/EC, 2010/31/EU, 2012/27/EU and 2013/30/EU of the European Parliament and of the Council, Council Directives 2009/119/EC and (EU) 2015/652 and repealing Regulation (EU) No 525/2013 of the European Parliament and of the Council

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

[16] http://unfccc.int/resource/docs/2013/cop19/eng/10a03.pdf#page=2
http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf

[17] COMMISSION IMPLEMENTING REGULATION (EU) 2020/1208 of 7 August 2020 on structure, format, submission processes and review of information reported by Member States pursuant to Regulation (EU) 2018/1999 of the European Parliament and of the Council and repealing Commission Implementing Regulation (EU) No 749/2014

providing templates. Information on how Austria's submission fulfills the obligations as included in Articles 9 to 23 Chapter III of this Commission Implementing Regulation is provided in chapter 6.

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[18].

Table 1: Status of the present report.

Reporting Obligation	Format	Inventory	Version
Governance Regulation	Common Reporting Format (CRF)	OLI 2022	January 11th 2023

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*.

Important Note:

The CO_2-equivalent emissions presented in this report were calculated by applying the Global Warming Potentials ('GWPs') according to the 5th Assessment Report ('AR5')[11] of the Intergovernmental Panel on Climate Change (IPCC). As a result, the values for CH_4, N_2O and F-gas emissions in metric tons of CO_2e have changed significantly compared to the previous years' report (Short-NIR 2022), which presented the CO_2 equivalents in accordance with the 4th Assessment Report ('AR4'). The effects are shown separately in chapter 3.1.

With this change, Austria fulfills the requirements of the EU Governance Regulation[14] on GHG inventories applicable from 2023 onwards, which, by means of its Delegated Regulation 2020/1044[19] Article 2 ('Greenhouse Gas Potentials'), requires the use of the GHG potentials listed in Annex 1 of this Regulation in accordance with AR5.

Since the UNFCCC CRF Reporter GHG inventory software used to create the CRF reporting tables does not yet allow conversion to the GWPs according to AR5 (an updated CRF reporter version is expected for 15 March submission), the emissions presented as CO_2 equivalents in the CRF were calculated according to AR4 GWPs. **The emission values for the 1990-2021 time series presented in CO_2 equivalents in the current CRF tables attached to this submission therefore deviate from correctly calculated GHG values given in this report.**

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

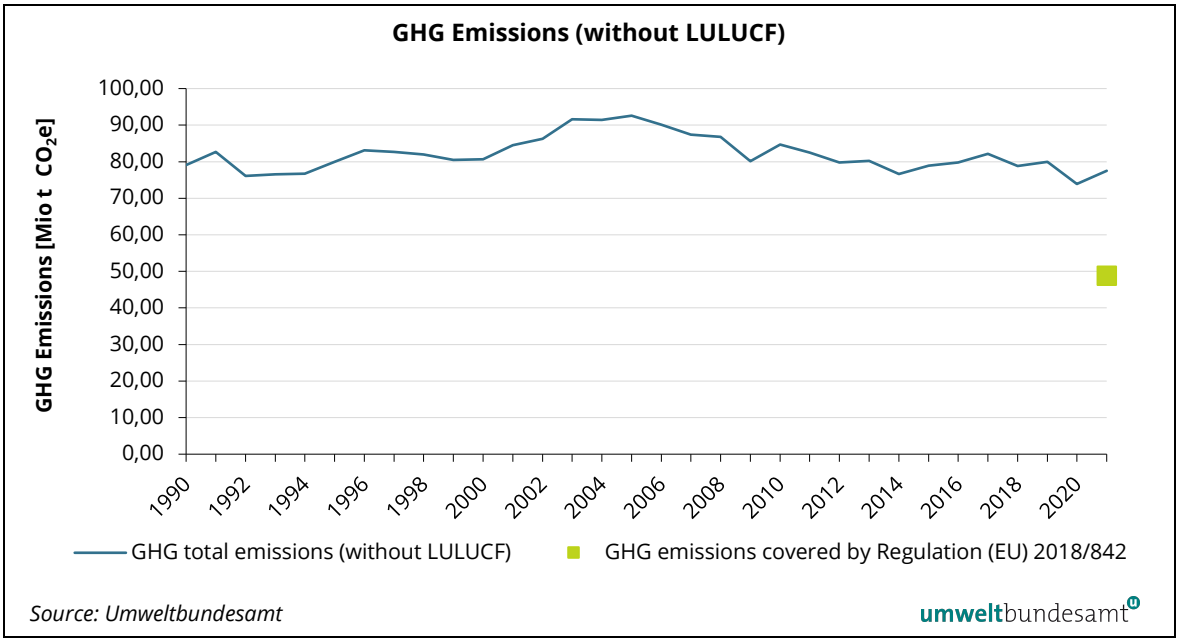
[19] COMMISSION DELEGATED REGULATION (EU) 2020/1044 of 8 May 2020 supplementing Regulation (EU) 2018/1999 of the European Parliament and of the Council with regard to values for global warming potentials and the inventory guidelines and with regard to the Union inventory system and repealing Commission Delegated Regulation (EU) No 666/2014

2 EMISSION TRENDS

2.1 Overview

In 2021 Austria's total greenhouse gas (GHG) emissions (without Land Use, Land Use Change and Forestry – LULUCF) amounted to 77.5 Mt CO_2 equivalents (CO_2e). Compared to the 1990 base year[20], 2021 GHG emissions without LULUCF decreased by 1.9%. Compared to 2020 GHG emissions increased by 4.9%.

Figure 1: Trend in GHG emissions for 1990-2021 without LULUCF.



The CO_2-equivalent emissions presented in this report were calculated on the basis of the Global Warming Potentials ('GWPs') according to the 5th Assessment Report ('AR5')[11] of the Intergovernmental Panel on Climate Change (IPCC) for the first time. The change of GWPs has led to an increase in national total GHG emissions in metric tons of CO_2e over the entire time series (please refer to chapter 1 and 3.1).

Greenhouse gas emissions covered by Regulation (EU) No. 2018/842 ('Effort Sharing Regulation'[13]) amounted to 48 801 253 t CO_2 equivalents in 2021, and were thus slightly above the level of the annual emission allocation (AEA) for this year (see Table 2)

[20] Austria's base year under the UNFCCC is 1990. Under the EU Effort Sharing, 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.

Table 2: GHG Emissions (covered by the ESR) and status of ESR-target achievement 2021

t CO_2-Äquivalent (AR5)	**2021**
Total GHG emissions without LULUCF	77 528 522
Total verified emissions from stationary installations under Directive 2003/87/EC2	28 703 349
GHG emissions covered by Regulation (EU) 2018/842[13]	48 801 253*
Annual Emission Allocations (AEA) pursuant to Article 4(3) of Regulation (EU) 2018/842[21]	48 768 448
Deviation from AEA	-32 805

* *Defined as: Total greenhouse gas emissions without LULUCF minus total verified emissions from stationary installations under Directive 2003/87/EC ("ETS emissions") minus CO_2 emissions from 1.A.3.a civil aviation.*

2.2 Trend description

The largest increases in emissions between 2020 and 2021 took place in the sectors *Energy (CRF 1)* (+2 212 kt CO_2e; +4.4 %) and *Industrial Processes and Other Product Use (CRF 2)* (+1 435 kt CO_2e; +9.2%).

The main reasons for the emissions increase in sector *Energy (CRF 1)* were the higher natural gas and gasoil consumption in category *1.A.4 Other Sectors* as well as the higher diesel oil and motor gasoline sales in category *1.A.3 Transport.*

Emissions from *Industrial Processes and Other Product Use (CRF 2)* increased due to a strong increase in iron and steel production (+7.2 %) after lower production levels during the pandemic year 2020. The increase was partly counterbalanced by a strong decrease of emissions of F-Gases (-14 %), where on the one hand the effects of measures related to the EU F-gas regulation (No. 517/2014) are now visible, and on the other hand lower emissions due to decommissioning of equipment were reported.

Net removals from *LULUCF* (*CRF 4*) show an increase of 173% (6 610 kt CO_2e) from 2020 to 2021, mainly caused by increased sinks in the Forest land soil and harvested wood products. However, it should be noted that the annual variations of the LULUCF category (both positive and negative) are very high over the entire 1990-2021.

Emissions from *Agriculture (CRF 3)* increased slightly by 0.3 % (+24 kt CO_2e) from 2020 to 2021, mainly due to rising emissions from mineral fertilizer application. In addition, slightly increased cattle numbers (dairy cows and non-dairy cattle) resulted in higher emissions from *enteric fermentation* in 2021 compared to the previous year.

[21] as included in Annex II of COMMISSION IMPLEMENTING DECISION (EU) 2020/2126 of 16 December 2020 on setting out the annual emission allocations of the Member States for the period from 2021 to 2030 pursuant to Regulation (EU) 2018/842 of the European Parliament and of the Council

The declining emission trend of recent decades continues for the sector *Waste (CRF 5)* with a further decline by 4.2 % (−53 kt CO_2e) mainly due to the decreasing carbon content of waste deposited in preceding years.

Table 3: Summary of Austria's anthropogenic greenhouse gas emissions by sector (without LULUCF).

GHG source and sink categories	1. Energy	2. IPPU	3. Agriculture	4. LULUCF	5. Waste	6. Other
	CO_2 equivalents (kt)					
1990	52 665	13 615	8 400	-12 207	4 367	NO*
1995	54 162	13 606	8 130	-19 771	4 055	NO
2000	55 291	14 408	7 644	-14 284	3 277	NO
2005	66 715	15 652	7 181	-18 418	3 041	NO
2010	59 281	15 935	7 188	-19 827	2 289	NO
2011	56 971	16 126	7 265	-15 433	2 143	NO
2012	54 830	15 730	7 212	-5 846	2 017	NO
2013	55 005	16 139	7 211	-6 299	1 874	NO
2014	51 280	16 289	7 346	-7 693	1 747	NO
2015	53 064	16 800	7 376	-6 620	1 645	NO
2016	54 289	16 498	7 489	-7 069	1 546	NO
2017	56 001	17 231	7 444	-3 311	1 457	NO
2018	54 555	15 596	7 330	4 872	1 373	NO
2019	54 937	16 520	7 221	2 086	1 315	NO
2020	49 930	15 524	7 197	-3 826	1 259	NO
2021	52 142	16 959	7 221	-10 435	1 207	NO

* *not occurring*

The most important gas in the Austrian GHG balance remains carbon dioxide (CO_2) with a share of 85 % in total 2021 emissions (without LULUCF). Emissions of CO_2 primarily result from combustion activities. Methane (CH_4), which mainly arises from livestock farming and waste disposal, contributes 8.4 % to total national GHG emissions. Nitrous oxide (N_2O), with agricultural soils as the main source, contributes another 4.0% in 2021. The remaining 2.4% are emissions of fluorinated compounds, which are mostly emitted from the use of these gases as substitutes for ozone depleting substances (ODS) in refrigeration equipment.

Table 4: Austria's anthropogenic greenhouse gas emissions (without LULUCF) by gas.

