umweltbundesamt
ENVIRONMENT AGENCY AUSTRIA

Austria's Annual Air Emission Inventory 1990–2022

Emissions of SO_2, NO_x, NMVOC, NH_3 and $PM_{2.5}$

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INHALTSVERZEICHNIS

1 ZUSAMMENFASSUNG

Die aktuellen Ergebnisse der Österreichischen Luftschadstoff-Inventur zeigen im Jahr 2022 gegenüber 2021 rückläufige Emissionen über alle Schadstoffe (SO_2, NO_x, NMVOC, NH_3 und $PM_{2,5}$).

Die folgende Analyse bezieht sich auf die nationale Emissionsmenge inklusive Kraftstoffexport (berechnet auf Basis der verkauften Treibstoffmenge). Seit dem NEC-Bericht 2022 sind für das nationale Monitoring unter der NEC-Richtlinie (siehe Kapitel 3.2) die Emissionsmengen aus Kraftstoffexport nicht mehr von der Gesamtemissionsmenge abzuziehen.

- Die SO_2-Emissionen sind im Jahr 2022 gegenüber 2021 um 0,9 % zurückgegangen, was vor allem auf die Haushalte (verringerter Einsatz von Biomasse und Kohle auf Grund der milderen Witterung und der Preisänderungen am Energiemarkt) zurückzuführen ist. Die Emissionen der Papierindustrie nahmen gegenüber 2021 auf Grund geringerer Produktion ebenfalls ab. Den größten Anteil an den SO_2-Emissionen nimmt 2022 die Eisen- und Stahlindustrie mit 44 % ein. Hier blieben die Emissionen gegenüber 2021 annähernd auf dem gleichen Niveau (+0,3 %).
- Die NO_x-Emissionen sind verglichen mit 2021 im Jahr 2022 um ca. 7,1 % zurückgegangen. Hauptverantwortlich für den NO_x-Ausstoß ist der Straßenverkehr. Für den rückläufigen Trend ist vor allem die Flottenerneuerung auf emissionsärmere Kfz im Pkw- und Lkw-Verkehr verantwortlich, die das Emissionsniveau trotz Fahrleistungssteigerung sinken lässt. Zudem ist rund ein Viertel des gesamten Rückgangs der NO_x-Emissionen in diesem Zeitraum im Bereich der Haushalte erfolgt (milde Witterung, hohe Energiepreise).
- Von 2021 bis 2022 sind die NMVOC-Emissionen um 7,4 % gesunken. Diese stammen überwiegend aus der Landwirtschaft, dem Lösemittelsektor und der Bereitstellung von Raumwärme und Warmwasser in Haushalten. Während die Emissionen 2022 aus der Landwirtschaft nahezu unverändert geblieben sind, sind jene aus den Haushalten auf Grund der milderen Witterung und dem Anstieg der Energiepreise deutlich zurückgegangen. Auch beim NMVOC aus dem Lösemittelsektor wird eine Abnahme verzeichnet, die zurückzuführen ist auf geringere Emissionen aus der industriellen Lackbeschichtung.
- Die NH_3-Emissionen stammen nahezu ausschließlich aus dem Sektor Landwirtschaft (94 %). Im Jahr 2022 sind sie um ca. 1,7 % gegenüber 2021 gesunken, wofür maßgeblich der reduzierte Mineraldüngereinsatz als Folge der enormen Preissteigerungen sowie die verstärkte Ausbringung von Wirtschaftsdünger mit bodennahen Techniken verantwortlich war.
- Von 2021 auf 2022 haben die $PM_{2,5}$-Emissionen um 9,6 % abgenommen, hauptsächlich auf Grund des witterungsbedingt sowie durch Preisänderungen deutlich verringerten Biomasseeinsatzes für die Bereitstellung von Raumwärme und Warmwasser in Haushalten.

Die ab dem Jahr 2020 entsprechend der Richtlinie (EU) 2016/2284 über die Reduktion der nationalen Emissionen bestimmter Luftschadstoffe („NEC-Richtlinie") bzw. dem Emissionsgesetz-Luft 2018 (EG-L 2018; BGBl. I Nr. 75/2018) geltenden Reduktionsverpflichtungen für die anthropogenen Emissionen von NO_x, SO_2, NMVOC, NH_3 und Feinstaub ($PM_{2,5}$) wurden im Jahr 2022 für die Luftschadstoffe NO_x, SO_2, NMVOC und $PM_{2,5}$ eingehalten. Die Emissionsmenge von NH_3 liegt hingegen um rund 4 %-Punkte über der Reduktionsverpflichtung.

2 EINLEITUNG

Dieser Bericht beinhaltet eine Zusammenfassung des aktuellen Stands der Emissionen von Schwefeldioxid (SO_2), Stickstoffoxiden (NO_x), flüchtigen Kohlenwasserstoffen ohne Methan (NMVOC) und Ammoniak (NH_3) sowie der Feinstaubfraktion $PM_{2,5}$. Es werden die Emissionsdaten, die am 15. Februar 2024 an die Europäische Kommission übermittelt wurden, die wichtigsten Trends sowie die wesentlichen methodischen Änderungen gegenüber dem Vorjahr dargestellt.

- Annex 1 beinhaltet die Emissionen der Schadstoffe SO_2, NO_x, NH_3, NMVOC und $PM_{2,5}$ basierend auf dem inländischen Kraftstoffabsatz (Emissionen auf Basis „fuel sold").
- Annex 2 enthält die Emissionstrends dieser Schadstoffe abzüglich der Emissionsmengen aus preisbedingtem Kraftstoffexport in Fahrzeugen (Emissionen auf Basis „fuel used").

Die sektorale Gliederung der im Anhang präsentierten Überblickstabellen hält sich an die Berichtsnomenklatur (Nomenclature For Reporting, NFR) der United Nations Economic Commission for Europe (UNECE). Der vollständige Datensatz wurde in diesem Format an die Europäische Kommission übermittelt.

Der vorliegende Bericht wurde vom Umweltbundesamt auf Grundlage des Umweltkontrollgesetzes (BGBl. Nr. 152/1998) erstellt. Dem Umweltbundesamt wird in diesem Bundesgesetz in § 6 (2) Z. 19 unter anderem die Aufgabe übertragen, an der Erfüllung der Berichtspflichten an die Europäische Kommission gemäß Richtlinien und Entscheidungen der EU mitzuwirken. In § 6 (2) Z. 20 werden die Erstellung 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.

Das Umweltbundesamt führt jährlich die Berechnung der Österreichischen Luftschadstoff-Inventur (OLI) durch, die als Grundlage für die Erfüllung der nationalen und internationalen Berichtspflichten herangezogen wird. Die OLI wird erforderlichenfalls auch für zurückliegende Jahre aktualisiert, um eine konsistente Zeitreihe zur Verfügung zu stellen. Die in diesem Bericht publizierten Emissionsdaten ersetzen somit die publizierten Daten und Zeitreihen vorhergehender Berichte.

Stand der Daten und das Berichtsformat der vorliegenden Publikation:

Tabelle 1: Datengrundlage des vorliegenden Berichts.

Inventur	Datenstand	Berichtsformat
OLI 2023	30. Jänner 2024	NFR-Format der UNECE

3 EMISSIONSTRENDS

In folgender Tabelle werden die aktuellen Ergebnisse der Österreichischen Luftschadstoff-Inventur (OLI) für die Emissionen von SO_2, NO_x, NH_3, NMVOC und $PM_{2,5}$ dargestellt.

Tabelle 2: NEC-Emissionen Österreichs, 1990–2022. (Quelle: Umweltbundesamt).

	Emissionen Österreichs [Kilotonnen]				
	SO_2	**NO_x**	**NMVOC**	**NH_3**	**$PM_{2,5}$**
1990	73,70	216,19	328,77	74,09	27,33
1995	47,31	199,39	244,38	72,10	25,94
2000	31,52	212,65	177,23	68,05	24,22
2001	32,38	223,30	171,86	67,75	24,57
2002	31,28	231,13	167,44	66,79	23,93
2003	31,05	242,18	163,48	66,61	23,98
2004	26,57	242,21	150,21	65,95	23,49
2005	25,89	247,83	154,07	66,01	23,42
2006	26,66	238,30	155,94	66,41	22,87
2007	23,34	231,62	152,01	67,86	22,20
2008	20,27	218,67	146,86	67,60	21,25
2009	14,74	205,17	134,18	68,91	20,16
2010	15,98	206,00	134,75	68,43	20,68
2011	15,17	198,08	130,01	68,14	19,50
2012	14,79	193,32	127,74	68,45	18,97
2013	14,35	193,75	121,98	68,31	18,35
2014	14,52	186,70	115,35	69,16	16,78
2015	14,10	184,03	111,68	70,12	16,68
2016	13,26	176,41	110,31	71,15	16,38
2017	12,79	167,27	110,70	71,70	16,22
2018	11,58	155,00	106,94	70,42	15,20
2019	11,17	145,81	106,69	69,13	14,94
2020	10,41	124,41	107,93	68,73	13,70
2021	10,88	123,21	108,05	69,15	14,88
2022	10,78	114,44	100,04	67,99	13,45

Demnach nahmen im Jahr 2022 gegenüber dem Vorjahr 2021 alle Luftschadstoffemissionen ab.

3.1 Beschreibung der Emissionstrends ab 1990

3.1.1 SO_2-Emissionen

2022 betrugen die SO_2-Emissionen 10,8 kt. Seit 1990 (73,7 kt) konnte der SO_2-Ausstoß um 85 % reduziert werden. Seit 2005 gab es einen Rückgang um 58 %. Diese Entwicklung ist vorwiegend zurückzuführen auf den Ersatz von Kohle und Heizöl durch schwefelärmere Brennstoffe, wie z. B. Erdgas, die Absenkung des Schwefelanteils in Mineralölprodukten und Treibstoffen (gemäß Kraftstoffverordnung) sowie den Einbau von Entschwefelungsanlagen in der Industrie und in Kraftwerken in den 1980er- und 1990er-Jahren (gemäß Luftreinhaltegesetz für Kesselanlagen).

Den größten Beitrag zu den SO_2-Emissionen lieferte 2022 die Industrie mit 76 % in Summe aus pyrogenen Emissionen (NFR Sektor *1.A.2*) und Prozessemissionen (*2*), allen voran die Eisen- und Stahlproduktion mit 44 %. 11 % stammten aus der Energieversorgung (*1.A.1*) und 10 % aus Verbrennungsprozessen in Sonstigen Sektoren (*1.A.4*, überwiegend Haushalte). Im Jahr 1990 waren Letztere mit 44 % noch Hauptverursacher. In diesen Sonstigen Sektoren konnten durch die Umstellung von Kohle und Heizöl auf schwefelärmere Brennstoffe oder andere Energieträger die größten absoluten Reduktionen erreicht werden.

Von 2021 auf 2022 sind die SO_2-Emissionen um 0,1 kt (-0,9 %) gesunken. Vor allem bei den Haushalten (*1.A.4.b.1*) führte der rückläufige Einsatz von Biomasse (-20 %) und Kohle (-25 %) auf Grund der milderen Witterung und der Preisanstiege am Energiemarkt gegenüber dem Vorjahr zu einer deutlichen Emissionsabnahme. Teilweise kompensiert wurde dieser Rückgang durch gestiegene Emissionen aus Energieversorgung und Industrie; nur für die Papierindustrie (*1.A.2.d*) ist ein deutlicher Rückgang der SO_2 Emissionen um 20 % gegenüber 2021 auf Grund einer geringeren Produktion zu verzeichnen.

3.1.2 NO_x-Emissionen

Für das Jahr 2022 wurde ein Ausstoß von rund 114,4 kt NO_x berechnet. Im Jahr 1990 betrugen die NO_x-Emissionen 216,2 kt. Seither gingen sie um rund 47 % zurück. Seit 2005 wurde eine Emissionsreduktion um rund 54 % erzielt.

Der Rückgang der NO_x-Emissionen zu Beginn der 1990er-Jahre und vor allem ab 2005 ist überwiegend auf Maßnahmen im Bereich der Personenkraftwägen (*1.A.3.b.1*) zurückzuführen. Auch der generell stark rückläufige Einsatz von Heizöl und Kohle, der Umstieg auf modernere schadstoffarme Heizungssysteme und Fernwärme in Haushalten und Dienstleistungsbetrieben sowie Minderungsmaßnahmen bei den großen Kohle- und Ölkraftwerken (*1.A.1.a*) und in der Industrie (*1.A.2*) trugen zum Rückgang bei. Die Wirtschaftskrise war hauptverantwortlich für die Reduktion der NO_x-Emissionen von 2008 auf 2009.