GHG emissions	CO_2	CH_4	N_2O	HFCs	PFCs	SF_6	NF_3
	CO_2 equivalents (kt)						
1990	62 167	11 319	4 011	2.0	1 063	485	NO,NA
1995	64 044	10 514	3 856	324	75	1 134	6.0
2000	66 172	9 218	3 871	677	80	592	9.8
2005	79 097	8 514	3 188	1 104	150	509	26
2010	72 017	7 836	2 994	1 426	71	346	3.9
2011	69 909	7 604	3 087	1 518	66	317	3.8
2012	67 283	7 470	3 061	1 599	46	321	8.0
2013	67 776	7 349	3 046	1 689	45	315	9.1
2014	64 176	7 191	3 127	1 787	48	324	9.9
2015	66 366	7 103	3 142	1 897	45	319	13
2016	67 227	7 023	3 231	1 884	46	405	5.7
2017	69 609	6 993	3 175	1 892	40	412	11
2018	66 572	6 758	3 136	1 946	29	398	15
2019	67 956	6 609	3 131	1 802	35	450	13
2020	62 121	6 503	3 089	1 705	27	455	11
2021	66 019	6 498	3 121	1 486	23	371	12

The dominant sector regarding GHG emissions in Austria is *Energy*, causing 67 % of the total national GHG emissions in 2021 (67 % in 1990), followed by the sectors *Industrial Processes and Other Product Use* (22 % in 2021) and *Agriculture* (9.3 % in 2021).

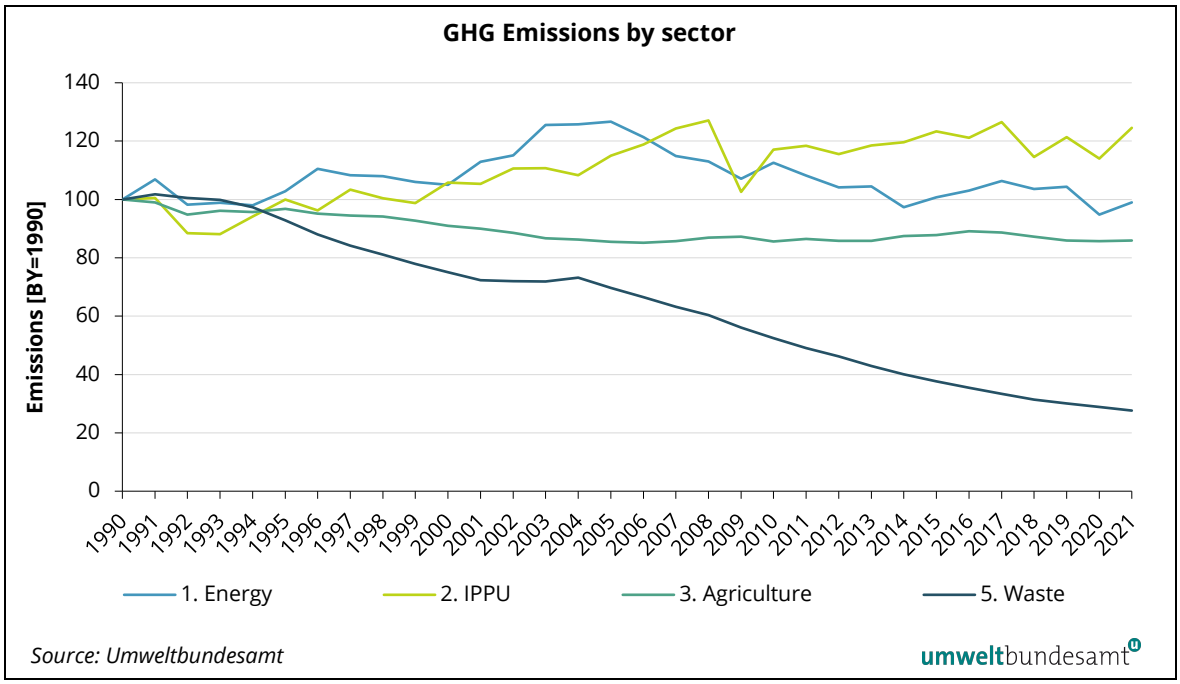
Table 5: Austria's greenhouse gas emissions (without LULUCF) for 1990 and 2021 expressed as aggregate levels and trends, as well as respective sector contributions.

GHG	1990	2021	Trend 1990–2021	1990	2021
	Emissions [kt CO_2e]			Share [%]	
Total	**79 047**	**77 529**	**-1.9%**	**100%**	**100%**
Energy	52 665	52 142	-1.0%	67%	67%
IPPU	13 615	16 959	+25%	17%	22%
Agriculture	8 400	7 221	-14%	11%	9.3%
Waste	4 367	1 207	-72%	5.5%	1.6%

Total emissions without emissions from sector LULUCF

The only sector with 2021 GHG emissions above the level in 1990 is *Industrial Processes and Other Product Use* (+25 %; +3 343 kt CO_2e). All other sectors show decreasing trends, with the most significant decreases in GHG emissions in the sectors *Waste* (-72 %; -3 160 kt CO_2e) and *Agriculture* (-14 %; -1 179 kt CO_2e).

Figure 2: Trend in 1990-2021 emissions 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.

2.2.1 Energy

In 2021, greenhouse gas emissions from sector 1 Energy amounted to 52 142 kt CO_2 equivalents which corresponds to 67% of total national emissions. Emissions from fuel combustion (1.A) contribute 99% of total Energy emissions, while fugitive emissions from fuels (1.B) are of minor importance.

The most important **sub-category** of *1.A Fuel Combustion Activities* is *1.A.3 Transport* with a share of 42% in 2021, followed by *1.A.2 Manufacturing Industries and Construction* (21%), *1.A.4 Other Sectors* (19%) and the sub-category *1.A.1 Energy Industries* (17%). The most important **greenhouse gas** is CO_2, contributing 98.1% to total sectoral GHG emissions, followed by CH_4 (0.8%) and N_2O (1.1%).

From 2020 to 2021, emissions from sector *1.A Fuel Combustion Activities* increased by 4.5% (2 236 kt CO_2e). The main drivers of the trend were the categories *1.A.4 Other Sectors* (+1 006 kt CO_2e) due to higher natural gas (+12%) and gasoil (+11%) consumption and *1.A.3 Transport* (+777 kt CO_2e) due to higher diesel oil (+3.2%) and motor gasoline (+5.5%) sales. Between 2020 and 2021, emissions from *1.A.1 Energy* increased by 0.6% (+55 kt CO_2e). Despite this overall increase, it is worth noting varying 2020-2021 changes for different fuels, with emissions from natural gas power plants increasing (+240 kt CO_2), while emissions from coal power plants decreased due to further closures (-356 kt CO_2).

Emissions from category *1.A.2 Manufacturing Industries and Construction* increased by 3.8%, mainly due to higher consumption of natural gas, fuel waste and liquid fuels from stationary and from mobile sources. The category *1.A.4 Other Sectors* emissions increased by 11% following heating degree days being 13% higher in 2021 than in 2020.

The overall trend of greenhouse gas emissions of the *Energy* sector shows the same level for 1990 and 2021. Greenhouse gas emissions 2021 from *1.A.3.b Road transport* are however 59% higher than in 1990. Year to year variations are mainly due to the following factors:

- 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
- Economic situation as reflected in the gross domestic product (GDP)
- Change in power generation (switch from coal to gas)

Sub-category trends between 1990 and 2021

In 2021 emissions from sub-category ***1.A.1 Energy Industries*** were 37% below the level in 1990. Emissions from power plants have generally been decreasing since 2005, mainly because of the growing contribution of renewable energy sources, the substitution of solid and liquid fuels by natural gas and biomass, as well as improvements in efficiency.

The share of biomass used as a fuel in this sector increased from 0.9% in 1990 to 28% in 2021. The contribution of hydro, wind and photovoltaic power plants to total public electricity production increased from 69% in 1990 to 82% in 2021. Electricity consumption has increased by 51% since 1990; however, since 2002 the increase in consumption has been largely covered by electricity imports.

Energy related GHG emissions from ***1.A.2 Manufacturing Industries and Construction*** increased by 14 % from 1990 to 2021, mainly due to increasing emissions from *Off-road vehicles and other machinery (1.A.2.g.7)* as well as the *Chemicals Industry (1.A.2.c)*. Emissions from *Pulp, Paper and Print (1.A.2.d)*, *Other Manufacturing Industries (1.A.2.g.8)* and *Iron and Steel (1.A.2.a)* are however decreasing since 1990. Fuel consumption increased by 39% in that period, mainly due to increased use of natural gas and biomass. As natural gas has a lower carbon content, and CO_2 emissions from biomass combustion are not accounted for under the UNFCCC reporting framework, the increase in GHG emissions from this category is significantly smaller (only +14%) compared to the increase in fuel consumption.

The sector ***1.A.3 Transport*** showed an increase in GHG emissions since 1990 (+57%) mainly due to an increase of road performance (mileage) of diesel cars 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 called fuel export mainly caused by a lower fuel tax compared to Austria's neighbouring countries – has increased considerably since 1990. Between 2005 and 2012 total GHG emissions decreased due to lower amounts of fuel sold together with an increased use of biofuels for blending and the gradual replacement with newer vehicles with lower specific fuel consumption. Since then GHG emissions from transport have been **gradually increasing** with rising traffic volumes, although a sharp decrease in the pandemic year 2020 was observed. **From 2020 to 2021** GHG emissions increased again by 3.7% due to increased vehicle kilometres. Sales of biofuels – pure and for blending – increased by 2.0 % in this period.

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 ***1.A.4 Other Sectors***. Emissions in 2021 were 30% 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 (less carbon intensity of overall declining fossil fuel use) as well as the growing importance of district heating and the modernisation of heating systems. Total fuel consumption of this sub-category has decreased by 2.7% since 1990.

Emissions from ***1.B Fugitive emissions*** decreased by 57% since 1990 due to the progressive closure of coal mines up until 2006. There have been no coal-mining activities in Austria since 2007. Fugitive Emissions from ***1.B.2 Oil and Natural gas*** are also below 1990 level (-17%) as volumes of crude oil and crude gas produced declined and the material of gas distribution network has changed over time (less cast iron, more PE).

2.2.2 Industrial Processes and Other Product Use

In 2021, greenhouse gas emissions from *Industrial Processes and Other Product Use* amounted to 16 959 kt CO_2 equivalent, which corresponds to 22% of total national emissions.

The most important **sub-categories** of this sector are *metal industry* and *mineral industry*, generating 65% and 18% of total sectoral emissions, respectively. The most important **greenhouse gas** of this sector is CO_2 with a contribution of 88% to total sectoral emissions, followed by HFCs with 9% and SF_6 with 2.2%, the other GHGs contribute less than 0.5 % each.

From 2020 to 2021, overall emissions from this sector increased by 9.2% due to a strong increase in iron and steel production (+7.2 %) after low production levels in the pandemic year 2020. The increase was partly counterbalanced by a strong decrease of emissions of F-Gases (-14 %), where on the one hand the effects of measures related to the EU F-gas regulation (No. 517/2014) are now visible, and on the other hand lower emissions from decommissioning were reported.