Der Großteil der nationalen NO_x-Emissionen entsteht bei der Verbrennung von Brenn- und Kraftstoffen, wobei der größte Anteil an den NO_x-Emissionen im

Jahr 2022 mit 43 % auf den Straßenverkehr entfiel. In den Jahren 2003 bis 2005 erreichten die NO_x-Emissionen des Straßenverkehrs einen Höchstwert und gehen seither kontinuierlich zurück. Seit 2005 konnten sie um 68 % reduziert werden, wobei besonders die Emissionen des Schwerverkehrs durch Fortschritte in der Abgasnachbehandlung schwerer Nutzfahrzeuge (Lkw und Busse) zurückgingen.

Von 2021 auf 2022 kam es zu einer Abnahme der österreichweiten NO_x-Emissionen um 8,8 kt oder 7,1 %. Hierfür maßgeblich verantwortlich ist die Flottenerneuerung auf emissionsärmere Kfz im Pkw- und Lkw-Verkehr (1.A.3.b), die das Emissionsniveau trotz Fahrleistungssteigerungen sinken lässt. Die NO_x-Emissionen aus Verbrennungsprozessen in Sonstigen Sektoren (*1.A.4*, überwiegend Haushalte) sind auf Grund des geringeren Einsatzes von Biomasse, Gas und Öl in Folge der milderen Witterung und der Preisanstiege am Energiemarkt gegenüber dem Vorjahr um 3,0 kt oder 15 % deutlich gesunken.

3.1.3 NMVOC-Emissionen

Die NMVOC-Emissionen betrugen im Jahr 2022 100,0 kt und im Jahr 1990 328,8 kt. Das entspricht einer Reduktion um 70 %. Seit 2005 konnten die NMVOC-Emissionen um 35 % reduziert werden. Von 2021 auf 2022 ist die Emissionsmenge um 8,0 kt (-7,4 %) gesunken.

Die größten Reduktionen seit 1990 konnten im Verkehrssektor erzielt werden, im Wesentlichen durch den verstärkten Einsatz von Katalysatoren und Diesel-Kfz. Aktuell nimmt der Straßenverkehr (*1.A.3.b*) nur mehr einen geringen Anteil von 3,5 % an den gesamten NMVOC-Emissionen ein.

Im Lösemittelsektor (*2.D.3*) konnten auf Grund gesetzlicher Regelungen (Lösungsmittelverordnung sowie VOC-Anlagen-Verordnung) beachtliche Reduktionen erzielt werden. 2022 verursachte dieser Sektor rund 31 % der gesamtösterreichischen NMVOC-Emissionen. Gegenüber dem Vorjahr haben die Emissionen um 5,4 % abgenommen, was auf einen Rückgang der Emissionen der industriellen Lackbeschichtung zurückzuführen ist.

Einen wesentlichen Anteil an den NMVOC-Emissionen hatte 2022 auch der Sektor Landwirtschaft (*3*) mit 32 %, wobei hier die Emissionsberechnung mit erheblichen Unsicherheiten verbunden ist. Die NMVOC-Emissionen stammen vorwiegend aus dem Wirtschaftsdüngermanagement (*3.B*) und zu einem geringeren Anteil aus Landwirtschaftlichen Böden (*3.D*; genaugenommen aus Ackerpflanzen und Grünlandbewuchs). Im Vergleich zum Jahr 2021 blieb das Emissionsniveau 2022 in der Landwirtschaft nahezu konstant (-0,2 %).

Die Bereitstellung von Raumwärme und Warmwasser in Haushalten (*1.A.4.b.1*) nimmt 2022 einen Anteil von 21 % der NMVOC-Emissionen ein. Der rückläufige Einsatz von Biomasse (-20 %) auf Grund der milderen Witterung und der Preisanstiege am Energiemarkt führte 2022 gegenüber dem Vorjahr zu einer deutlichen Emissionsabnahme um 5,4 kt oder 21 %.

3.1.4 NH_3-Emissionen

Für das Jahr 2022 wurde eine Emissionsmenge von rund 68,0 kt NH_3 berechnet. Von 1990 bis 2022 nahmen die NH_3-Emissionen um 8,2 % ab. Seit 2005 ist allerdings ein Anstieg um 3,0 % zu verzeichnen.

Die Landwirtschaft ist mit einem Anteil von 94 % (2022) Hauptverursacher der österreichischen Ammoniak-Emissionen. Innerhalb des Sektors entstanden 2022 etwa 49 % der Emissionen aus dem Wirtschaftsdüngermanagement (*3.B*) und rund 51 % aus Landwirtschaftlichen Böden (*3.D*). Die Emissionen aus der Landwirtschaft gingen seit 1990 um 10 % zurück. Neben dem rückläufigen Viehbestand wirkten sich die effizientere Fütterung der Tiere, der verstärkte Einsatz bodennaher Wirtschaftsdüngerausbringungstechniken (u. a. Schleppschlauch, Schleppschuh, rasche Einarbeitung von Gülle und Mist) sowie die abnehmenden Mineraldüngermengen günstig auf das Emissionsniveau aus.

Im Vergleich zu 2021 verringerten sich die NH_3-Emissionen Österreichs im Jahr 2022 um 1,2 kt (-1,7 %). Hauptursache ist der reduzierte Einsatz von Mineraldüngern im Sektor Landwirtschaft als Folge der enormen Preissteigerungen bei Energie und Rohstoffen. Ebenfalls deutlich zurück gingen die NH_3-Emissionen aus der Tierhaltung, insbesondere durch die verstärkte Nutzung bodennaher Wirtschaftsdüngerausbringungstechniken.

3.1.5 $PM_{2,5}$-Emissionen

Seit 1990 nahmen die $PM_{2,5}$-Emissionen um 51 %, von 27,3 kt auf 13,4 kt, ab. Die Reduktion seit 2005 beträgt 43 %. Die größten Abnahmen seit 1990 gab es bei der Bereitstellung von Raumwärme und Warmwasser in Haushalten (*1.A.4.b.1*) wegen des stark reduzierten Kohleverbrauchs und beim Straßenverkehr (*1.A.3.b*) durch Verbesserungen bei den Antriebs- und Abgasnachbehandlungstechnologien (z. B. Partikelfilter).

Von 2021 auf 2022 haben sich die $PM_{2,5}$-Emissionen um 1,4 kt (-9,6 %) reduziert, hauptsächlich auf Grund des witterungsbedingt verringerten Biomasseeinsatzes in Haushalten (*1.A.4.b.1*).

Die Bereitstellung von Raumwärme und Warmwasser in Haushalten (*1.A.4.b.1*) nimmt 2022 mit rund 40 % den größten Anteil an den $PM_{2,5}$-Emissionen Österreichs ein. Die Emissionsabnahme um 18 % zwischen 2021 und 2022 ist eine Folge der milden Witterung sowie der Änderungen der Energiepreise und dem damit einhergehenden verringerten Einsatz von Biomasse. Zum Teil kann der insgesamt sinkende Trend der $PM_{2,5}$-Emissionen seit 2005 auch auf Effizienzverbesserungen durch thermische Sanierung und auf die höheren Anteile moderner Biomasseheizungen (Verbesserung der Verbrennungstechnologie) zurückgeführt werden. Veraltete Scheitholzfeuerungen („Allesbrenner") sind in diesem Sektor weiterhin hauptverantwortlich für die relativ hohen Emissionen.

3.2 Emissionsreduktionsverpflichtungen ab 2020

Seit dem Jahr 2020 gelten neue Emissionsreduktionsverpflichtungen für die anthropogenen Emissionen von NO_x, SO_2, NMVOC, NH_3 und erstmals auch für Feinstaub ($PM_{2,5}$). Sie sind in der EU-Richtlinie über die Reduktion der nationalen Emissionen bestimmter Luftschadstoffe (kurz NEC-Richtlinie)[1] bzw. dem Emissionsgesetz-Luft 2018[2] festgelegt und gelten von 2020 bis 2029 und ab 2030. Die Mitgliedstaaten sind verpflichtet, diesen Emissionsreduktionsverpflichtungen jährlich nachzukommen und die Emissionen dieser fünf Schadstoffe entsprechend zu begrenzen.

Im Gegensatz zu den bis zum Berichtsjahr 2021 geltenden absoluten Emissionshöchstmengen für die Jahre 2010 bis 2019 sind die NEC-Ziele ab 2020 als Relativwerte festgelegt. Basisjahr für die Berechnungen der Emissionsreduktionsverpflichtungen ist das Jahr 2005.

In folgender Tabelle sind die ab 2020 geltenden Emissionsreduktionsverpflichtungen Österreichs dargestellt.

Tabelle 3: Nationale Emissionsreduktionsverpflichtungen gemäß NEC-Richtlinie für Österreich (Quelle: EG-L 2018, BGBl. I Nr. 75/2018).

	Nationale Emissionsreduktionsverpflichtungen gemäß NEC-Richtlinie	
Luftschadstoff	**Reduktion gegenüber 2005 in jedem Jahr zwischen 2020 und 2029**	**Reduktion gegenüber 2005 in jedem Jahr ab 2030**
NO_x	-37 %	-69 %
SO_2	-26 %	-41 %
NMVOC	-21 %	-36 %
NH_3	-1 %	-12 %
$PM_{2,5}$	-20 %	-46 %

Die Emissionen von NO_x und NMVOC aus Tätigkeiten, die unter die Kategorien 3.B (Düngewirtschaft) und 3.D (Landwirtschaftliche Böden) fallen, sind im Rahmen der Reduktionsverpflichtungen nicht zu berücksichtigen und sind daher im Zielvergleich von den jeweiligen Gesamtemissionen abzuziehen.

[1] Richtlinie (EU) 2016/2284 des Europäischen Parlaments und des Rates vom 14. Dezember 2016 über die Reduktion der nationalen Emissionen bestimmter Luftschadstoffe, zur Änderung der Richtlinie 2003/35/EG und zur Aufhebung der Richtlinie 2001/81/EG, Anhang II. Nach der englischen Bezeichnung *National Emission Reduction Commitments Directive* bzw. der Bezeichnung der Vorgängerrichtlinie (*National Emission Ceilings Directive*) wird sie auch kurz NEC-Richtlinie genannt.

[2] Emissionsgesetz-Luft 2018 (EG-L 2018; BGBl. I Nr. 75/2018): Bundesgesetz über nationale Emissionsreduktionsverpflichtungen für bestimmte Luftschadstoffe (Emissionsgesetz-Luft 2018 – EG-L 2018)

Entsprechend Artikel 5 der NEC-Richtlinie werden den Mitgliedsstaaten gewisse Flexibilitätsregelungen und Anpassungsmöglichkeiten eingeräumt. Diese werden von Österreich im vorliegenden Bericht nicht angewandt.