The **overall trend** in GHG emissions from *Industrial Processes and Other Product Use* shows an increase of 25% from 1990 to 2021. Within this period, emissions were at minimum in 1993 then increased until peaking in 2008. Since then, emissions fluctuated just below this maximum. **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) the economic crisis of 2009, (iv) increasing iron and steel production resulting in 61% higher GHG emissions in 2021 compared to 1990 and (iv) a strong increase of HFC emissions over the 1990-2021 period from 2 to 1 486 kt CO_2 equivalent.

Sub-category trends between 1990 and 2021

The largest increase in GHG emissions between 1990 and 2021 can be observed in the *metal industry* due to an increase in GHG emissions from iron and steel production (+61%). In sub-categories *mineral industry* and *chemical industry*, GHG emissions declined over the same period by 2.0% and 46%, respectively. Emissions from *non-energy products from fuels and solvent use* dropped by 53%, due to legal measures controlling the solvent content of products and their use.

Emissions of *fluorinated gases* increased by 22% compared to 1990, driven by increasing emissions of HFCs (+359% since 1995) due to HFCs replacing Ozone Depleting Substances (ODSs) as cooling agents. The maximum was reached in 2018; since then emissions are decreasing.

2.2.3 Agriculture

In 2021, greenhouse gas emissions from *Agriculture* amounted to 7 221 kt CO_2 equivalent, which correspond to 9.3% of total national emissions.

The **most important sub-categories** of this sector are *enteric fermentation* (58%) and *agricultural soils* (25%). *Agriculture* is the largest source of national N_2O and CH_4 emissions: in 2021, 72% (8.5 kt N_2O) of total N_2O emissions and 74% (172 kt CH_4) of total CH_4 emissions originated from this sector. Total GHG emissions from the sector *Agriculture* are dominated by CH_4 with a share of 67% and N_2O with a share of 31%. CO_2 emissions account for 2.1% of the emissions from this sector.

From 2020 to 2021 GHG emissions increased slightly by 0.3%, mainly due to rising emissions from mineral fertilizer application. In addition, slightly increased cattle numbers (dairy cows and non-dairy cattle) resulted in higher emissions from *enteric fermentation* in 2021 compared to the previous year.

The **overall trend** in GHG emissions from *Agriculture* shows a decrease of 14% from 1990 to 2021. The **main drivers** for this trend are decreasing livestock numbers of cattle and swine as well as lower amounts of N-fertilizers applied on agricultural soils.

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

In 2021, net removals from sector *LULUCF* amounted to −10 435 kt CO_2 equivalent, which correspond to 13% of national total GHG emissions (without LULUCF) in the same year.

With regard to the **overall trend**, the net removals from *LULUCF* are 15% lower in 2021 compared to those in the base year 1990 with substantial annual variations in the observed period (regarding the regression trend line the decrease of net removals is about 75 % for the observed period from 1990 to 2021). The **main driver** for this trend is the biomass and soil carbon stock change in *Forest land*. Fluctuations are due to weather conditions which influence growth rates (e.g. very low increment in 2003) as well as decay in forest soils, natural disturbances (windthrows and bark beetle infestations), 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 −10 408 kt CO_2 equivalent in 2021 (including indirect emissions).

Compared to the previous submission, the *Forest land* category has been subject to major revisions in the time series due to the availability of data from the latest cycle of the national forest inventory (2016/2021) which changed the time series since 2009, new soil carbon modelling results and, for the first time, emissions/removals estimates for the forests not-in-yield (see chapter 3.3.4). Due to these recalculations, the *LULUCF* category and the *Forest land* subcategory became, for the first time since reporting began, net GHG sources in single years, namely in 2018 and 2019. The net source values in these years are explained by high harvest rates due to natural disturbances and low increments due to weather conditions.

Harvested Wood Products (4.G) is the second largest sink category and contributed –1 889 kt CO_2 equivalent in 2021. After the low domestic production and consequently exceptionally low HWP sink in 2020 (due to a huge amount of salvage logged disturbance wood from the years before, as well as low wood prices and Corona pandemic influences), the net sink of the HWP category has increased in 2021 again to a typical level as in the last years before 2020. Together, CH_4 and N_2O emissions amounted to 139 kt CO_2 equivalent (including indirect emissions). Total net emissions arising from the other non-forest sub-sectors (excluding HWPs) amounted to 1 862 kt CO_2 equivalent in 2021 (including indirect emissions).

2.2.5 Waste

In 2021, greenhouse gas emissions from the sector *Waste* amounted to 1 207 kt CO_2 equivalent, which correspond to 1.6% of total national emissions.

The most important sub-category of *Waste* is *solid waste disposal*, which caused 73% of the emissions from this sector in 2021, followed by *waste water treatment and discharge* (15%) and *biological treatment of solid waste* (12%). The most important greenhouse gas is CH_4 with a share of 81% in emissions, mainly arising from *solid waste disposal*, followed by N_2O with 19% and CO_2 with 0.2%.

From 2020 to 2021 GHG emissions continued to decrease (−4.2%) mainly due to the decreasing carbon content of waste deposited in preceding years.

The **overall trend** in GHG emissions from *Waste* is decreasing, with a decrease of 72% from 1990 to 2021. 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

The Austrian greenhouse gas inventory is subject to continuous improvement. An inventory improvement programme is a formal part of the Quality Management System (QMS) of the National Inventory System (see chapter 4).This programme enhances transparency and enables 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 the national inventory. 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).

This chapter describes the changes in the emissions estimates made since the last submission to the UNFCCC.

Note:

The CO_2-equivalent (CO_2e) emissions presented in this report were calculated for the first time by applying the Global Warming Potentials ('GWPs') according to the 5th Assessment Report ('AR5')[11] of the Intergovernmental Panel on Climate Change (IPCC). As a result, the values for CH_4, N_2O and F-gas emissions expressed in metric tons of CO_2e deviate significantly from the previous years' report (Short-NIR 2022), which presented the CO_2 equivalents in accordance with the 4th Assessment Report ('AR4'). The effects from this switch of GWPs from AR4 to AR5 is illustrated in Table 6.

Considering the recalculations of Austria's GHG emissions solely due to methodological improvements, total GHG emissions (excluding LULUCF) reported this year differ only slightly from the data reported in submission 2022 (see Table 8).

Note:

In order to make a reasonable, technically correct comparison of this years' (submission 2023) with previous years' (submission 2022) data, it was necessary to analyze the recalculations on basis of national totals considering AR5 GWPs. For this reason, the results of the 2022 submission (OLI 2021) – originally converted to tonnes CO_2 equivalent by applying the GWPs according to AR4 – were converted to AR5 GWPs to allow for a discussion of recalculations purely due to methodological improvements (see Chapter 3.2).

3.1 Effect of GWP change (AR5) for submission 2023

Table 6 shows the effect of GWP ('global warming potentials') change from AR4 to AR5 for the latest inventory (OLI 2022; 2023 submission) over the whole time series.

Table 6: Effect of GWP switch from AR4 to AR5

	1 Energy	2 IPPU	3 Agriculture	4 LULUCF	5 Waste	National Total*
			kt CO_2 equivalent			
1990	97	-209	282	-11	440	611
1995	51	-95	295	-12	401	652
2000	33	-126	272	-12	311	490
2005	13	-81	255	-12	280	467
2010	12	-68	263	-13	198	405
2011	8.5	-75	245	-13	182	360
2012	11	-79	245	-12	168	344
2013	9.0	-84	250	-12	153	328
2014	4.6	-90	241	-12	139	295
2015	3.5	-93	243	-12	127	281
2016	3.2	-92	234	-12	115	261
2017	6.1	-93	245	-12	106	264
2018	-2.1	-99	244	-12	97	239
2019	-4.4	-105	240	-12	90	221
2020	-2.3	-102	235	-11	83	214
2021	-1.6	-104	235	-11	77	206

* *without emissions from LULUCF*

The effect of the new GWPs (higher total GHG emissions over the time series) decreased from +611 kt in 1990 to +206 kt in 2021. This trend is mainly explained by decreasing CH_4 emissions from sectors Waste (-116 kt CH_4) and Agriculture (-31 kt CH_4) from 1990 to 2021. For more information refer to chapter 2.2.

The following table presents a comparison of the GWPs obtained from the "4th Assessment Report" with the GWPs obtained from the "5th Assessment Report":

Table 7: GWPs according to AR5 und AR5

	GWP (AR4[22])	GWP (AR5[23])
CO_2	1	1
CH_4	25	28
N_2O	298	265
F Gases:		
SF_6	22 800	23 500
NF_3	17 200	16 100
HFCs	124 – 14 800	4 – 12 400
PFCs	7 390 – 12 200	6 630 – 11 100

3.2 Effect due to inventory improvements

The implementation of inventory improvements has hardly changed Austria's National total emissions of **1990** without LULUCF (+0.02 %; +16 kt CO_2e). The effect of inventory revisions to the **2020** national total emission amount (without LULUCF) is + 0.14% (+ 102 kt CO_2e) when excluding the effect of shifting from AR4 to AR5 GWPs in submission 2023.

Table 8: Recalculations of Austria's GHG emissions compared to the previous submission.

	National Total GHG emissions without LULUCF			
	OLI 2022 (AR5)	OLI 2021 (AR5[24])	Recalculation Difference	
	[kt CO_2e]	[kt CO_2e]	[kt CO_2e]	[%]
1990	79 047	79 031	16	0.02%
1995	79 953	79 925	28	0.04%
2000	80 619	80 566	53	0.07%
2005	92 589	92 488	101	0.11%
2010	84 693	84 556	137	0.16%
2011	82 506	82 370	136	0.16%
2012	79 788	79 659	129	0.16%
2013	80 229	80 105	123	0.15%
2014	76 663	76 535	128	0.17%
2015	78 884	78 771	113	0.14%

[22] https://www.ipcc.ch/site/assets/uploads/2018/02/ar4-wg1-chapter2-1.pdf (Table 2.14)

[23] https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL.pdf (Table 8.A.1)

[24] In order to make a reasonable, technically correct comparison of this years' (submission 2023) with previous years' (submission 2022) data, it was necessary to analyze the recalculations on basis of national totals considering AR5 GWPs. For this reason, the results of the 2022 submission (OLI 2021) – originally converted to tonnes CO_2 equivalent by applying the GWPs according to AR4 – were converted to AR5.