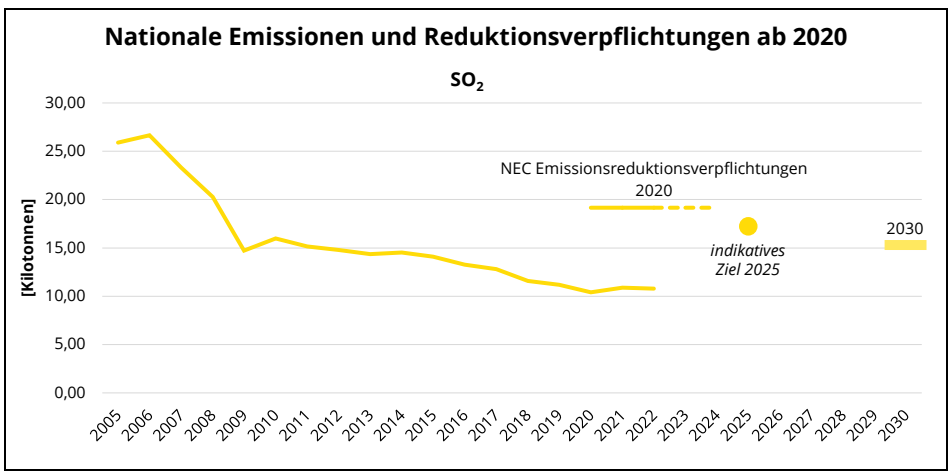
Auf Basis der NEC-Emissionsberichterstattung 2024 stellt sich der Zielvergleich wie folgt dar:

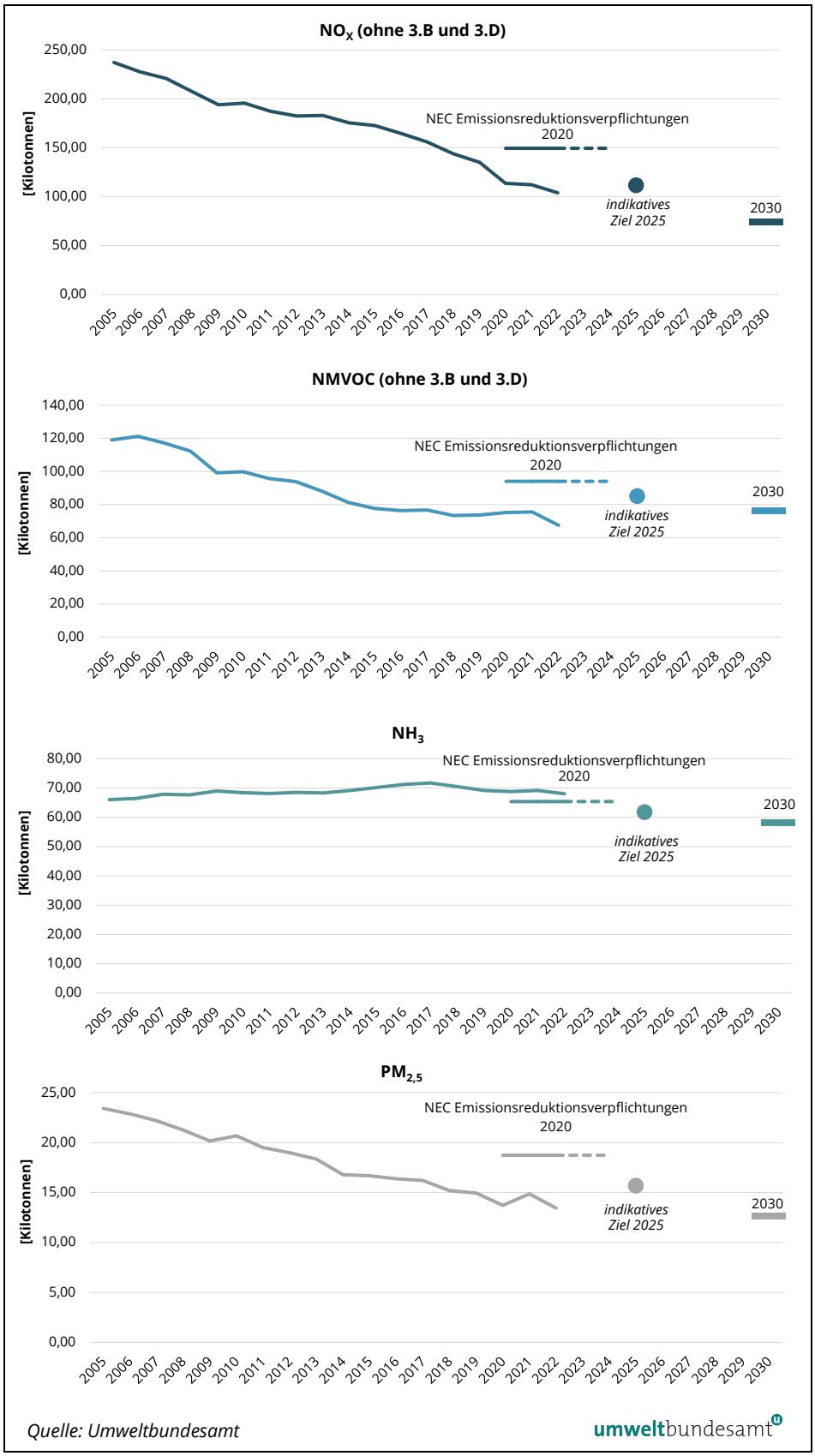
- Für die Luftschadstoffe NO_x, SO_2, NMVOC und $PM_{2,5}$ werden die Emissionsreduktionsverpflichtungen für das Jahr 2022 eingehalten.
- Für Ammoniak (NH_3) wird das Reduktionsziel für das Jahr 2022 nicht erreicht (+3 % anstatt -1 % verglichen mit dem Basisjahr 2005).

Tabelle 4: Emissionen und prozentuelle Änderung von 2005 bis 2022 (Quelle: Umweltbundesamt).

	2005	2022	2005–2022
NO_x (ohne 3.B und 3.D)	237,07	103,85	-56,2 %
NMVOC (ohne 3.B und 3.D)	119,09	67,54	-43,3 %
SO_2	25,89	10,78	-58,4 %
NH_3	66,01	67,99	+3,0 %
$PM_{2,5}$	23,42	13,45	-42,6 %

Abbildung 1: Gegenüberstellung der Emissionen und der Emissionsreduktionsverpflichtungen ab 2020.





Quelle: Umweltbundesamt

umweltbundesamt

3.3 Kraftstoffexport

Die Emissionsberechnungen für den Straßenverkehr basieren auf der in Österreich verkauften Treibstoffmenge. Allerdings wird nicht die gesamte Menge davon in Österreich verfahren, sondern ein Teil wird in den Fahrzeugtanks über die Landesgrenzen hinaus exportiert. Dieser Effekt wird „Kraftstoffexport" genannt.

Gründe für diesen Effekt sind strukturelle Gegebenheiten (Binnenland mit hohem Exportanteil in der Wirtschaft) sowie Unterschiede im Kraftstoffpreisniveau zwischen Österreich und seinen Nachbarländern.

Methodisch lassen sich die über die Grenzen verschobenen Kraftstoffmengen aus der Differenz zwischen Kraftstoffabsatz in Österreich und dem berechneten Inlandsverbrauch ermitteln. Davon können die Fahrleistungen (Kfz-km) von Pkw und schweren Nutzfahrzeugen abgeleitet werden und in weiterer Folge die zugehörigen Emissionen für den „Kraftstoffexport in Kraftfahrzeugen".

Nachstehende Tabelle zeigt die Emissionsmengen, die auf den Kraftstoffexport in Fahrzeugtanks zurückzuführen sind. Im Jahr 2022 sind 7,1 kt, rund 6,2 % der NO_x-Gesamtemissionen Österreichs oder 14 % des NO_x-Ausstoßes aus dem Straßenverkehr (*1.A.3.b)*, auf diesen Effekt zurückzuführen.

Ab Ende der 1990er-Jahre kam es – bedingt durch den zunehmenden Kraftstoffexport – zu einem verstärkten Anstieg der NO_x-Emissionen, vor allem im Schwerverkehr. Im Jahr 2005 wurde ein Höchstwert erreicht; seither nimmt der Kraftstoffexport kontinuierlich ab.

Tabelle 5: Emissionen aus Kraftstoffexport in Fahrzeugtanks (Quelle: Umweltbundesamt).

	Emissionen in Kilotonnen				
	SO_2	**NO_x**	**NMVOC***	**NH_3**	**$PM_{2,5}$***
1990	0,76	16,44	4,43	0,05	0,54
1995	0,92	17,03	1,40	0,04	0,68
2000	0,52	31,57	0,27	-0,14	0,76
2001	0,63	39,24	1,47	0,01	0,96
2002	0,68	47,62	3,45	0,34	1,28
2003	0,74	54,29	4,45	0,54	1,51
2004	0,06	54,10	4,44	0,58	1,52
2005	0,05	56,94	4,49	0,63	1,58
2006	0,04	46,16	3,37	0,59	1,32
2007	0,04	43,08	3,09	0,60	1,23
2008	0,03	36,63	2,44	0,51	0,98
2009	0,04	35,70	2,25	0,51	0,90
2010	0,04	36,09	1,99	0,49	0,87
2011	0,03	29,02	1,53	0,40	0,67
2012	0,03	27,97	1,32	0,36	0,59
2013	0,04	31,40	1,21	0,32	0,58

	Emissionen in Kilotonnen				
	SO_2	**NO_x**	**NMVOC***	**NH_3**	**$PM_{2,5}$***
2014	0,04	27,39	1,00	0,28	0,47
2015	0,04	26,19	0,97	0,29	0,44
2016	0,04	22,59	0,88	0,29	0,37
2017	0,04	20,25	0,78	0,28	0,32
2018	0,04	18,69	0,75	0,29	0,28
2019	0,04	17,00	0,67	0,29	0,24
2020	0,03	8,87	0,35	0,15	0,12
2021	0,03	9,12	0,41	0,19	0,12
2022	0,02	7,14	0,37	0,18	0,09

* *exkl. Brems-, Reifenabrieb und Aufwirbelung ($PM_{2,5}$) sowie Benzinverdampfung (NMVOC)*

Die Emissionsmengen ohne Kraftstoffexport wurden für den Zielvergleich der Jahre 2010 bis 2019 herangezogen (Richtlinie 2001/81/EG über nationale Emissionshöchstmengen für bestimmte Luftschadstoffe, Anhang I).

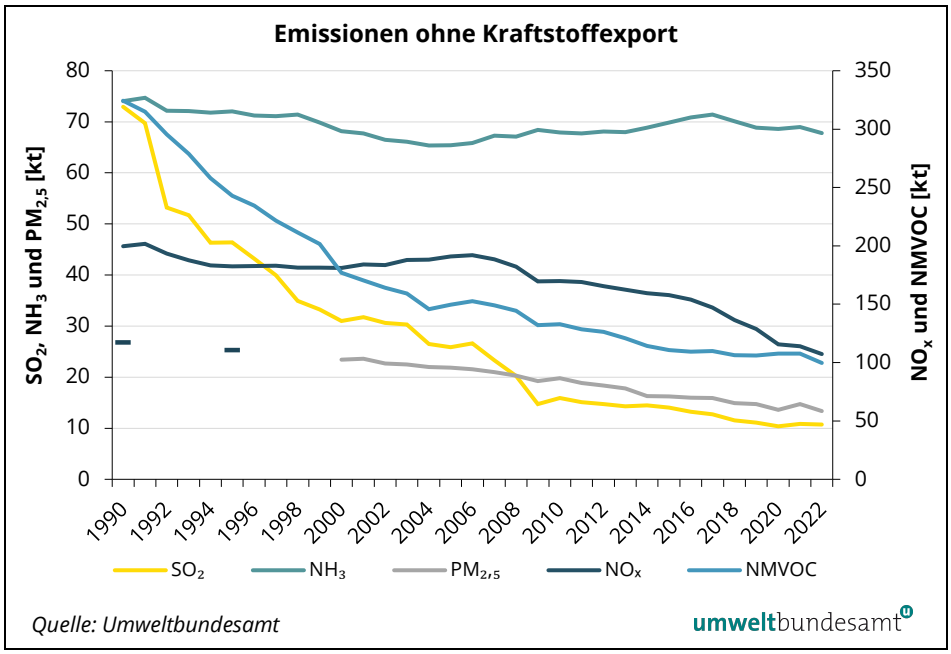
Im Gegensatz dazu werden zur Überprüfung der NEC-Emissionsreduktionsverpflichtungen ab 2020 die Emissionsmengen auf Basis der verkauften Treibstoffe (also inkl. Kraftstoffexport) herangezogen.

Dies ist in den Leitlinien für die Inventurberichterstattung[3] begründet. Dort ist vorgesehen, dass die Beurteilung der Zielerreichung grundsätzlich anhand der auf Basis der verkauften Treibstoffmenge berechneten Inventurdaten erfolgt. Jene Staaten, deren Verpflichtungen auf Basis der verbrauchten Treibstoffe festgelegt wurden, können allerdings auch die auf Basis der verbrauchten Treibstoffmengen berechneten Inventurdaten als Grundlage für die Beurteilung der Zielerreichung wählen. Die Festlegung der ab 2010 geltenden Emissionshöchstmengen erfolgte in den späten 1990er-Jahren; damals war die Problematik des Kraftstoffexports im Fahrzeugtank noch nicht einmal erkannt worden. Die Festlegung der Emissionsreduktionsverpflichtungen für 2020 und 2030 basiert jedoch schon auf Modellrechnungen im Auftrag der Europäischen Kommission, bei denen der Kraftstoffexport in die österreichischen Daten eingerechnet wurde.