	National Total GHG emissions without LULUCF			
	OLI 2022 (AR5)	OLI 2021 (AR5[24])	Recalculation Difference	
	[kt CO_2e]	[kt CO_2e]	[kt CO_2e]	[%]
2016	79 821	79 732	89	0.11%
2017	82 132	82 057	76	0.09%
2018	78 854	78 798	56	0.07%
2019	79 994	79 962	32	0.04%
2020	73 911	73 809	102	0.14%

Inventory revisions for the year 2020 are significantly affected by recalculations in the Sector *1 Energy*, more specific in *1.A.3.b Road Transportation* regarding light and heavy duty trucks (*1.A.3.b.2* and *1.A.3.b.3*) and *1.A.4.b Residential*, as well as Sector *2 IPPU*, in particular *2.C.1 Iron and Steel Production*, *2.F.1 Refrigeration and Air Conditioning* and *2.A Mineral Industry.*

Estimates for *LULUCF* were revised for the entire time series (1990: -130 kt CO_2e; 2020: -2 559 kt CO_2e) and changed significantly. New results from the latest cycle of the national forest inventory (2016/21) were incorporated, the forest soil C stock changes were recalculated for the complete time series and estimates for the forests not-in-yield were carried out for the first time for this submission. Furthermore the methods to estimate land use changes between and involving *Cropland* and *Grassland* categories were improved.

Table 9: Recalculations per sector (inventory improvements)

	OLI 2022 (AR5)		OLI 2021 (AR5)		Recalculation Difference	
THG	**1990**	**2020**	**1990**	**2020**	**1990**	**2020**
	[kt CO_2e]		[kt CO_2e]		[kt CO_2e]	
Total*	**79 047**	**73 911**	**79 031**	**73 809**	**16**	**102**
1. Energy	52 665	49 930	52 903	49 927	-238	3.2
2. IPPU	13 615	15 524	13 361	15 391	255	132
3. Agriculture	8 400	7 197	8 401	7 199	-1.3	-1.4
4. LULUCF	-12 207	-3 826	-12 077	-1 267	-130	-2 559
5. Waste	4 367	1 259	4 367	1 292	0.6	-32

* *without emissions from LULUCF*

The following table presents the recalculation difference with respect to last years' submission for each gas (positive values indicate that this years' estimate is higher). Regarding emissions in 2020, CO_2 emissions were revised upwards (+84 kt CO_2), whereas N_2O (-22 kt CO_2e) and CH_4 (-15 kt CO_2e) emissions were revised downwards. Emissions of fluorinated gases have been revised upwards by 55 kt CO_2e.

Recalculations of CH_4 and N_2O are largely attributable to revisions in sector *5 Waste*, category *5.B.1 Composting,* where volumes of home composted waste were re-estimated using a new method (balance approach) delivering more plausible results than previously reported.

Emissions reported under *2.F.1 Refrigeration and Air Conditioning* (F gases) were revised due to more comprehensive research on stationary air conditioning leading to improvements in the Austrian refrigerant model.

Table 10: Recalculations per gas (inventory improvements)

	1990 (Base year)	2020
	Recalculation Difference [kt CO_2e]	
Total	**+16**	**+102**
CO_2	+22	+84
CH_4	-5.1	-15
N_2O	-0.7	-22
HFC, PFC, SF_6, NF_3	0.00	+55

without emissions from LULUCF

3.3 Sectoral recalculations

The following section provides further explanations for sectoral recalculations. Further background information and a complete description of the recalculation for the period 1990–2020 will be presented in Austria's National Inventory Report 2023.

3.3.1 Energy

3.3.1.1 Stationary sources

Update/Improvement of activity data

Revision of the energy balance

The federal statistics office "Statistik Austria" revised the energy balance (mainly for year 2020) with the following **main implications** for energy consumption as used in the inventory and the corresponding CO_2 emissions:

- Natural gas 2020: Gross inland consumption has been revised by +1.5 PJ (+ 85 kt CO_2) and allocated to final energy consumption, of which 0.8 PJ (+ 44 kt CO_2) has been allocated to *1.A.2* (+10 kt CO_2 for *1.A.2.a*, +5 kt CO_2 for *1.A.2.b*, +23 kt CO_2 for *1.A.2.c*, +28 kt CO_2 for 1.A.2.d, +14 kt CO_2 for *1.A.2.e*, -36 kt for *1.A.2.g*). Another 0.7 PJ of final consumption (+ 41 kt CO_2) has been allocated to *1.A.4* (mainly to *1.A.4.b.1*).
- Gasoil 2020: Minor shifts between *1.A.2* (-0.06 PJ), *1.A.4.a* (-0.29 PJ) and *1.A.4.b* (+0.43 PJ)
- LPG 2020: Minor shifts from non-energy use (-0.07 PJ) to *1.A.4.b.1*.
- Hard coal 2020: 0.2 PJ (-19 kt CO_2) have been shifted from *1.A.4.b.1* residential to *1.A.2.f* non-metallic minerals industry although *1.A.2.f* has not been revised because hard coal consumption is 100% covered by the ETS.

- Coke oven coke 2020: 0.06 PJ (- 5 kt CO_2) have been shifted from *1.A.4.b* to *1.A.2.a* final consumption.
- Solid biomass: 0.07 PJ of fuel wood has been shifted from *1.A.4.c* agriculture to *1.A.4.a* commercial. For the years 2018-2020, 0.05 to 0.3 PJ have been shifted between *1.A.2* and *1.A.4* sub categories.

Methodological changes

- For 1990 to 2020, up to 260 kt of CO_2 from solid fuels have been shifted from iron and steel (*1.A.2.a*) to industrial processes *(2.C.1*), e.g. 230 kt for 1990, 167 kt for 2005 an 56 kt for 2020.
- For 1990 to 2020, minor changes in greenhouse gas emissions of categories *1.A.4.a commercial/institutional* and *1.A.4.b residential* occur because of updated heating stock data and newly allocated shares of combustion technologies per energy carrier (updated energy demand model for space heating).

3.3.1.2 Mobile sources

Update of activity data

1.A.3.b Road transport

- **Update of specific vehicle mileage per year**
  A statistical evaluation of the specific annual mileage from the central assessment database (ZBD - annual "sticker check" in accordance with §57a KFG) for the years 2018, 2019 and 2020 was carried out for passenger cars, light duty vehicles, buses and 2-wheelers. The revision of this data resulted in a shift between inland vehicle kilometres and mileage of vehicles in the category fuel export (mainly HDV). In detail the ZBD data shows that there was an overestimation of inland vehicle kilometres in 2018 and 2019 by the model and an underestimation of inland vehicle kilometres in the pandemic year 2020. This was corrected accordingly in this years' submission.

Update of methodology

1.A.3.b Road transport

- Update of fuel consumption and emission factors according to HBEFA Version V4.2:
  Update of hot emission factors and characteristic motor curves for EURO 6 passenger cars and EURO VI HDV trucks. Adaptation of the fleet data to HBEFA V4.2 (HDV EUROVI_ABC_DE). Update of aging factors for cars and HDV.

All these changes resulted in recalculations of -2.5 kt CO_2e for *1.A.3.b. Road Transport* in 2020.

3.3.1.3 Fugitive Emissions

Minor recalculations (+ 0.08 kt CO_2e in 2020) are reported for *1.B.2.a.4 Refining/Storage* due to revisions (refinery intake data 2020) of the annual energy balance as well as to a lesser extent for *1.B.2.b.2 Natural Gas Production* for some historical years due to the correction of rounding errors.

3.3.2 Industrial Processes and Other Product Use

Reallocation of emissions

2.A.1 Cement Production / 2.A.2 Lime Production / 2.A.3 Glass Production/ 2.A.4.a Bricks and Tiles / 2.A.4.c Magnesia Production / 2.B.2.10.b CO_2 emissions from chemical industry (ETS)

During extensive quality checks several minor errors of the ETS data analysis (allocation of process streams, as well as some rounding errors) for the years 2013ff were identified for single years and categories, and subsequently corrected.

2.A.2 Lime Production / 2.A.4.d Other Use of Carbonates

Following a recommendation from the 2022 UNFCCC review, all emissions from lime production i.e. those previously reported under *2.A.4.d* (desulphurization) and *2.C.5.a* Carbide Production are now reported together with emissions from lime kilns, as well as from processes using or producing PCC (precipitated calcium carbonate) under *2.A.2*.

2.B.1 Ammonia Production / 2.D.3 Other: Urea used as a catalyst

Updated urea amounts used in road traffic for the years 2005–2020 led to a redistribution of minor amounts between these two categories.

2.C.1.a Steel

During extensive quality checks, it became obvious that one process stream (tar) was considered incorrectly in the disaggregation of total CO_2 emissions from Iron & Steel production (which is verified ETS data) into process specific and energy related emissions reported under *1.A.2.a*. The correction led to a minor shift of emissions between those two categories.

Update of activity or emissions data

2.B.10.ii Fertilizer Production

During extensive quality checks, a minor error of the year 2010 was found and corrected (-0.04 kt CO_2 in 2010).

2.C.5 Lead Production

Activity data from the year 2016 onwards were updated (+0.5 kt CO_2 in 2020).

2.D.3 Solvent Use

During extensive quality checks several minor errors of the VOC directive data analysis used as basis for the bottom up approach for the years 2015 and 2019 were identified and subsequently corrected. As data from 2002 to 2015 is interpolated, this affected emissions from 2003 onwards (+0.01 kt CO_2e in 2020).

2.F.1.d Transport Refrigeration

Additional research identified an additional supplier of transport refrigeration equipment and furthermore showed that refill data previously used was incomplete. Therefore new assumptions on stock and especially stock composition were made, taking into account all available information. This affected emissions from 2007 onwards (-6.4 kt CO_2e in 2020).

2.F.1.e MAC

A minor correction of amounts filled into new equipment for trains in 2019 led to recalculations of the stock back to 1996, as stocks are calculated back in time using newly filled in amounts (+0.03 kt CO_2e in 2020).

2.F.3 Fire protection

Disposal emissions from 2019 had mistakenly not been considered in previous submissions, but are now included (+0.2 kt CO_2e in 2019).

2.G.1 Electrical equipment

Updated stock data for 2020 became available, and was included in this year's inventory (+ 1.0 kt CO_2e).

2.G.2 Other uses of SF6- particle accelerators.

Activity data for some new equipment were updated for 2020 (+1.4 kt CO_2e).

Improvements of methodologies and emission factors

2.A.2 Lime Production

CO_2 recovery in the process of PCC production of one site, for which emissions from the calcination step have been considered in the inventory, was included in the calculation. This affected emissions from 1990-2019, e.g. -1.1 kt CO_2 in 2019).

2.B.5.b Calcium Carbide Production

Following a recommendation from the 2022 UNFCCC review, the EF for carbide production was reevaluated and emissions from acetylene production were included for the first time. As already described above, emissions from the calcination step in carbide production were reallocated to *2.A.2 Lime Production*. The overall effect on emissions from this category is -5.4 kt CO_2 in 2020.

2.C.1.b Pig Iron

Methane emissions from coke production are now estimated using plant specific data. Furthermore emissions reported for sinter production were corrected, as previously only CH_4-C was reported (+2.2 kt CO_2e in 2020).

2.F.1.a Commercial refrigeration, 2.F.1.c Industrial Refrigeration and 2.F.1.f Stationary air conditioning

Additional research on stationary air conditioning showed that

1. less equipment was filled on site than previously assumed. Thus the gap between quantities surveyed bottom up and import figures is now higher, raising both stocks and emission from stocks for the categories **commercial and industrial refrigeration**, those two categories where the residual amounts are allocated to.
2. for one type of equipment the assumed filling capacity for the years 2009ff was too low, increasing the stock and emissions for **stationary air conditioning** from 2009 onwards.