Die folgende Abbildung zeigt die österreichischen Emissionen der Schadstoffe SO_2, NO_X, NH_3, NMVOC und $PM_{2,5}$ abzüglich der Emissionen aus dem Kraftstoffexport. Sie werden auf Basis des verbrauchten Kraftstoffs ("fuel used") ermittelt. Die Emissionswerte in tabellarischer Form sind im Anhang 2 angeführt.

[3] 2023 Guidelines for Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution. Diese Leitlinien sind auch unter der NEC-Richtlinie anzuwenden.

Abbildung 2: SO_2, NO_x, NMVOC, NH_3 und $PM_{2,5}$-Emissionen ohne Kraftstoffexport.



4 INTRODUCTION

This report provides a summary of Austria's annual SO_2, NO_x, NH_3, NMVOC and $PM_{2.5}$ emissions for the years between 1990 and 2022.

The annexes at the end of the report include trend tables for the main NFR sectors and the years 1990 – 2022 (SO_2, NO_x, NH_3, NMVOC and $PM_{2.5}$):

- Annex 1: national emission data based on the fuel sold;
- Annex 2: national emission data based on the fuel used.

The complete tables in the NFR format have been uploaded to the Central Data Repository (CDR)[4] of EIONET[5] as digital files (Excel).

[4] http://cdr.eionet.europa.eu/at/eu/nec

[5] European Environment Information and Observation Network (EIONET)

5 EMISSION TRENDS

The following table shows the current results of the Austrian Air Emission Inventory (OLI) for the emissions of SO_2, NO_X, NH_3, NMVOC und $PM_{2.5}$ for the years 1990 to 2022.

Table 1: Emissions in Austria, 1990-2022 (Source: Umweltbundesamt)

	Emissions in Austria [kilotonnes]				
	SO_2	**NO_x**	**NMVOC**	**NH_3**	**$PM_{2.5}$**
1990	73.70	216.19	328.77	74.09	27.33
1995	47.31	199.39	244.38	72.10	25.94
2000	31.52	212.65	177.23	68.05	24.22
2001	32.38	223.30	171.86	67.75	24.57
2002	31.28	231.13	167.44	66.79	23.93
2003	31.05	242.18	163.48	66.61	23.98
2004	26.57	242.21	150.21	65.95	23.49
2005	25.89	247.83	154.07	66.01	23.42
2006	26.66	238.30	155.94	66.41	22.87
2007	23.34	231.62	152.01	67.86	22.20
2008	20.27	218.67	146.86	67.60	21.25
2009	14.74	205.17	134.18	68.91	20.16
2010	15.98	206.00	134.75	68.43	20.68
2011	15.17	198.08	130.01	68.14	19.50
2012	14.79	193.32	127.74	68.45	18.97
2013	14.35	193.75	121.98	68.31	18.35
2014	14.52	186.70	115.35	69.16	16.78
2015	14.10	184.03	111.68	70.12	16.68
2016	13.26	176.41	110.31	71.15	16.38
2017	12.79	167.27	110.70	71.70	16.22
2018	11.58	155.00	106.94	70.42	15.20
2019	11.17	145.81	106.69	69.13	14.94
2020	10.41	124.41	107.93	68.73	13.70
2021	10.88	123.21	108.05	69.15	14.88
2022	10.78	114.44	100.04	67.99	13.45

Emissions of all the above pollutants have decreased since 1990. Compared to 2021, the inventory results show reduced emissions for all pollutants in 2022 as well.

5.1 Description of trends since 1990

5.1.1 SO_2 emissions

In 2022, SO_2 emissions amounted to 10.8 kt. Since 1990 (73.7 kt), emissions have decreased by 85 % and since 2005 by 58 %.

This decline is mainly due to the substitution of coal and heating oil with low-sulphur fuels such as natural gas, the reduction of the sulphur content in mineral oil products and fuels (as prescribed by the Austrian Fuel Ordinance), as well as the installation of desulphurisation units in industry and energy plants (according to the Clean Air Act for boilers).

In 2022, the largest contributor to the national SO_2 emissions is industry with 76 %, summarizing emissions from fuel combustion (*1.A.2*) and process emissions (*2*), whereby the iron and steel industry (*1.A.2.a*) is mainly responsible (contribution of 44 % to national emissions). The energy industries sector (*1.A.1*) contributes to 11 %, the other sectors (*1.A.4*, predominantly households) to 10 %. On the contrary, in 1990 the sector *1.A.4* was as a main emission source of SO_2 responsible for 44 %. Because of the switch of coal and heating oil to low-sulphur fuels or other energy carriers, the largest emission reductions could be achieved in this sector since then.

From 2021 to 2022, SO_2 emissions decreased by 0.1 kt (-0.9 %). In the case of households (*1.A.4.b.1*), the reduction in the use of biomass (-20 %) and coal (-25 %) led to a significant decrease in emissions compared to the previous year. This is due to milder weather conditions and price changes on the energy market. This decline was partly offset by higher emissions from energy supply and increased production from industry, with only the paper industry showing a decline. SO_2 emissions from the paper industry (*1.A.2.d*) decreased by 20 % compared to 2021 due to lower production.

5.1.2 NO_X emissions

In 1990, NO_X emissions amounted to 216.2 kt, and in 2022 to 114.4 kt, constituting a decrease of 47 % over the period. Given that emissions increased between 1990 and 2005 (247.8 kt), the relative emission reduction between 2005 and 2022 is in fact higher at 54 %.

The reduction in NO_x emissions at the beginning of the 1990s and from 2005 onwards was mainly due to reductions in sector *1.A.3.b.1* (passenger cars). Reductions have been also achieved due to a general decrease of fuel oil and coal consumption in all sectors, the switch of households and service providers to modern low-emission heating systems as well as district heating and the installation of abatement technologies in energy and manufacturing industries. The economic crisis caused a fall in emissions between 2008 and 2009.

The main share of Austria's national NO_x emissions is emitted by fuel combustion activities. With 43 %, road transportation accounted for the biggest share of

Austria's total NO_x emissions in the year 2022. In the years 2003 to 2005, NO_x emissions from road traffic peaked and have since then decreased continuously. 2022 emissions have decreased by 68 % compared to 2005 levels. In particular, emissions from heavy duty vehicles (trucks and busses) have fallen due to improvements in exhaust after-treatment technology.

National emissions in the year 2022 were 8.8 kt (and 7.1 %) lower than 2021 levels. One of the main reasons for this was the renewal of the fleet with low-emission vehicles in passenger car and truck traffic (*1.A.3.b*), which reduced the level of emissions despite an increase in mileage. NO_x emissions from fuel combustion of other sectors (*1.A.4*, predominantly households) fell significantly by 3.0 kt (and 15 %) compared to the previous year. This was due to the lower use of biomass, gas and oil, the milder weather and price changes on the energy market.

5.1.3 NMVOC emissions

Non-methane volatile organic compounds emissions amounted to 328.8 kt in 1990 and to 100.0 kt in 2022. This corresponds to a reduction of 70 %. From 2021 to 2022, NMVOC emissions decreased by 8.0 kt (-7.4 %).

The largest reductions since 1990 have been achieved in the road transport sector due to an increased use of catalytic converters and diesel cars. Currently the road transport sector (*1.A.3.b*) accounts only for a small share (3.5 %) of Austria's total NMVOC emissions.

Reductions in the solvent sector (*2.D.3*) have been achieved due to the EU Solvents Directive and the national VOC Installation Act. In 2022, the solvent sector accounted for around 31 % of Austria's total NMVOC emissions. Compared to the previous year, emissions decreased by 5.4 %, which was mainly due to reduced emissions from industrial paint application.

With a share of 32 %, the agriculture sector (*3*) contributed significantly to total NMVOC emissions in 2022. However, emission calculations for this sector are considerably uncertain. NMVOC emissions from agriculture originate mainly from the manure management (*3.B*) and to a lesser extent from agricultural soils (*3.D*). Compared to the previous year, emissions from agriculture remained quite stable in 2022 (-0.2 %).

Residential stationary heating (*1.A.4.b.1*) accounted for 21 % of the total 2022 NMVOC emissions. The decline in the use of biomass (-20 %) due to the milder weather and price changes on the energy market led to a significant decrease in emissions of 5.4 kt (-21 %) in 2022 compared to the previous year.

5.1.4 NH_3 emissions

Ammonia emissions amounted to 68.0 kt in 2022. Since 1990, NH_3 emissions have decreased by 8.2 %, although since 2005 they have increased by 3.0 %.

The main source of NH_3 emissions is the agriculture sector with a share of 94 % in 2022. Within the agriculture sector about 49 % of NH_3 emissions result from Manure Management (*3.B*) and 51 % from Agricultural Soils (*3.D*). There was a decrease of 10 % in NH_3 emissions from the agriculture sector between 1990 and 2022. This reduction can be mainly explained by decreasing livestock numbers, more efficient feeding, an increased application of low emission spreading techniques (e.g. band spreading, trailing shoe, rapid incorporation of manure) and reduced amounts of mineral fertilizer application.

Compared to the previous year 2021, total emissions decreased by 1.2 kt (- 1.7 %). The main reason for this reduction were falling emissions from mineral fertilizer application as a result of lower sales volumes due to the significant increase in energy and raw material prices, which led to higher prices on the fertilizer market. Furthermore, ammonia emissions decreased due to reductions in manure spreading because of the increased use of band spreading techniques in Austria.

5.1.5 $PM_{2.5}$ emissions

Since 1990, $PM_{2.5}$ emissions have decreased by 51 % to 13.4 kt. The decrease since 2005 is estimated at 43 %. The largest reductions were achieved through reduced coal consumption for the provision of space heating and hot water in households (*1.A.4.b.1*) and improved vehicle exhaust after-treatment technologies in road transport (*1.A.3.b*).

From 2021 to 2022, $PM_{2.5}$ emissions decreased by 1.4 kt (9.6 %), due to the significant lower biomass consumption from residential heating (*1.A.4.b.1*) because of the milder weather conditions.

With a share of about 40 %, sector *1.A.4.b.1* residential: stationary was the main source of total $PM_{2.5}$ emissions in 2022. The 18 % decrease in emissions between 2021 and 2022 was a consequence of the mild weather as well as changes in energy prices and the associated reduced use of biomass. To some extent, the overall decreasing trend in $PM_{2.5}$ emissions of *1.A.4.b.1* stationary residential heating since 2005 can also be explained by efficiency improvements through thermal renovation and a switch to modern biomass appliances (improvements in fuel combustion technologies). Obsolete log firing systems ("all-purpose burners") continue to be the main source of the relatively high emissions in this sector.

5.2 Emission reduction obligations as of 2020

The EU Directive on the Reduction of National Emissions of Certain Atmospheric Pollutants (NEC Directive for short)[6] and the national Air Emissions Act 2018[7], respectively, set out separate targets for anthropogenic emissions of NO_x, SO_2, NMVOC, NH_3 and particulate matter ($PM_{2.5}$) for the years 2020 to 2029. The Member States are obliged to comply with these emission reduction commitments annually and to limit the emissions of these five pollutants accordingly.

The NEC targets for the years from 2020 onwards are set as relative values compared to base year values. The base year for the calculations of the emission reduction commitments is 2005.

The following table shows Austria's emission reduction commitments that apply for the years from 2020 and 2030.

Table 2: National Emission reduction commitments under the NEC Directive for Austria (Source: EG - L 2018, https://www.ris.bka.gv.at/eli/bgbl/I/2018/75).

	National Emission reduction commitments under the NEC Directive	
Atmospheric pollutant	**Reduction compared with 2005 for any year from 2020 to 2029**	**Reduction compared with 2005 for any year from 2030**
NO_x	– 37 %	– 69 %
SO_2	– 26 %	– 41 %
NMVOC	– 21 %	– 36 %
NH_3	– 1 %	– 12 %
$PM_{2.5}$	– 20 %	– 46 %

The emissions of NO_x and NMVOC from activities falling under categories 3.B (manure management) and 3.D (agricultural soils) are not to be taken into account in the context of the reduction obligations and should therefore be deducted from the respective total emissions.

In accordance with Article 5 of the NEC Directive, Member States will be given some flexibility and adaptation possibilities. These are not applied by Austria in the present report.