Furthermore, as the GWP was changed to AR5, also the blend categories used for modelling the residual amounts of refrigerants not surveyed bottom up, had to be revised.

The overall effect of recalculations in these three sub categories is + 58.5 kt CO_2e in 2020.

3.3.3 Agriculture

Update of activity data

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

Livestock data – poultry and deer

Updated livestock data for poultry (layers, broilers, turkeys and other poultry) and deer became available for the year 2020, based on the final results of the farm structure survey 2020 (STATISTIK AUSTRIA 2022[25]). For 2016, activity data of the farm structure survey 2016 was used (STATISTIK AUSTRIA 2018[26]). The numbers for the years 2017, 2018 and 2019 have been derived by interpolation.

Background data for feeding and nutrition of cattle

New values for the protein content of milk for the years 2019 and 2020 and for the fat content of milk for 2020 became available (AMA 2021[27]). In addition, for the years 1996-2004 and 2014-2020 the data on distribution of cattle breeds were slightly updated. These improvements resulted in minor revisions of the values for gross energy intake, $N_{excretion}$ and $VS_{excretion}$ of dairy and suckling cows.

Biogas plants

Updated figures on biogas plants (E-CONTROL 2022[28]) resulted in slight revisions of CH_4 and N_2O with an impact in source categories *3.B Manure Management*, *3.D.a.2.a Animal manure applied to soils* and *3.D.a.2.c Other organic fertilizers applied to soils*.

3.A Enteric Fermentation (CH_4)

This category has been slightly revised due to updated activity and nutrition data (GE-intake, livestock numbers of poultry and deer – see above).

The improvements resulted in updated emissions for the years 1996-2004 and 2014-2020 (+0.04 kt CH_4 for 2020).

3.D.a.4 Crop Residues (N_2O)

For 2020, sugar beet harvest amounts have been marginally revised resulting in lower N_2O amounts (-0.0005 kt N_2O for 2020).

3.D.a.5 Mineral Soils (N_2O)

Revisions of activity data (perennial cropland to annual cropland, for more information see chapter 3.3.4 on LULUCF) resulted in revised emissions for the entire time series (+0.001 kt N_2O for 2020).

[25] Statistik Austria (2022): Final results of the farm structure survey 2020 Agrarstrukturerhebung_2020_20221117 (statistik.at)

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

[27] AMA (2021): Rohmilchqualität | AMA - AgrarMarkt Austria

[28] E-CONTROL (2022): EC_EAG_Monitoringb_15.09_DRUCK.indd (e-control.at) accessed in November 2022

Improvements of methodologies and emission factors

3.B Manure Management (CH_4, direct and indirect N_2O)

Methane and direct N_2O emissions have been revised for the years 1996-2004 and 2014-2020 (+0.001 kt CH_4 for 2020 and -0.001 kt N_2O for 2020), as a result of updated activity and nutrition data (see above).

Austria's agriculture model is based on the N-flow concept. Thus, revisions within Austria's air emission inventory affect calculation results in Austria's GHG inventory. In Austria's air emission inventory, the decreasing share of tied systems from 2017 onwards was taken into account for the first time. This improvement contributed to the increased emissions for indirect N_2O (+0.01 kt N_2O for 2020).

3.D Agricultural Soils (N_2O)

3.D.1.2.a Animal Manure Applied to Soils

Updates and improvements in the area of animal husbandry described above resulted in minor revisions of emissions from animal manure application (-0.01 kt N_2O for 2020).

3.D.1.3 Urine and dung deposited by Grazing Animals

Livestock related updates as already described before, resulted in revised N_2O emissions for the years 1996-2004 and 2014-2020 (-0.001 kt N_2O for 2020).

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

Atmospheric deposition: the main reasons for revised emissions are the correction of a linkage error in the ammonia inventory and the adjusted activity data ($N_{excretion}$ values for cattle, livestock numbers poultry and deer, biogas). As a result, the indirect N_2O emissions from atmospheric deposition were revised downwards for the years 1991-2020 (-0.004 kt N_2O for 2020).

N leaching and run-off: updated AD (see above) are the reason for revised emissions for the entire time series (-0.001 kt N_2O for 2020).

Reallocation of emission sources

3.F Field burning

Following a recommendation of the NEC Review 2022, emissions from the burning of residual wood from vinicultures on open fields (formerly reported under *3.F.5 Other*) have been reallocated to category *5.C.2.1.b Incineration and Open Burning of Waste – Other*. This reallocation results in lower emissions of CH_4 and N_2O for the entire time series (-0.02 kt CH_4 and -0.0002 kt N_2O).

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

4.A Forest land

The forest areas, land use change areas, increment, drain and dead wood results of the NFI 2016/21 were taken to update the time series for the *Forest land* category for the years since 2009. In addition, biomass and dead wood C stock changes for forests not-in-yield representing about 15 % of the *Forest land* were estimated for the first time for the whole time series based on measured results from the NFI 2016/21 and backwards modelling for the whole time series. The forest soil C

stock changes were recalculated for the complete series based on an improved calibration and spin-up procedure of the model and the latest YASSO model version 20. Furthermore, instead of using average annual soil C stock changes as in previous submissions the yearly values are reported to better reflect the impacts and annual variations due to weather conditions, litterfall and harvest residues. These improvements caused changes of the annual net removals for the whole time series of the *Forest land* category in the range of -16 543 to +7 470 kt CO_2e per year compared to the last submission in 2022.

4.B Cropland

The land-use changes between *Grassland* and *Cropland* are assessed by a changed method based on IACS/LPIS data since submission 2022, which was further improved for submission 2023. The land parcel numbers are no more available in the IACS/LPIS system, so the assessment for the whole time series was changed to a grid point survey by using the INSPIRE grid of 100 x 100 m to sample geographic land use information in IACS/LPIS. In addition, the LUC areas from *Forest land* to *Cropland* since 2009 and the increment, harvest and dead wood stock change values for LUC areas *Forest land* to *Cropland* for the whole time series were changed on basis of the new NFI 2016/21 results. These improvements had an impact on the emissions/removals of the *Cropland* category: The annual emissions/removals are in the range of -109 to -250 kt CO_2e per year different compared to the last submission in 2022.

4.C Grassland

The total *Grassland* area was adjusted for grasslands, which are no more agriculturally managed and as a consequence no more tracked by the IACS system, but do not lose their status as grasslands. The land-use changes between *Grassland* and *Cropland* are assessed since submission 2022 by a changed method based on IACS/LPIS data, which was further improved for submission 2023.The land parcel numbers are no more available in the IACS/LPIS system, so the assessment for the whole time series was changed to a grid point survey by using the INSPIRE grid of 100 x 100 m to sample geographic land use information in IACS/LPIS. In addition, the LUC areas from *Forest land* to *Grassland* since 2009 and the increment, harvest and dead wood stock change values for LUC areas *Forest land* to *Grassland* for the whole time series were changed on basis of the new NFI 2016/21 results. These improvements had an impact on the emissions of the *Grassland* category: The annual emissions are in the range of 25 to 190 kt CO_2e per year higher compared to the last submission in 2022.

4.D Wetlands

The LUC areas from *Forest land* to *Wetland* since 2009 and the increment, harvest and dead wood stock change values for LUC areas *Forest land* to *Wetland* for the whole time series were changed on the basis of the new NFI 2016/21 results. These improvements had an impact on the emissions of the *Wetland* category: The annual emissions are in the range of 4 to 17 kt CO_2e per year higher compared to the last submission in 2022.

4.E Settlements

The land-use changes between *Grassland* and *Cropland* were assessed by a changed method based on IACS/LPIS data and the total *Grassland* area was adjusted for non-agriculturally used *grassland* (see above at the *Cropland* and *Grassland* categories). For area consistency in the LUC matrices, these LUC and area changes also had an impact on the LUC areas from *Cropland* and *Grassland* to *Settlements*. In addition, the LUC areas from *Forest land* to *Settlements* since 2009 and the increment,

harvest and dead wood stock change values for LUC areas *Forest land* to *Settlements* for the whole time series were changed on the basis of the new NFI 2016/21 results. These improvements had an impact on the emissions of the *Settlements* category: The annual emissions are in the range of 58 to 418 kt CO_2e per year higher compared to the last submission in 2022.

4.F Other land

The land-use changes between *Grassland* and *Cropland* were assessed by a changed method based on IACS/LPIS data and the total *Grassland* area was adjusted for non-agriculturally used grassland (see above at the *Cropland* and *Grassland* categories). For area consistency in the LUC matrices, these LUC and area changes also had an impact on the *Other land* category – LUCs from *Grassland* to *Other land* and related emission/removal estimates do not exist anymore, but the non-agriculturally used Grasslands are reported in the Grassland category. In addition, the LUC areas from *Forest land* to *Other land* since 2009 and the increment, harvest and dead wood stock change values for LUC areas *Forest land* to *Other land* for the whole time series were changed on the basis of the new NFI 2016/21 results. These improvements had an impact on the emissions of the *Other land* category: The annual emissions are in the range of -163 to +273 kt CO_2e per year different compared to the last submission in 2022.

4.G HWPs

The *HWP* production figures for the year 2020 were updated in the most recent FAO statistics. Consequently, the removal figures for this year had to be updated accordingly. The recalculations in the *HWP* category led to lower removals of this subcategory of 51 kt CO_2e for 2020.

3.3.5 Waste

Update of activity data

5.A Solid Waste Disposal

Minor revisions are reported for category *5.A Solid Waste Disposal* for the years 2016-2020 (2020: -0.005 kt CO_2e) due to slightly revised input (disposal) data following more comprehensive QA/QC activities.

5.B Biological Treatment of Solid Waste

The reason for this revision is a new estimation of home composted waste amounts (part of *5.B.1 Composting*) developed in view of a future reporting obligation regarding home-composted quantities to the European Commission (In the future home composting is to be included in the AT recycling rate for municipal waste). A new method of estimation was developed[29], which provides a more plausible estimate compared to the method previously applied (based on a per capita volume derived from one analysis provided for a city in Austria). This change leads to lower emission for 2001-2020 (2020: -34 kt CO_2e)

5.C Incineration and Open Burning of Waste

Following a recommendation of the NEC Review 2022, emissions from the burning of residual wood from vinicultures on open fields (formerly reported under *3.F.5 Other*) have been reallocated

[29] Input for the 2022 Federal Waste Management Plan

to category *5.C.2.1.b Incineration and Open Burning of Waste – Other*. This reallocation results in higher emissions of CH_4 and N_2O in this category for the entire time series (0.51 kt CO_2e).

5.D Wastewater Treatment and Discharge

N_2O emissions from *5.D.2 Industrial Wastewater* were revised for 2019 and 2020 (2020: +0.9 kt CO_2e) as emissions for these years were calculated based on reported N-flow data (direct dischargers) instead of derived using production data. Only minor revisions were reported for CH4 (-0.0001 kt CO_2e) due to correction of a transcription error.

4 NATIONAL INVENTORY SYSTEM

The regulations under the UNFCCC and the Kyoto Protocol define the standards for national emission inventories related to transparency, consistency, comparability, completeness and accuracy (TACCC). Above this, each Party shall have in place a national system[30] 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[31], in Austria's NIR 2022[32] and in the NISA Implementation Report[33].

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[34]), which defines the Umweltbundesamt (Environment Agency Austria) as the single national entity with the overall responsibility for inventory preparation. To comply with the stringent reporting 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.

[30] 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

[31] 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.

[32] UMWELTBUNDESAMT (2022): Austria's National Inventory Report 2022, Submission under the United Nations Framework Convention on Climate Change and under the Kyoto Protocol. Report REP-0811. Umweltbundesamt, Vienna.

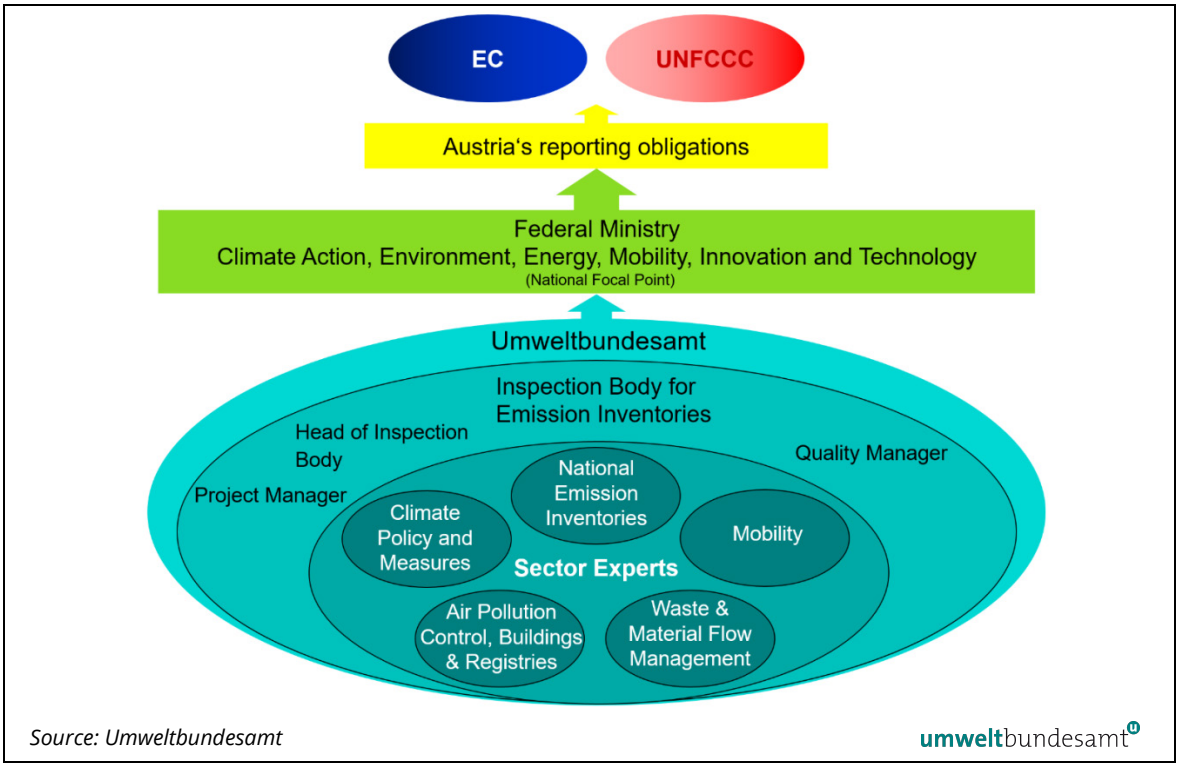
[33] UMWELTBUNDESAMT (2005): NISA National Inventory System Austria, Implementation Report, REP-0004; Umweltbundesamt, Vienna https://www.umweltbundesamt.at/fileadmin/site/publikationen/rep0004.pdf

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

Inspection Body for Emission Inventories
ID No. 0241

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

Figure 3: Responsibilities within the Austrian National Inventory System (greenhouse gases).



Source: Umweltbundesamt

The personnel of the Inspection Body for Emission Inventories (IBE) is made up of staff from various organisational units of the Umweltbundesamt, who in the course of their inspection activity for the IBE are assigned to the IBE and are therefore under the head of the inspection body. The head of the inspection body has the overall responsibility for the maintenance and continual improvement of the QMS.

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

4.1 Legal and institutional arrangements

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

LEGAL ARRANGEMENT: ENVIRONMENTAL CONTROL ACT[35]

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

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

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

1. **Statistik Austria**
   - Statistical yearbook (public)
   - National Energy balance (comprehensive/detailed Energy balance and IEA/Eurostat questionnaire)
     - **Long-term Contract** with the competent ministries
   - Production/Import/Export statistics for solvents, F-gases
     - **Contract on annual basis** with the Federal Ministry of Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)
   - Agricultural statistics (public)
   - Transport statistics (public)
     Procedural arrangement:
     - close cooperation Umweltbundesamt – Statistik Austria on definition of data format and specification

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

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

   The BMK as representative of the Republic of Austria owns (100%) the Umweltbundesamt, which has the legal status of a limited liability company. As superior authority and in the framework of the ENVIRONMENTAL CONTROL ACT the following institutional agreements regarding access to data of different reporting obligations were agreed:

   - Data on emissions and activity data from installations under the EU ETS (Federal law gazette 118/2011 establishing a scheme for greenhouse gas emission allowance trading)
   - Activity data of certain F-gases (Austrian Fluorinated Compounds Ordinance 139/2007 regarding prohibitions and restrictions of HFCs, PFCs, SF_6)
   - Activity data from landfill sites (Austrian Landfill Ordinance No. 39/2008) – EDM (Electronic Data Management)
   - Activity data regarding waste incineration (Austrian Waste Incineration Ordinance No. 35/2013)
   - Emissions data collected in the framework of E-PRTR (Austrian Ordinance No. 380/2007 concerning the establishment of the European Pollutant Release and Transfer Register)
   - Emissions data (SO_2, NO_x, dust) and activity data from steam boiler installations (Federal law gazette 127/2013 establishing integrated pollution prevention and control)
   - Forest fire statistics
     Procedural arrangement: The access to the data is organised for free via the EDM – Electronic Data Management – http://edm.gv.at, which is an information network which allows enterprises and authorities to handle registration and notification obligations in the waste and environment sectors online.
     - EDM is the Federal Ministry's central eGovernment initiative and is operated by the Umweltbundesamt
     - EDM aims at sustainably reducing the administrative burden of enterprises and authorities to efficient, electronic recording and notification systems and to ensure a high level of environmental protection in Austria.

3. **Austrian Research Centre for Forests (BFW)**

   - National Forest inventory
     - **Contract on a regular interval** with the Federal Ministry of Agriculture, Forestry, Regions and Water Management (BML)
   - Forest soil condition survey (of all federal provinces)
   - Forest soil modelling
     Procedural arrangement: close cooperation Umweltbundesamt – BFW on definition of data format and specification

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

   b. **University of Natural Resources and Life Sciences Vienna (BOKU) / Leibniz Institute for Agricultural Engineering Potsdam-Bornim (ATB)**
      - Agricultural model: calculation of emissions
        - Contract on a regular interval with Umweltbundesamt
          Procedural arrangement: close cooperation Umweltbundesamt – BOKU

5. **Austrian Economic Chambers and Associations of the Austrian Industries as well as Individual plant operators/companies**
   - Activity data, emission data and relevant parameters; information on the process and abatement technology
     - No formal agreements were made but it is good practice in Austria to have a good cooperation and exchange of knowledge regarding the requirements of GHG and Air pollutants Inventory on a continuing basis
       Procedural arrangement: close cooperation

6. **AustroControl**
   - Flight movements per aircraft type and airports (non-standard analysis)
     - *Procedural arrangement*: no formal agreement, but close cooperation Umweltbundesamt – AustroControl on definition of data format and specification

4.2 Data Sources

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

Table 11: Main data sources for activity data.

Sector	Data Sources for Activity Data
Energy	• Energy Balance from Statistik Austria • EU-ETS • Steam boiler database • Small scale combustion market data • Direct information from industry or associations of industry
Transport	• Energy Balance from Statistik Austria • Yearly new vehicle registrations from Statistik Austria • Yearly growth rates of transport performance on Austrian roads from Federal Ministry of Climate Action, Environment, Energy, Mobility, In-novation and Technology (BMK) • ZBD: Zentrale Begutachtungsdatenbank (periodically updated specific mileage, "sticker check" according to §57a KFG) • Yearly flight movements from AustroControl • Yearly FC of airport ground activities at Vienna International Airport
IPPU	• National production statistics • Import/export statistics • EU-ETS • Direct information from industry or associations of industry • Short term statistics for trade and services • Austrian foreign trade statistics • Structural business statistics • Surveys at companies and associations
Agriculture	• National studies • National agricultural statistics obtained from Statistik Austria • National fertilizer statistics, protein content and fat content of milk, obtained from Agrarmarkt Austria (AMA) • National statistics on cattle breeding obtained from Rinderzucht Austria • Distributing company (sales data)
LULUCF	• National forest inventory obtained from the Austrian Research Centre for Forests • National agricultural statistics and land use statistics obtained from Statistik Austria and from the IACS system • Wetland and settlement areas from the Real Estate Database
Waste	• Federal Waste Management Plan (Data sources: Database on landfills (1998–2007), Electronic Data Management (EDM) in environment and waste management) • EMREG-OW (Electronic Emission Register of Surface Water Bodies) • National studies

The main sources for emission factors are:

- National studies for country specific emission factors
- Plant-specific data reported by plant operators
- 2006 IPCC Guidelines for National Greenhouse Gas Inventories[36]
- 2019 Refinement to the 2006 IPCC Guidelines
- EMEP/EEA air pollutant emission inventory guidebooks[37]
- Handbook emission factors for road transport (HBEFA), Version 4.1
- National forest inventory obtained from the Austrian Research Centre for Forests
- Soil inventories by the Federal States and by the Austrian Federal Office and Research Centre for Forests
- Modelling of the forest soil C stock changes Austrian Research Centre for Forests

4.3 QA/QC Plan (QMS of IBE)

A Quality Management System (QMS) has been designed and implemented to fulfil all requirements of *good practice, i.e.* to improve transparency, consistency, comparability, completeness and accuracy as well as confidence in the national inventory. Since December 2005 the inventory team at the Umweltbundesamt has been accredited as an inspection body (ID No. 0241) in accordance with the international standard EN ISO/IEC 17020 and the Austrian Accreditation Law (AkkG)[38] by decree of Accreditation Austria[39]. This standard takes into account standards regarding a QMS as set out in the EN/ISO 9000 series and even goes beyond: It provides a clear statement of requirements regarding competence, as well as independence, impartiality and integrity.