Based on 2024 NEC emissions reporting, the compliance with the 2022 targets is as follows:

- For the air pollutants NO_x, SO_2, NMVOC and $PM_{2.5}$, Austria complies with the respective national emission reduction commitments in 2022.

[6] Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC

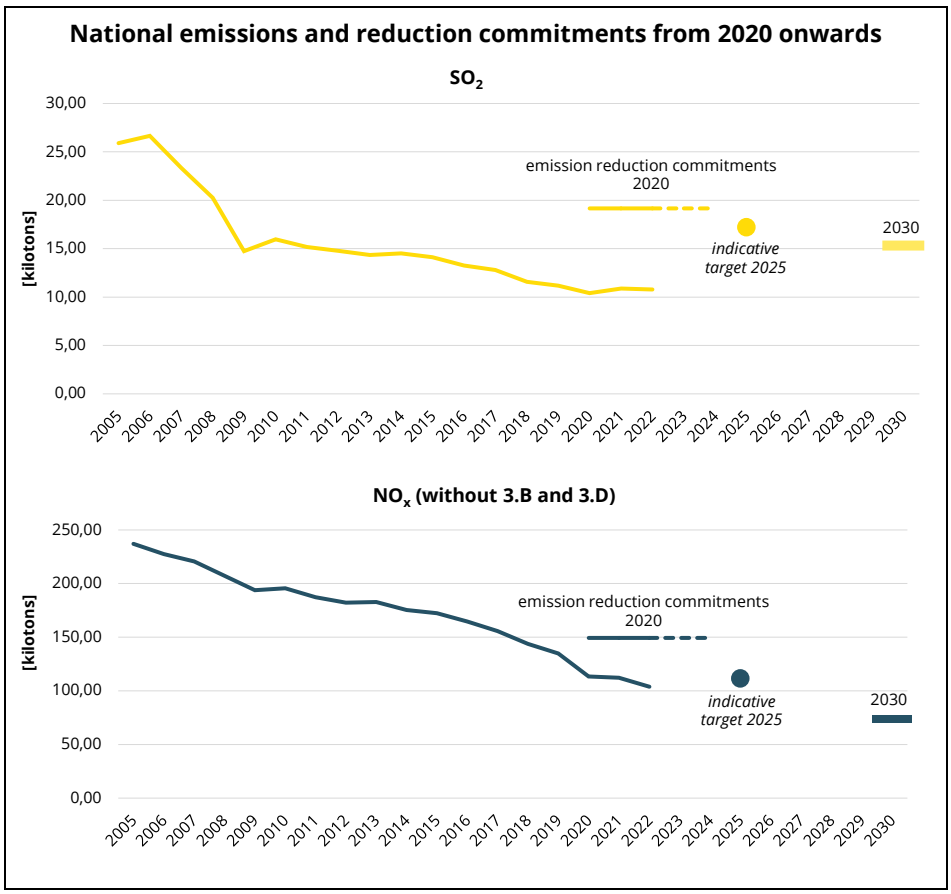
[7] Air Emissions Act (Emissionsgesetz-Luft) 2018 (EG-L 2018; BGBl. I Nr. 75/2018): Bundesgesetz über nationale Emissionsreduktionsverpflichtungen für bestimmte Luftschadstoffe (Emissionsgesetz-Luft 2018 – EG-L 2018)

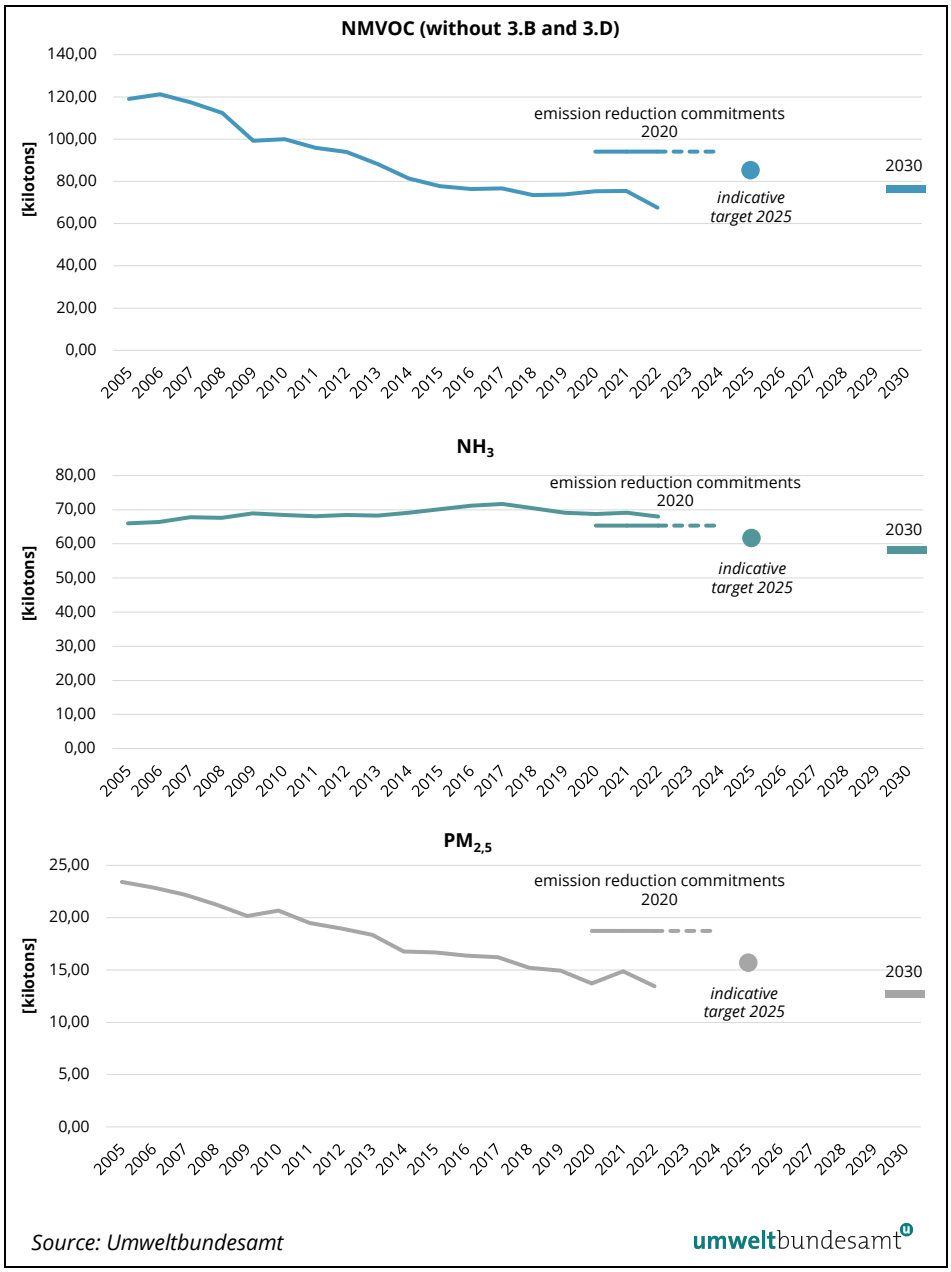
- For ammonia (NH_3), Austria's 2022 total amount of emissions does not comply with the respective national emission reduction commitment for this pollutant. Austria's emissions have risen by 3 % compared to 2005, while the NEC Directive stipulates a reduction of -1 %.

Table 3: Emissions and the percentage change from 2005 to 2022 (Source: Umweltbundesamt).

	2005	2022	2005-2022
NO_x (without 3.B and 3.D)	237.07	103.85	-56.2 %
NMVOC (without 3.B and 3.D)	119.09	67.54	-43.3 %
SO_2	25.89	10.78	-58.4 %
NH_3	66.01	67.99	+3.0 %
$PM_{2,5}$	23.42	13.45	-42.6 %

Figure 1: Comparison of emissions with emission reduction commitments from 2020 onwards.





5.3 Fuel export

Emission calculations for sector road transport are based on the quantity of fuel sold in Austria. However, it is important to note that the fuel quantity, which is sold in Austria, is higher compared to the quantity of fuel that is used and consumed in Austria. This is referred to as "fuel export". In Austria there is a net export of fuels in vehicle tanks that cross national borders, with subsequent combustion and emissions taking place outside the national territory.

The dynamic is explained in part by structural conditions (Austria is a landlocked country with a high share of exports in the economy) and by differences in fuel price levels between Austria and its neighboring countries.

The net quantities of fuel exported (and used) abroad can be determined from the difference between fuel sales in Austria and the calculated domestic consumption. Emissions from "fuel exports in motor vehicles" are derived from the associated mileage (car-km) of cars and heavy-duty vehicles outside the national territory.

The table below shows the emissions from fuel exports. In 2022, NO_x emissions were estimated at 7.1 kt, which is around 6.2 % of Austria's national total NO_x emissions.

From the end of the 1990s, there was an increase of these exported NO_x emissions, mainly from heavy-duty vehicles. A peak was reached in 2005; since then, fuel exports have declined continually. In 2022, the share of fuel export is 14 % of emissions from *1.A.3.b.* Road Transport and 6.2 % of the national total NO_x emissions.

Table 4: Emissions from fuel exports. (Source: Umweltbundesamt).

	Emissions in [kilotonnes]				
	SO_2	**NO_x**	**NMVOC***	**NH_3**	**$PM_{2.5}$***
1990	0.76	16.44	4.43	0.05	0.54
1995	0.92	17.03	1.40	0.04	0.68
2000	0.52	31.57	0.27	-0.14	0.76
2005	0.05	56.94	4.49	0.63	1.58
2010	0.04	36.09	1.99	0.49	0.87
2011	0.03	29.02	1.53	0.40	0.67
2012	0.03	27.97	1.32	0.36	0.59
2013	0.04	31.40	1.21	0.32	0.58
2014	0.04	27.39	1.00	0.28	0.47
2015	0.04	26.19	0.97	0.29	0.44
2016	0.04	22.59	0.88	0.29	0.37
2017	0.04	20.25	0.78	0.28	0.32
2018	0.04	18.69	0.75	0.29	0.28
2019	0.04	17.00	0.67	0.29	0.24
2020	0.03	8.87	0.35	0.15	0.12
2021	0.03	9.12	0.41	0.19	0.12
2022	0.02	7.14	0.37	0.18	0.09

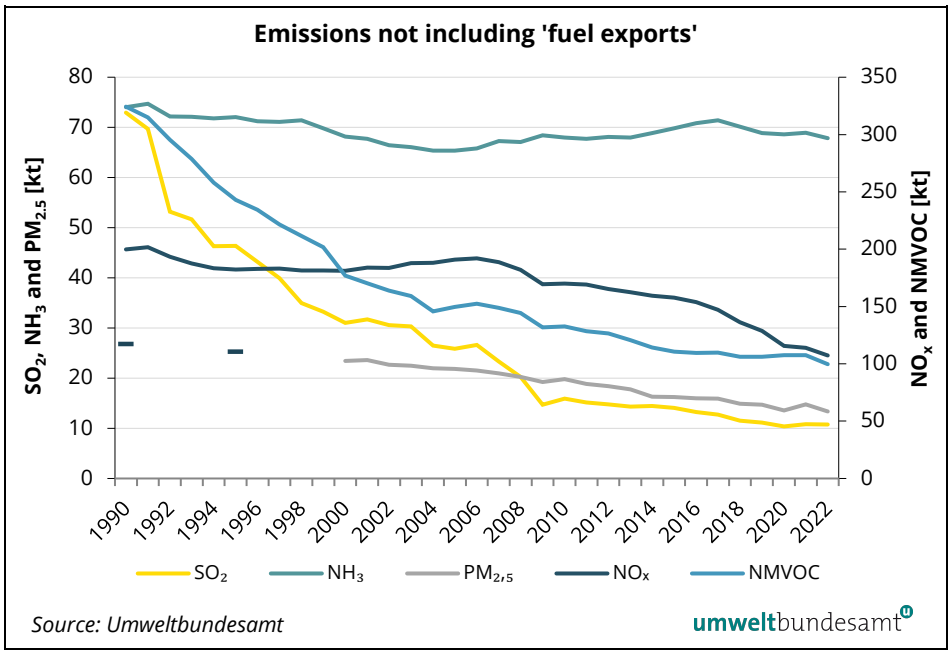
** excluding emissions from tyre and break wear and road abrasion ($PM_{2.5}$) as well as emissions from gasoline evaporation (NMVOC)*

The national emissions without fuel exports were used to assess compliance with the emission ceilings under the NEC Directive for the years 2010 to 2019

(Directive 2001/81/EG on national emission ceilings for certain atmospheric pollutants, Annex I). However, from 2020 onwards the emissions based on fuels sold (i.e. including fuel exports) are used for assessing the compliance with the current national emission reduction commitments. This is justified in the inventory reporting guidelines[8]. It provides that the assessment of the achievement of the target is, in principle, based on the inventory data calculated on the basis of the quantity of fuel sold. However, those States whose obligations have been determined on the basis of the fuel consumed may also choose the inventory data calculated on the basis of the quantities of fuel used as the basis for assessing the achievement of the target. The emission ceilings applicable from 2010 onwards were established in the late 1990s; at that time, the problem of fuel export in the vehicle tank had not been adequately considered. However, the setting of emission reduction commitments for the years post-2020 and post-2030 is based on model calculations made on behalf of the European Commission, where fuel exports have been considered in the respective Member State targets.

The following figure shows the Austrian emissions of the pollutants SO_2, NO_x, NH_3, NMVOC and $PM_{2.5}$ without emissions from fuel exports (calculated on the basis of fuel used). The emission values in tabular form are listed in Annex 2.

Figure 2: SO_2, NO_x, NMVOC, NH_3 and $PM_{2.5}$-emissions without fuel exports.



[8] 2023 Guidelines for Reporting Emissions and Projections Data under the Convention on Long-range Transboundary Air Pollution. These guidelines are also applicable under the NEC Directive.

6 METHOD OF REPORTING

6.1 Methodology

The Austrian Air Emission Inventory for the period 1990 to 2022 has been compiled according to the 2023 Guidelines for Reporting Emissions and Projections Data as adopted by the Executive Body for the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP Convention) at its 42nd session.

In Austria, emissions of air pollutants as well as emissions of greenhouse gases are all gathered in a database based on the CORINAIR (CORe INventory AIR)/ SNAP (Selected Nomenclature for sources of Air Pollution) nomenclature. This nomenclature was designed by the EEA to estimate emissions of all kinds of air pollutants. To comply with the reporting obligations under the UNECE/LRTAP Convention, the CORINAIR/SNAP category emissions translate and assigned to respective categories of the NFR (Nomenclature for Reporting) format.

The complete set of tables in the NFR format, including – in particular – sectoral emissions and activity data, is submitted separately in digital form only (Excel files). In this report, NFR summary tables are presented in annexes 1 and 2.

The following table summarises the status of this report:

Table 5: Status of report.

Format	Inventory	Version
NFR Format (UNECE)	OLI 2023	January 30th 2024

Data presented in this report are based on the 2023 Austrian Air Emission Inventory cycle (Österreichische Luftschadstoff-Inventur, OLI 2023) prepared by the Umweltbundesamt in the year 2023 with annual emissions estimates for the years between 1990 and 2022. The Austrian Air Emission Inventory is subject to continuous improvement, resulting in recalculations as outlined in Chapter 7.

6.2 Sources of Data

Table 6 presents the main data sources used for activity data as well as information on the institutions that carried out respective calculations.

Table 6: Main data sources for activity data and emission values.

Sector	Data Sources for Activity Data
Energy	Energy Balance from Statistik Austria; EU-ETS; LCP emission declarations; direct information from industry or associations of industry; energy demand model for space heating (fuel technology shares)
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, Innovation and Technology (BMK); ZBD: Zentrale Begutachtungsdatenbank (periodically updated specific mileage); yearly flight movements from AustroControl; yearly FC of airport ground activities at Vienna International Airport
IPPU	National production and foreign trade statistics; Structural business statistics; Surveys conducted at companies and industry associations; Reports submitted under the Industrial Emissions Directive
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 companies (sales data)
Waste	Federal Waste Management Plans (Data sources: Database on landfills (1998–2007), EDM – Electronic Data Management (from 2008 onwards); EMREG-OW (Electronic Emission Register of Surface Water Bodies), national studies

Emission calculations and related inventory work (reporting, QA/QC, documentation and archiving, etc.) are carried out by sector experts of the Inspection Body for Emission Inventories (IBE).

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

The IBE is responsible for

- choice of the contractor i.e. judging his/her/their 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 been entered into with e.g.:

- Technical University Graz (road and off-road transport)

- University of Natural Resources and Applied Life Sciences (agriculture)

A detailed description of the activity data, emission factors, and the methodologies applied will be provided in Austria's Informative Inventory Report (IIR) 2024[9], which is to be submitted under the UNECE Convention on Long-range Transboundary Air Pollution and the NEC-Directive (EU 2016/2284) on 15 March 2024. Furthermore, relevant service contracts, as described in brief above, will be referenced in the sector-specific chapters of this document.

[9] https://www.umweltbundesamt.at/emiberichte

7 RECALCULATIONS

Following the continuous improvements made to Austria's annual Air Emission Inventory, some sources have been recalculated on the basis of updated activity data or revised methodologies. Thus, the emission data for the period from 1990 to 2021 submitted this year may differ from the data previously reported.

The figures presented in this report replace former data reported by the Umweltbundesamt under the reporting framework of the UNECE/LRTAP Convention and the NEC Directive of the European Union.

Table 7: Recalculation difference with respect to the previous submission (Source: Umweltbundesamt).

	Recalculation Difference [%]		
	1990	**2005**	**2021**
SO_2	0.00 %	0.00 %	0.02 %
NO_x	-1.26 %	-0.01 %	0.47 %
NMVOC	-1.58 %	-1.98 %	-2.51 %
NH_3	6.96 %	5.29 %	5.01 %
$PM_{2.5}$	0.24 %	2.95%	6.70 %

There have been recalculations carried out in all sectors, largely due to updated activity data, e.g. the revision of the energy balance, production statistics and livestock data. Furthermore, methodological improvements such as the usage of updated emission factors, have also led to revisions.

The following section describes the methodological changes made to each sector of the inventory since the previous submission.

7.1 ENERGY (1)

7.1.1 Stationary combustion 1.A.1.a-c, 1.A.2.a-g, 1.A.3.e.i and 1.A.4.a-1.A.4.c

7.1.1.1 Update of activity data

Revision of the energy balance

The federal statistics office "Statistik Austria" revised the energy balance (mainly for year 2021) with the following **main implications** for energy consumption as used in the inventory:

- Natural gas 2021: Gross inland consumption has not been revised. Transformation input has been revised by +0.6 PJ (*1.A.1.a*). Own use by the en-

ergy sector has been revised by +0.4 PJ (*1.A.1.c*). -1.8 PJ of final energy consumption has been subtracted from *1.A.4* and +0.8 PJ has been shifted to *1.A.2*.

- Gasoil 2021: Gross inland consumption has been revised by -2.2 PJ, leading to revisions of -1.1 PJ final energy consumption for 1.A.2 and -1.1 PJ for 1.A.4.
- LPG 2021: Minor shifts (0.1 PJ) from 1.A.4 and Transport to 'non energy use'.
- Residual fuel oil: 0.7 PJ (59 kt CO2) has been shifted from 1.A.4 to 1.A.2.
- Coal 2021: Final energy consumption has been revised by -0.1 PJ (mainly 1.A.4).
- Solid biomass 2021: Final energy consumption has been revised by +6.9 PJ, which has been mostly allocated to the residential sector (1.A.4.b).

Non-road mobile Machinery in Industry (1.A.2.g.7)

Energy consumption for non-road mobile machinery in the industrial sector has been revised for 2021 due to an update of the industrial production index.

7.1.1.2 Methodological Changes

Energy Industries (1.A.1) and Manufacturing Industries (1.A.2)

For the categories *1.A.1* and *1.A.2*, the revisions follow those of the energy balance. The methods applied (emission factors and data sources) remain unchanged.

Minor revisions of PM emissions from *1.A.1.a* are due to an error correction of plant specific data allocation. Minor revisions of PM emissions from *1.A.2.f* were reported because an erroneous change in the previous year's submission were reversed.

Other Sectors (1.A.4)

For 1990 to 2021, minor changes in air pollutant emissions of categories Commercial/Institutional *(1.A.4.a)* and Residential *(1.A.4.b)* occur because of updated heating stock data and newly allocated shares of combustion technologies per energy carrier (updated energy demand model for space heating).

7.1.2 Fugitive emissions (1.B)

Distribution of oil products (1.B.2.a.5)

Activity data (gasoline) in *1.B.2.a.5 Distribution of oil products* (transport and depots except service stations) had to be corrected by one data supplier for the year 2021, resulting in slightly revised NMVOC emissions for that year (-0.0003 kt).

Storage of solid fuels (1.B.1.a)

PM emissions for 2021 were revised by +0.9% (+0.0005 kt $PM_{2.5}$) due to revised coal consumption activity data.

7.1.3 Transport (1.A.3)

Road Transport (1.A.3.b)

Update/improvement of activity data

- **Revision of real fuel consumption for PC and LDV PHEV**
  The energy consumption in hybrid vehicles is subject to high uncertainties. The fact is that in reality there are use cases with a high proportion of kilometers driven electrically, but on the other hand also cases that are almost exclusively powered with the combustion engine (ITNA, 2023, p.9). For this reason, a more pessimistic charging behavior for PHEV vehicles has been assumed, which increased the real fuel consumption of PHEV cars (petrol) and LDV (petrol), especially in 2021.
- **Update of specific vehicle mileage per year**
  Improvement of data evaluation in the central vehicle assessment database (ZBD - annual "sticker check" in accordance with §57a KFG): An update of the relevant input data made it possible to evaluate half-years for 2021 and 2022 and thus define the specific annual mileage of vehicles more precisely. This has led to an increase for LDV and 2-wheelers for 2021 compared to last year's inventory.
  In general, data from ZBD is used to evaluate the specific yearly mileage for vehicle categories PC, LDV, buses and 2-wheelers.

All these changes resulted in recalculations in *1.A.3.b. Road Transport* for 2021 of +0.3 kt NO_x, +0.00004 kt SO_2, +0.002 kt NH_3, -0.02 kt NMVOC and +0.55 kt $PM_{2.5}$.

Military (1.A.5)

Confidential data (fuel consumption) became available from a survey for military off-road vehicles for the year 2021. The evaluation for 2021 and a separate expert assessment helped to refine the trend from 1990 to 2022. Consequently, the entire time series has been recalculated.

Military air traffic continues to be subject to great uncertainty due to a lack of actual data. In the previous inventory, the year 2021 was an extrapolated value, which has been revised in the current inventory based on an update of the inventory of Austrian military helicopters and aircraft available for 2022.

All these changes resulted in recalculations in *1.A.5. Other* for 2021 of + 0.0018 kt NO_x, - 0.0006 kt SO_2, + 0.0000003 kt NH_3, - 0.0002 kt NMVOC and + 0.0004 kt $PM_{2.5}$.

Memo Item International Bunkers - Navigation

Due to a linking error in the GEORG "Danube Shipping" module, the value for 2021 was incorrect and has been corrected.

7.2 INDUSTRIAL PROCESSES (2)

7.2.1 Update of data

7.2.1.1 Construction and demolition (2.A.5.b)

Activity data taken from national statistics for the years from 2010 onwards were updated, which also impacted the extrapolation back to 1990. This resulted in minor recalculations of the whole time series (+ 0.003 kt $PM_{2.5}$ in 2021).

7.2.1.2 Iron and steel production (2.C.1)

PM emissions for 2016 and 2020 were updated resulting in minor recalculations (previously rounded values were used; recalculation effect e.g. for 2020: + 0.0001 kt $PM_{2.5}$)

7.2.1.3 Copper production (2.C.7.a)

Activity data for 2020 and 2021 were updated (e.g. + 0.00001 kt $PM_{2.5}$ and + 0.01 kt SO_2 in 2021).

7.2.2 Methodological changes

7.2.2.1 Ammonia production (2.B.1)

NMVOC emissions from ammonia production were previously reported together with emissions from another production site under *2.B.10.a other*. They are now allocated according to the EMEP/EEA GB 2023 (no effect on overall emissions level).

SO_2 emissions from ammonia production were reported by the plant operator, and have been included in the inventory (+ 0.00003 kt SO_2).