The implementation of QA/QC procedures as required by the IPCC supports the development of national greenhouse gas inventories that can be readily assessed in terms of quality and completeness. The QMS as implemented in the Austrian inventory includes all elements of the QA/QC system outlined in IPCC 2006 GL Volume 1 'QA/QC and Verification', and goes beyond. It comprises supporting and management processes in addition to the QA/QC procedures in inventory compilation and thus ensures agreed standards not only within (i) the inventory compilation process and (ii) supporting processes (e.g. archiving), but also for (iii) management processes (e.g. annual management reviews, internal audits, regular training of personnel, error prevention).

As part of the QMS an efficient process is established to ensure 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

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

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

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

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

and discrepancies are documented; responsibilities, resources and a time schedule are attributed to each of these in the improvement plan. Measures, which include possible recalculations, are taken by the sector experts.

The Austrian Quality Management System is described in detail in Austria's NIR 2022, some aspects and improvements compared to the previous submission are described below (QMS activities and improvements 2022).

The Quality Manual can be downloaded at:
https://www.umweltbundesamt.at/klima/emissionsinventur/emi-akkreditierung

Sector Experts

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

In cases which exceed the IBE's resources, the IBE concludes service contracts with qualified institutions (particularly universities or research institutes).

In the course of this the IBE is responsible for

- choice of the contractor i.e. judging his/her expertise with regard to the technical and QMS requirements
- specifying the technical and QMS requirements in the service contract
- performing and documenting a detailed QC check of the results i.e. checking if the specified requirements were fulfilled
- implementation of the results into the emission inventory in line with the technical and QMS requirements particularly the requirement of full reproducibility of the emission inventory

Service contracts have so far been concluded with:

- Technical University Graz (Road and Off-road transport)
- University of Natural Resources and Applied Life Sciences,
  Research Center Seibersdorf (Agriculture)
- Öko-Recherche, Büro für Umweltforschung und -beratung GmbH (F gases)
- Institute for Industrial Ecology (Product Use)
- Barbara Amon and Stefan Hörtenhuber (Agriculture)
- Laboratorium für Umweltanalytik GmbH (heavy metals and POPs)
- Forschung Burgenland GmbH (Fugitive emissions)

Data Management

The Austrian Inventory is based on the SNAP nomenclature and has to be transformed into the UNFCCC Common Reporting Format ('CRF') 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 2022

In 2022 several improvements concerning the personnel of the inventory team have been made: The number of sector experts of the IP, PU and fugitive emissions teams was raised to three. Additionally a second deputy was nominated for the coordination of the report "Austria's annual greenhouse gas inventory" and the "National Inventory Report". Currently, the IBE team consists of 24 persons and each position is at least double staffed.

Four of our experts participated in the international inventory reviews in 2022.

An audit by the accreditation body was successfully passed in February 2022.

4.4 Changes in the national inventory system

Member States shall clearly state in the relevant chapters of the national inventory report if there were no changes in the description of their national inventory systems or, if applicable, of their national registries referred to in points (k) and (l) of Part 1 of Annex V to Regulation (EU) 2018/1999 since the previous submission of the national inventory report.

The national inventory system, as described in this chapter (4), is unchanged compared to the description given in the Austrian Initial Report under the Kyoto Protocol[40].

[40] 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

According to Commission Implementing Regulation (EU) 2020/1208[17] Member States shall clearly state in the national inventory report if there were no changes in the description of their national inventory systems or, if applicable, of their national registries referred to in points (k) and (l) of Part 1 of Annex V to Regulation (EU) 2018/1999[14] since the previous submission of the national inventory report.

The following changes to the national registry of Austria have occurred in 2022.

Note that there is no SIAR report for 2022 due to the simplified process during the CP2 true-up period. This process foresees a comparison of the submitted SEF files with data of the International Transaction Log. No recommendations have been made in this context. There were also no recommendations from the previous Annual Review Report (FCCC/ARR/2021/AUT).

Table 12: Changes to the national registry of Austria in 2022.

Reporting Item	Description
15/CMP.1 annex II.E paragraph 32.(a) Change of name or contact	The name and contact of the registry administrator as an institution has not changed. A change of the alternate registry administrator was notified to the Secretariat in 2022.
15/CMP.1 annex II.E paragraph 32.(b) Change regarding cooperation arrangement	No change of cooperation arrangement occurred during the reported period.
15/CMP.1 annex II.E paragraph 32.(c) Change to database structure or the capacity of national registry	There has been 3 new EUCR releases (versions 13.6.1, 13.7.1 and 13.8.2) after version 13.5.2 (the production version at the time of the last Chapter 14 submission). No changes were applied to the database, whose model is provided in Annex A. No change was required to the application backup plan or to the disaster recovery plan. No change to the capacity of the national registry occurred during the reported period.
15/CMP.1 annex II.E paragraph 32.(d) Change regarding conformance to technical standards	The changes that have been introduced with versions 13.6.1, 13.7.1 and 13.8.2 compared with version 13.5.2 of the national registry are presented in Annex B. It is to be noted that each release of the registry is subject to both regression testing and tests related to new functionality. These tests also include thorough testing against the DES and are carried out prior to the relevant major release of the version to Production (see Annex B). No other change in the registry's conformance to the technical standards occurred for the reported period.
15/CMP.1 annex II.E paragraph 32.(e) Change to discrepancies procedures	No change of discrepancies procedures occurred during the reported period.
15/CMP.1 annex II.E paragraph 32.(f) Change regarding security	No changes regarding security occurred during the reported period.

Reporting Item	Description
15/CMP.1 annex II.E paragraph 32.(g) Change to list of publicly available information	No change to the list of publicly available information occurred during the reporting period.
15/CMP.1 annex II.E paragraph 32.(h) Change of Internet address	No change to the registry internet address occurred during the reported period.
15/CMP.1 annex II.E paragraph 32.(i) Change regarding data integrity measures	No change of data integrity measures occurred during the reporting period.
15/CMP.1 annex II.E paragraph 32.(j) Change regarding test results	No change during the reported period.

6 REPORTING UNDER ARTICLE 26(3) GOVERNANCE REGULATION

According to Section 2 'Annual Reporting', Article 26(3) of the Governance Regulation' No 2018/1999[13] from 2023 on, Member States shall determine and report to the Commission final greenhouse gas inventory data by 15 March each year (year X) and preliminary data by 15 January each year, including the greenhouse gases and the inventory information listed in Annex V.

Information on points (a) – (d) of Part I of Annex V is provided in the respective CRF Tables. Emissions of GHG referred to in Article 2(1) of Regulation (EU) 2018/842[1] is additionally provided as separate template 'Art19_AnnexXV_Emissions covered by the ESR_AT'. Chapters 2 and 3 of this report include textual information on the GHG emission trends and recalculations and improvements. Information on indicators (e), concluded transfers (f), steps taken to improve inventory estimates, in particular in areas of the inventory that have been subject to adjustments or recommendations following expert reviews (g), allocation of verified emissions reported under Directive 2003/87/EC (h), uncertainties (m) and intended use of flexibilities (n) are provided to the EU Commission as separate templates via electronic upload (EIONET/CDR):

- Art13_AnnexXI_Indicators_AT
- Art21_AnnexXVII_Concluded transfers for ESR_AT
- Art20_AnnexXVI_Concluded transfers for LULUCF_AT
- Art10_AnnexVIII_Recommendations_AT
- Art14_AnnexXII_Consistency with ETS_AT
- Art12_AnnexX_Uncertainty and completeness_AT
- Art22_AnnexXVIII_Intended use of flexibilities_AT
- Art23_AnnexXIX_Use of revenues_AT

Results of consistency checks (i and j) are summarized in chapter 6.2. Information on changes to Austria's national inventory system, including information on Austria's quality assurance and quality control plans (k, m) and changes in the national registry (l) are provided in chapters 4 and 5.

6.1 Overview of Reporting

In Commission Implementing Regulation (EU) 2020/1208[17] the reporting obligations were further specified. The fulfilment of the obligations as included in Articles 9 to 23 Chapter III of this Regulation is summarized in the following table.

Table 13: Overview of AT reporting on GHG inventories pursuant to Article 8(2) Commission Implementing Regulation (EU) 2020/1208

[Article of] Regulation EU) 2020/1208 (ANNEX VII[41])	**Information to be found:**	**Separate Annex**
Article 9 Reporting on recalculations	CRF Table 8, Short-NIR Chapter 3	Not applicable
Article 10 Reporting on implementation of recommendations in Table 1 of Annex VIII	Short-NIR Ch. 3.3	Art10_AnnexVIII_Recommendations_AT[42]
Article 10 Reporting on implementation of recommendations in Table 2 of Annex VIII	Short-NIR Ch. 3.3	Art10_AnnexVIII_Recommendations_AT[42]
Article 12(1) Reporting on uncertainty	Not applicable	Art12_AnnexX_Uncertainty and completeness_AT
Article 12(2) Reporting on completeness	CRF Table 9	Not applicable
Article 14(1) Reporting on consistency of reported emissions with data from the emissions trading scheme (Annex XII data)	Not applicable	Art14_AnnexXII_Consistency with ETS_AT
Article 14(2) Reporting on consistency of reported emissions with data from the emissions trading scheme (textual information)	Short-NIR Ch. 6	Possible (AT: not relevant)
Article 15 Reporting on consistency of the reported data on air pollutants	Short-NIR Ch. 6	Possible (AT: not relevant)
Article 16 Reporting on consistency of the data reported on fluorinated greenhouse gases	Short-NIR Ch. 6	Possible (AT: not relevant)
Article 17 Reporting on consistency with energy statistics	Short-NIR Ch. 6	Possible (AT: not relevant)
Article 18 Reporting on changes in descriptions of national inventory systems or registries	Short-NIR Ch. 4 Short-NIR Ch. 5	Not applicable

[41] Overview of reporting on greenhouse gas inventories pursuant to Article 8(2) of Commission Implementing Regulation (EU) 2020/1208

[42] No Review Report from the latest 2022 UNFCCC Review was available at the time of submission, so the content of this template still refers to the implementation and status of recommendations set in the 2020 UNFCCC Review. Should the (final) ARR 2022 become available in time until the final submission in March, the template will be updated accordingly.

6.2 Reporting on Consistency

6.2.1 Consistency with EU ETS data (Article 14)

According to Annex V Part 1 point (i), where relevant, the results of the checks performed on the consistency of the emissions reported in the GHG inventories, for the year x-2, with the verified emissions reported under Directive 2003/87/EC. 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 2022.

6.2.2 Consistency with other reported data

According to Annex V Part 1 point (j), where relevant, the results of the checks performed on the consistency of the data used to estimate emissions in preparation of the GHG inventories, for the year X-2, with:

1. The data used to prepare inventories of air pollutants pursuant to Directive (EU) 2016/2284
2. The data reported pursuant to Article 19(1) of, and Annex VII to, Regulation (EU) No 517/2014
3. The energy data reported pursuant to Article 4 of, and Annex B to, Regulation (EC) No 1099/2008

6.2.2.1 Data on air pollutants (Article 15)

The Austrian Air Emission Inventory (OLI) covers both, greenhouse gases and air pollutants reported under the NEC Directive (EU) 2016/2284 and CLRTAP. Data basis (activity data and other relevant parameters) is thus consistent for NEC, CLRTAP and MMR reporting.