7.2.2.2 Chemical industry other (2.B.10.a) - Ammonia production (2.B.1) – Nitric acid production (2.B.2)

A time series inconsistency was eliminated: for the years 1990-1993 NO_x emissions previously were taken from a study that upscaled emissions from some installations to total chemical production using business volumes. Now emissions from these years are estimated in accordance with the methodology for

subsequent years considering relevant production processes (- 2.74 kt NO_x in 1990).

PM emissions from fertilizer and urea production were reassessed incorporating recent measurement data and also correcting some inconsistencies of the time series (+0.04 kt $PM_{2.5}$ in 2021).

7.2.2.3 Solvent and other product use (2.D.3 except 2.D.3.b and 2.D.3.c)

Data on installation basis that is prepared by the operators according to the VOC directive were collected and incorporated. During intensive QC, which included comparison with the data of 2015 and 2019, some corrections of the data for 2015 and 2019 were made, leading to a recalculation for most sub-categories from 2015 onwards.

Also, corrections on the top down data were made: besides correction of minor transcription errors for the years from 2016 onwards, non-solvent use of a new company became available which was considered for 2021 leading to a decrease of total solvent use in Austria. As bottom up data is extrapolated to this value, this resulted in lower activity data and thus lower emissions for 2021.

Overall, the recalculation difference for 2021 of this subcategory is – 1.34 kt NMVOC.

7.2.2.4 Wood Processing (2.I)

During extensive QA/QC a transcription error was corrected, resulting in minor recalculations of the whole time series (e.g. – 0.0004 kt $PM_{2.5}$ in 2021).

7.3 AGRICULTURE (3)

7.3.1 Update of activity data

7.3.1.1 Manure Management (3.B), Agricultural Soils (3.D)

Livestock data – cattle < 1 year

The livestock category cattle < 1 year comprises slaughtering calves < 1 year, other male calves and cattle < 1 year, and other female calves and cattle <1 year according to the official statistics (Statistics Austria). The breakdown by type of use is determined by Statistics Austria using model calculations. Methodological improvements resulted in shifts between the cattle < 1 year sub-categories in the years 2003-2021 and thus lead to revised average values for gross energy intake, $N_{excretion}$ and $VS_{excretion}$ for cattle < 1 year.

Background data for feeding and nutrition of dairy and suckling cows

New figures for the protein and fat content of milk for the year 2021 became available (AMA 2023[10]). This update resulted in minor revisions of the values for gross energy intake, $N_{excretion}$ and $VS_{excretion}$ of dairy and suckling cows.

Biogas plants

New data on input materials for Austria's biogas plants became available from the compost and biogas association (Kompost- und Biogasverband[11]) resulting in slightly revised NO_x and NH_3 emissions with an impact on the 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 for 2020 and 2021.

7.3.2 Methodological changes

7.3.2.1 Manure Management (3.B) – NH_3, NO_x, and NMVOC

One reason for the revised estimates is the improved activity and nutrition data as already explained above. Additionally, a linkage error in the NMVOC agriculture sector model for other cattle was corrected.

Overall, NH_3 and NO_x emissions from manure management have increased, whereas NMVOC emissions have decreased compared to the previous submission (+0.2 kt NH_3, +0.002 kt NO_x and -2.2 kt NMVOC for 2021).

7.3.2.2 Agricultural Soils (3.D) – NH_3, NO_x and NMVOC

Inorganic N-fertilizers (3.D.a.1)

For the first time the new Tier 2 NH_3 EF for mineral fertilizers according to the EMEP/EEA Guidebook 2023 has been used. This update resulted in revised ammonia emissions for the entire time series (+3.1 kt NH_3 for 2021).

Animal Manure Applied to Soils (3.D.a.2.a)

Updated activity and nutrition data, as described before, resulted in revised NH_3, NO_x and NMVOC emissions between 2003 and 2021. In addition, the latest subsidy data on manure amounts applied with low-emission spreading techniques for cattle and swine from the ÖPUL database[12] of the Federal Ministry of Agriculture, Forestry, Regions and Water Management (BML) were imple-

[10] AMA (2023): Rohmilchqualität | AMA - AgrarMarkt Austria

[11] KOMPOST- UND BIOGASVERBAND (2023): Biogas Downloads | Arbeitskreise, accessed in November 2023

[12] The Agri-environmental Programme ÖPUL intends to foster the environmentally sound management of the agricultural areas in Austria. One of the objectives is the reduction of greenhouse gas and ammonia emissions from agriculture.

mented, resulting in revised estimates for ammonia from 2018 to 2021. Additionally, for NMVOC and other cattle a linkage error in the agriculture sector model was corrected (-0.1 kt NH_3, +0.02 kt NO_x and -0.6 kt NMVOC for 2021).

Other organic fertilizers (3.D.a.2.c)

As a result of the updated input materials for biogas plants, NH_3 and NO_x emissions have been revised for the years 2020 and 2021 (-0.01 kt NH_3 and -0.01 kt NO_x).

Urine and dung deposited by Grazing Animals (3.D.a.3)

Reasons for recalculations are the livestock related updates as already described above, updated NH_3-EF for sheep and deer according to the new EMEP/EEA GB 2023 and the correction of a linkage error in the sector model for NMVOC. These improvements resulted in revised NH_3 and NMVOC emissions of the entire time series. In the case of NO_x, recalculations are reported for the years between 2003 and 2021 (+0.1 kt NH_3, +0.003 kt NO_x and -0.01 kt NMVOC for 2021).

7.4 WASTE (5)

7.4.1 Update of activity data

7.4.1.1 Solid waste disposal on land (5.A.1)

Revisions are reported for the years 2018-2021 (2021: +0.001 kt NMVOC, +0.00002 kt NH_3) as updated data on landfill gas recovery became available from a national study (Umweltbundesamt 2023[13]). In the previous submissions, results from the preceding study (Umweltbundesamt 2019[14]) were used to derive assumptions on recovered amounts for the years 2018-2021.

Furthermore, minor recalculations of particulate matter emissions are reported for 2021 ($PM_{2.5}$: +0.0001 kt) due to updated activity data (revised amounts of deposited mineral waste).

[13] Umweltbundesamt (2023): Deponiegaserfassung 2018-2022 bei österreichischen Massenabfalldeponien. Grundlagenstudie für die Österreichische Luftschadstoff-Inventur (Sektor Abfallwirtschaft). https://www.umweltbundesamt.at/fileadmin/site/publikationen/rep0878.pdf

[14] Umweltbundesamt (2019): Deponiegaserfassung 2013–2017. https://www.umweltbundesamt.at/fileadmin/site/publikationen/rep0679.pdf

7.4.1.2 Anaerobic digestion at biogas facilities (5.B.2)

Recalculations of NH_3 reported for 5.*B.2 anaerobic digestion at biogas facilities* (+0.01 kt in 2021) are due to updates of activity and nutrition data ($N_{excretion}$ of cattle, biogas plants). See also Chapter 7.3 on recalculations in the agriculture sector.

7.4.1.3 Open burning of waste (5.C.2)

In previous inventories, a share of 3 % was assumed for the area of vineyards burnt for the entire time series according to an expert judgement from the Federal Association of Viniculture in 2001 (Bundesweinbauverband Österreich). According to current information from the Federal Association of Viniculture, the area of vineyards burnt has decreased over time and is assessed to be no more than 1 % of the total vineyard areas for the years 2010 onwards. The burning of vine is either prohibited or permitted to an only very limited extent in the relevant federal provinces. The area of vineyards burnt between 2001 and 2010 was determined by linear interpolation between the two, respective expert judgement, estimates. This improvement resulted in revised emissions for the years 2002-2021.

7.4.1.4 Other waste (5.E)

In this category *5.E* recalculations for 2021 were carried out for particulate matter ($PM_{2.5}$: +0.2 kt) as updated statistical information on accidental building fires 2021 became available.

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ABBILDUNGSVERZEICHNIS

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ANNEX 1: AUSTRIA'S EMISSIONS BASED ON FUEL SOLD (WITH ‚FUEL EXPORTS')

Notation keys:

NE (not estimated) ..... for existing emissions by sources and removals by sinks of pollutants which have not been estimated.

IE (included elsewhere) ... for emissions by sources and removals by sinks of pollutants 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 pollutants 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 pollutant.

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.

The complete tables in the NFR format are submitted separately in digital form only (Excel files).

Table A.I-1: SO_2 emissions [in kilotonnes] 1990–2022 based on fuel sold. (Source: Umweltbundesamt)

	NFR								
	1	1 A	1 B	2	3	5	6		
	ENERGY	FUEL COMBUSTION ACTIVITIES	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	AGRICULTURE	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1990	71.69	69.69	2.00	1.93	0.00	0.07	NO	73.70	0.25
1991	69.06	67.76	1.30	1.61	0.00	0.06	NO	70.73	0.28
1992	52.79	50.79	2.00	1.36	0.00	0.04	NO	54.20	0.30
1993	51.66	49.56	2.10	1.11	0.00	0.04	NO	52.82	0.32
1994	46.16	44.88	1.28	1.12	0.00	0.05	NO	47.33	0.34
1995	46.18	44.65	1.53	1.07	0.00	0.05	NO	47.31	0.38
1996	42.90	41.70	1.20	0.99	0.00	0.05	NO	43.94	0.42
1997	39.36	39.29	0.07	0.96	0.00	0.06	NO	40.38	0.43
1998	34.65	34.61	0.04	0.87	0.00	0.06	NO	35.59	0.45
1999	32.82	32.78	0.04	0.81	0.00	0.06	NO	33.70	0.44
2000	30.68	30.63	0.04	0.78	0.00	0.06	NO	31.52	0.48
2001	31.61	31.56	0.05	0.71	0.00	0.06	NO	32.38	0.47
2002	30.51	30.47	0.04	0.71	0.00	0.06	NO	31.28	0.43
2003	30.28	30.23	0.05	0.71	0.00	0.06	NO	31.05	0.40
2004	25.78	25.74	0.04	0.72	0.01	0.06	NO	26.57	0.47
2005	25.11	25.07	0.04	0.72	0.00	0.06	NO	25.89	0.55
2006	25.87	25.83	0.05	0.73	0.00	0.05	NO	26.66	0.58
2007	22.55	22.49	0.05	0.75	0.00	0.04	NO	23.34	0.61
2008	19.46	19.41	0.04	0.78	0.00	0.03	NO	20.27	0.61
2009	14.02	13.96	0.06	0.70	0.00	0.02	NO	14.74	0.53
2010	15.26	15.21	0.05	0.70	0.00	0.01	NO	15.98	0.57
2011	14.47	14.43	0.05	0.68	0.00	0.01	NO	15.17	0.60
2012	14.12	14.08	0.05	0.65	0.00	0.01	NO	14.79	0.57
2013	13.75	13.71	0.04	0.58	0.00	0.01	NO	14.35	0.54
2014	13.95	13.91	0.04	0.56	0.00	0.01	NO	14.52	0.54
2015	13.53	13.49	0.04	0.55	0.00	0.01	NO	14.10	0.58
2016	12.69	12.66	0.02	0.56	0.00	0.01	NO	13.26	0.54
2017	12.21	12.17	0.04	0.57	0.00	0.01	NO	12.79	0.52
2018	11.01	10.98	0.02	0.56	0.00	0.01	NO	11.58	0.59
2019	10.56	10.54	0.02	0.59	0.00	0.01	NO	11.17	0.68
2020	9.80	9.78	0.02	0.59	0.00	0.01	NO	10.41	0.24
2021	10.27	10.24	0.03	0.59	NA	0.01	NO	10.88	0.27
2022	10.17	10.14	0.03	0.59	NA	0.02	NO	10.78	0.45

Table A.I-2: NO_x emissions [in kilotonnes] 1990–2022 based on fuel sold. (Source: Umweltbundesamt)