Results of the checks performed for each air pollutant on the consistency of the data, for the year 2021 show no differences of more than +/−5% between the total emissions excluding LULUCF. Minor differences are solely due to different reporting requirements regarding air transport and international navigation.

6.2.2.2 Data on fluorinated greenhouse gases (Article 16)

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.

6.2.2.3 Energy statistics (Article 17)

Checks performed on the consistency of the data used to estimate emissions in preparation of the greenhouse gas inventory for 2021 with the energy data reported pursuant to Article 4 of Regulation (EC) No 1099/2008 show no differences of more than +/−2%.

7 ABBREVIATIONS

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

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

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

BML ..... Bundesministerium für Land- und Forstwirtschaft, Regionen und Wasserwirtschaft
Federal Ministry of Agriculture, Forestry, Regions and Water Management

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

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

CDR ..... Central Data Repository

CNG ..... Compressed Natural Gas

COP ..... Conference of the Parties

CORINAIR ..... Core Inventory Air

CRF ..... Common Reporting Format

EC ..... European Community

EEA ..... European Environment Agency

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

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

EN ..... European Norm

ETC ..... European Topic Centre

EU ..... European Union

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

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

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

FC ..... Fuel Consumption

FMRL ..... Forest Management Reference Level

GHG ..... Greenhouse Gas

GWP ..... Global Warming Potential

IBE ..... Inspection Body for Emission Inventories

IPCC..... Intergovernmental Panel on Climate Change

IEA ..... International Energy Agency

IED..... Industrial Emissions Directive

ISO..... International Standards Organisation

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

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

NEMO ..... Network Emission Model (for the Transport Sector)

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 expressed in kt CO_2 equivalents applying the GWPs according to the 5th Assessment Report ('AR5').

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 in AR5).

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total Emissions/Removals with LULUCF	**66 840**	**66 335**	**74 170**	**81 086**	**81 696**	**74 398**	**72 011**	**64 867**	**67 073**	**73 942**	**73 929**	**68 969**	**72 265**	**72 752**	**78 821**	**83 726**	**82 081**	**70 085**	**67 093**
Total Emissions without LULUCF	**79 047**	**80 619**	**92 589**	**90 159**	**87 378**	**86 771**	**80 137**	**84 693**	**82 506**	**79 788**	**80 229**	**76 663**	**78 884**	**79 821**	**82 132**	**78 854**	**79 994**	**73 911**	**77 529**
1. Energy	**52 665**	**55 291**	**66 715**	**63 921**	**60 488**	**59 531**	**56 392**	**59 281**	**56 971**	**54 830**	**55 005**	**51 280**	**53 064**	**54 289**	**56 001**	**54 555**	**54 937**	**49 930**	**52 142**
A. Fuel Combustion (Sectoral Approach)	51 891	54 755	66 244	63 421	59 982	59 066	55 878	58 779	56 476	54 320	54 500	50 810	52 608	53 866	55 539	54 155	54 563	49 575	51 811
1. Energy Industries	14 008	12 315	16 026	14 821	13 622	13 447	12 437	13 747	13 409	11 975	11 006	9 387	10 502	10 287	10 903	10 054	10 170	8 800	8 855
2. Manufacturing Industries and Construction	9 609	10 023	11 361	11 192	10 748	11 096	10 568	11 188	11 098	10 993	10 733	10 339	10 204	10 515	10 722	10 833	10 818	10 522	10 923
3. Transport	13 952	18 792	24 928	23 663	23 887	22 416	21 759	22 567	21 916	21 732	22 911	22 226	22 702	23 555	24 305	24 422	24 472	21 156	21 932
4. Other Sectors	14 286	13 583	13 884	13 701	11 680	12 062	11 069	11 232	10 010	9 578	9 809	8 818	9 161	9 471	9 572	8 810	9 069	9 064	10 070
5. Other	36	42	44	45	46	46	45	44	43	42	41	40	39	38	37	36	35	34	30
B. Fugitive Emissions from Fuels	774	537	471	500	506	465	513	502	495	510	505	471	456	423	462	400	374	355	331
1. Solid Fuels	373	30	0	0	NO, IE,NA	NO, IE,NA	NO, IE,NA	NO, IE,NA	NO, IE,NA	NO, IE,NA	NO, IE,NA	NO, IE,NA	NO, IE,NA	NO, IE,NA	NO, IE,NA	NO, IE,NA	NO, IE,NA	NO, IE,NA	NO, IE,NA
2. Oil and Natural Gas	401	506	470	500	506	465	513	502	495	510	505	471	456	423	462	400	374	355	331
C. CO_2Transport and Storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
2. Industrial Processes and Other Product Use	**13 615**	**14 408**	**15 652**	**16 178**	**16 926**	**17 303**	**13 970**	**15 935**	**16 126**	**15 730**	**16 139**	**16 289**	**16 800**	**16 498**	**17 231**	**15 596**	**16 520**	**15 524**	**16 959**
A. Mineral Industry	3 114	2 761	2 906	3 060	3 275	3 290	2 732	2 677	2 800	2 725	2 739	2 739	2 760	2 804	2 815	2 926	2 833	2 846	3 050
B. Chemical Industry	1 463	1 521	920	963	886	981	778	776	780	754	692	806	777	797	739	639	834	779	784
C. Metal Industry	8 304	8 489	9 800	10 154	10 714	10 962	8 550	10 420	10 429	10 082	10 468	10 407	10 823	10 387	11 159	9 469	10 375	9 518	11 039
D. Non-Energy Products from Fuels and Solvent Use	349	198	174	188	192	188	167	169	168	160	151	146	132	134	142	145	147	154	165
E. Electronics Industry	133	420	342	356	367	349	112	144	113	97	86	93	102	88	87	78	85	54	53
F. Product Uses as Substitutes for ODS	NO	673	1 099	1 108	1 154	1 200	1 310	1 424	1 516	1 597	1 687	1 786	1 895	1 883	1 889	1 942	1 798	1 702	1 483
G. Other Product Manufacture and Use	252	346	409	350	338	334	321	325	319	314	315	313	311	405	399	397	448	470	383
H. Other (please specify)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3. Agriculture	**8 400**	**7 644**	**7 181**	**7 153**	**7 202**	**7 300**	**7 326**	**7 188**	**7 265**	**7 212**	**7 211**	**7 346**	**7 376**	**7 489**	**7 444**	**7 330**	**7 221**	**7 197**	**7 221**
A. Enteric Fermentation	5 055	4 692	4 407	4 373	4 375	4 354	4 400	4 382	4 325	4 288	4 299	4 316	4 317	4 327	4 334	4 276	4 214	4 182	4 192
B. Manure Management	1 141	994	932	941	967	964	994	1 005	1 016	1 025	1 042	1 062	1 082	1 098	1 123	1 106	1 094	1 089	1 094
C. Rice Cultivation	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
D. Agricultural Soils	2 117	1 867	1 746	1 736	1 748	1 856	1 805	1 687	1 798	1 765	1 743	1 835	1 831	1 911	1 837	1 793	1 762	1 777	1 786
E. Prescribed Burning of Savannas	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
F. Field Burning of Agricultural Residues	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	NO
G. Liming	46	43	54	58	62	72	72	69	77	81	75	75	83	84	86	97	99	99	99
H. Urea application	10	19	22	25	28	26	31	29	27	31	30	34	35	39	38	32	27	25	23
I. Other carbon-containing fertilizers	31	27	20	20	20	27	23	15	21	22	22	24	27	29	26	26	25	25	27
J. Other	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4. Land Use, Land-Use Change and Forestry*	-12 207	-14 284	-18 418	-9 073	-5 682	-12 373	-8 126	-19 827	-15 433	-5 846	-6 299	-7 693	-6 620	-7 069	-3 311	4 872	2 086	-3 826	-10 435
A. Forest Land**	-11 051	-13 907	-16 748	-7 054	-2 380	-9 444	-8 798	-19 144	-14 480	-5 519	-6 891	-8 046	-7 095	-7 705	-3 389	5 024	1 724	-5 541	-10 392
B. Cropland**	183	-19	-120	-117	-133	-88	-127	-126	-130	-138	-122	-93	-28	25	76	104	134	185	277
C. Grassland**	709	503	755	754	750	740	566	559	555	552	552	550	544	517	496	480	475	470	461
D. Wetlands**	47	40	52	42	44	56	85	86	90	86	118	88	75	94	84	83	76	76	76
E. Settlements**	507	559	727	737	723	767	756	732	702	712	667	666	623	618	618	625	609	574	496
F. Other Land**	514	418	365	356	347	338	506	505	504	503	502	501	504	508	511	514	518	521	525
G. Harvested Wood Products	-3 122	-1 889	-3 461	-3 803	-5 045	-4 755	-1 126	-2 452	-2 687	-2 055	-1 138	-1 372	-1 254	-1 137	-1 719	-1 969	-1 462	-122	-1 889
5. Waste	**4 367**	**3 277**	**3 041**	**2 906**	**2 762**	**2 636**	**2 450**	**2 289**	**2 143**	**2 017**	**1 874**	**1 747**	**1 645**	**1 546**	**1 457**	**1 373**	**1 315**	**1 259**	**1 207**
A. Solid Waste Disposal on Land	4 081	2 987	2 730	2 591	2 446	2 322	2 138	1 978	1 831	1 701	1 566	1 435	1 328	1 221	1 135	1 052	988	931	878
B. Biological Treatment of Solid Waste	35	81	116	123	128	129	130	134	136	140	132	138	141	146	144	144	148	150	149

GREENHOUSE GAS SOURCE AND SINK CATEGORIES	1990 (Base year)	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
C. Incineration and Open Burning of Waste	29	13	13	11	9	7	5	3	3	3	3	3	3	3	3	3	3	3	3
D. Waste Water Treatment and Discharge	223	196	182	181	179	178	176	175	174	173	172	171	173	176	176	175	176	176	177
E. Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
6. Other *(please specify)*	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

* *including indirect N_2O emissions*

** *excluding indirect N_2O emissions*

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In the 'Austria's Annual Greenhouse Gas Inventory 1990–2021' report the Umweltbundesamt presents updated greenhouse gas (GHG) emissions in Austria. In 2021, total GHG emissions amounted to 77.5 Mt CO_2e. This corresponds to a 1.9% decrease compared to 1990 and a 4.9% increase compared to 2020. Key drivers for the development 2020–2021 were higher natural gas and gasoil consumption (mainly for stationary combustion in residential buildings) due to the colder weather conditions in the heating season, as well as higher diesel oil and motor gasoline sales in category Transport.

Emissions of GHG covered by EU Regulation No. 2018/842 ('Effort Sharing Regulation') amounted to around 48.8 Mt CO_2e in 2021 and were thus slightly above the annual emission allocation for that year.

Content and format of this report are in accordance with the obligations under the Governance Regulation (EU) No. 218/1999.

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