	NFR								
	1	1 A	1 B	2	3	5	6		
	ENERGY	FUEL COMBUSTION ACTIVITIES	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	AGRICULTURE	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1990	200.87	200.87	IE	1.53	13.66	0.12	NO	216.19	2.48
1991	210.80	210.80	IE	1.51	13.58	0.11	NO	226.01	2.80
1992	199.64	199.64	IE	1.41	13.16	0.08	NO	214.30	3.06
1993	193.88	193.88	IE	1.51	12.91	0.07	NO	208.36	3.27
1994	186.00	186.00	IE	1.38	12.71	0.07	NO	200.16	3.43
1995	185.65	185.65	IE	0.90	12.78	0.07	NO	199.39	3.85
1996	203.64	203.64	IE	0.87	12.60	0.07	NO	217.18	4.24
1997	189.86	189.86	IE	0.86	12.60	0.07	NO	203.39	4.43
1998	201.66	201.66	IE	0.83	12.61	0.07	NO	215.17	4.59
1999	193.82	193.82	IE	0.82	12.18	0.07	NO	206.88	4.52
2000	199.81	199.81	IE	0.83	11.93	0.07	NO	212.65	6.44
2001	210.62	210.62	IE	0.78	11.84	0.07	NO	223.30	6.32
2002	218.48	218.48	IE	0.79	11.79	0.07	NO	231.13	5.67
2003	230.01	230.01	IE	0.81	11.30	0.07	NO	242.18	5.21
2004	230.71	230.71	IE	0.69	10.74	0.07	NO	242.21	6.09
2005	236.29	236.29	IE	0.70	10.78	0.06	NO	247.83	6.99
2006	226.84	226.84	IE	0.58	10.82	0.05	NO	238.30	7.54
2007	220.11	220.11	IE	0.48	10.98	0.05	NO	231.62	7.99
2008	206.56	206.56	IE	0.56	11.51	0.04	NO	218.67	7.90
2009	193.46	193.46	IE	0.41	11.27	0.03	NO	205.17	6.86
2010	195.05	195.05	IE	0.55	10.38	0.02	NO	206.00	7.60
2011	186.62	186.62	IE	0.52	10.93	0.02	NO	198.08	7.98
2012	181.72	181.72	IE	0.55	11.03	0.02	NO	193.32	7.68
2013	182.37	182.37	IE	0.45	10.90	0.02	NO	193.75	7.46
2014	175.02	175.02	IE	0.46	11.19	0.02	NO	186.70	7.49
2015	171.91	171.91	IE	0.52	11.58	0.02	NO	184.03	8.18
2016	164.04	164.04	IE	0.52	11.83	0.02	NO	176.41	10.28
2017	155.17	155.17	IE	0.47	11.60	0.02	NO	167.27	10.06
2018	143.24	143.24	IE	0.41	11.32	0.02	NO	155.00	11.54
2019	134.42	134.42	IE	0.50	10.85	0.02	NO	145.81	13.47
2020	113.05	113.05	IE	0.48	10.86	0.03	NO	124.41	4.54
2021	111.69	111.69	IE	0.46	11.03	0.03	NO	123.21	5.35
2022	103.42	103.42	IE	0.40	10.59	0.03	NO	114.44	8.91

Table A.I-3: NMVOC emissions [in kilotonnes] 1990–2022 based on fuel sold. (Source: Umweltbundesamt)

	NFR								
	1	1 A	1 B	2	3	5	6		
	ENERGY	FUEL COMBUSTION ACTIVITIES	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	AGRICULTURE	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1990	164.98	149.38	15.59	118.97	44.66	0.17	NO	328.77	0.18
1991	168.61	153.38	15.23	112.45	43.99	0.17	NO	325.22	0.20
1992	153.43	138.12	15.30	105.71	41.98	0.16	NO	301.27	0.21
1993	141.00	126.23	14.77	99.03	42.60	0.16	NO	282.78	0.23
1994	125.24	114.00	11.23	92.42	42.16	0.15	NO	259.97	0.24
1995	116.83	107.22	9.60	85.75	41.66	0.15	NO	244.38	0.26
1996	109.71	101.13	8.58	84.21	40.64	0.14	NO	234.70	0.31
1997	97.58	89.51	8.07	82.86	40.05	0.14	NO	220.63	0.35
1998	91.27	84.71	6.55	81.58	39.93	0.14	NO	212.91	0.39
1999	83.34	77.56	5.79	78.83	39.22	0.13	NO	201.52	0.38
2000	76.80	71.00	5.80	62.61	37.70	0.13	NO	177.23	0.42
2001	73.65	69.70	3.95	61.02	37.07	0.12	NO	171.86	0.41
2002	70.37	66.22	4.14	60.61	36.34	0.12	NO	167.44	0.37
2003	68.23	64.16	4.07	59.21	35.92	0.12	NO	163.48	0.34
2004	64.46	60.78	3.69	50.02	35.60	0.12	NO	150.21	0.40
2005	61.75	58.28	3.46	57.19	35.01	0.12	NO	154.07	0.47
2006	58.10	54.62	3.48	62.99	34.73	0.11	NO	155.94	0.50
2007	55.18	52.07	3.11	61.99	34.73	0.11	NO	152.01	0.53
2008	52.73	49.85	2.89	59.48	34.55	0.10	NO	146.86	0.52
2009	49.84	47.12	2.72	49.31	34.93	0.10	NO	134.18	0.45
2010	51.14	48.57	2.57	48.71	34.81	0.09	NO	134.75	0.49
2011	46.92	44.39	2.54	48.79	34.20	0.09	NO	130.01	0.51
2012	46.47	43.94	2.53	47.36	33.82	0.08	NO	127.74	0.49
2013	45.66	43.22	2.44	42.36	33.88	0.08	NO	121.98	0.46
2014	40.73	38.16	2.57	40.60	33.95	0.07	NO	115.35	0.46
2015	40.87	38.39	2.48	36.84	33.90	0.07	NO	111.68	0.50
2016	40.18	37.75	2.43	36.14	33.91	0.07	NO	110.31	0.23
2017	39.63	37.17	2.45	37.01	33.99	0.07	NO	110.70	0.20
2018	36.36	34.02	2.34	37.07	33.45	0.06	NO	106.94	0.22
2019	36.19	33.79	2.41	37.47	32.97	0.06	NO	106.69	0.24
2020	34.35	32.32	2.03	40.86	32.66	0.06	NO	107.93	0.10
2021	38.35	36.34	2.02	37.08	32.55	0.06	NO	108.05	0.12
2022	32.15	30.28	1.86	35.34	32.50	0.06	NO	100.04	0.19

Table A.I-4: NH_3 emissions [in kilotonnes] 1990–2022 based on fuel sold. (Source: Umweltbundesamt)

	NFR								
	1	1 A	1 B	2	3	5	6		
	ENERGY	FUEL COMBUSTION ACTIVITIES	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	AGRICULTURE	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1990	1.96	1.96	IE	0.34	71.42	0.37	NO	74.09	0.00
1991	2.43	2.43	IE	0.58	71.49	0.38	NO	74.87	0.00
1992	2.61	2.61	IE	0.44	68.80	0.43	NO	72.28	0.00
1993	2.89	2.89	IE	0.29	68.54	0.51	NO	72.23	0.00
1994	3.03	3.03	IE	0.24	68.01	0.60	NO	71.87	0.00
1995	3.22	3.22	IE	0.17	68.11	0.61	NO	72.10	0.00
1996	3.39	3.39	IE	0.16	66.93	0.63	NO	71.12	0.00
1997	3.46	3.46	IE	0.16	66.73	0.62	NO	70.97	0.00
1998	3.76	3.76	IE	0.17	66.87	0.65	NO	71.45	0.00
1999	3.79	3.79	IE	0.19	65.02	0.70	NO	69.70	0.00
2000	3.74	3.74	IE	0.17	63.40	0.74	NO	68.05	0.00
2001	3.91	3.91	IE	0.15	62.93	0.77	NO	67.75	0.00
2002	4.04	4.04	IE	0.13	61.83	0.79	NO	66.79	0.00
2003	4.15	4.15	IE	0.14	61.51	0.81	NO	66.61	0.00
2004	4.03	4.03	IE	0.12	60.79	1.00	NO	65.95	0.00
2005	4.01	4.00	0.00	0.13	60.79	1.09	NO	66.01	0.00
2006	3.93	3.92	0.01	0.14	61.23	1.12	NO	66.41	0.00
2007	3.83	3.83	0.01	0.14	62.73	1.15	NO	67.86	0.00
2008	3.58	3.57	0.00	0.14	62.73	1.15	NO	67.60	0.00
2009	3.38	3.37	0.00	0.15	64.24	1.14	NO	68.91	0.00
2010	3.43	3.42	0.00	0.15	63.68	1.17	NO	68.43	0.00
2011	3.13	3.12	0.00	0.16	63.69	1.17	NO	68.14	0.00
2012	3.00	3.00	0.00	0.15	64.13	1.18	NO	68.45	0.00
2013	2.82	2.82	0.00	0.16	64.22	1.11	NO	68.31	0.00
2014	2.60	2.60	0.00	0.15	65.26	1.15	NO	69.16	0.00
2015	2.65	2.65	0.00	0.14	66.16	1.17	NO	70.12	0.00
2016	2.56	2.56	0.00	0.15	67.23	1.22	NO	71.15	0.00
2017	2.59	2.59	0.00	0.17	67.74	1.20	NO	71.70	0.00
2018	2.55	2.55	0.00	0.14	66.55	1.19	NO	70.42	0.00
2019	2.57	2.57	0.00	0.16	65.20	1.20	NO	69.13	0.01
2020	2.31	2.31	0.00	0.16	65.02	1.24	NO	68.73	0.00
2021	2.50	2.50	0.00	0.14	65.22	1.28	NO	69.15	0.00
2022	2.40	2.40	0.00	0.13	64.23	1.23	NO	67.99	0.00

Table A.I-5: $PM_{2.5}$ emissions [in kilotonnes] 1990–2022 based on fuel sold. (Source: Umweltbundesamt)

	NFR								
	1	1 A	1 B	2	3	5	6		
	ENERGY	FUEL COMBUSTION ACTIVITIES	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	AGRICULTURE	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1990	22.67	22.56	0.11	4.07	0.34	0.25	NO	27.33	0.27
1995	21.88	21.80	0.09	3.46	0.34	0.25	NO	25.94	0.41
2000	20.44	20.35	0.09	3.22	0.32	0.24	NO	24.22	0.52
2001	20.86	20.77	0.09	3.14	0.33	0.24	NO	24.57	0.51
2002	20.63	20.54	0.10	2.73	0.32	0.25	NO	23.93	0.46
2003	20.74	20.64	0.10	2.67	0.32	0.25	NO	23.98	0.43
2004	20.25	20.16	0.09	2.62	0.36	0.25	NO	23.49	0.51
2005	20.34	20.25	0.09	2.54	0.31	0.22	NO	23.42	0.59
2006	20.07	19.98	0.09	2.28	0.31	0.22	NO	22.87	0.63
2007	19.48	19.40	0.08	2.13	0.31	0.27	NO	22.20	0.66
2008	18.48	18.40	0.08	2.20	0.31	0.26	NO	21.25	0.66
2009	17.55	17.49	0.06	2.05	0.30	0.25	NO	20.16	0.57
2010	18.07	18.00	0.07	2.02	0.30	0.30	NO	20.68	0.62
2011	16.86	16.78	0.07	2.07	0.28	0.29	NO	19.50	0.65
2012	16.43	16.36	0.07	1.97	0.27	0.31	NO	18.97	0.62
2013	15.83	15.77	0.07	1.98	0.26	0.27	NO	18.35	0.59
2014	14.22	14.16	0.06	1.97	0.27	0.32	NO	16.78	0.59
2015	14.15	14.09	0.07	1.93	0.26	0.33	NO	16.68	0.63
2016	13.83	13.77	0.06	1.96	0.26	0.32	NO	16.38	0.70
2017	13.67	13.61	0.07	1.97	0.26	0.32	NO	16.22	0.67
2018	12.74	12.68	0.06	1.92	0.26	0.28	NO	15.20	0.76
2019	12.42	12.36	0.06	1.94	0.26	0.33	NO	14.94	0.88
2020	11.28	11.23	0.05	1.84	0.25	0.33	NO	13.70	0.31
2021	12.32	12.27	0.05	1.96	0.25	0.35	NO	14.88	0.37
2022	10.98	10.93	0.05	1.86	0.25	0.36	NO	13.45	0.59

ANNEX 2: AUSTRIA'S EMISSIONS BASED ON FUEL USED (WITHOUT ‚FUEL EXPORTS')

Notation keys:

NE (not estimated) ..... for existing emissions by sources and removals by sinks of pollutants, which have not been estimated.

IE (included elsewhere) ... for emissions by sources and removals by sinks of pollutants 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 pollutants 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 pollutant.

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.II-1: SO_2 emissions [in kilotonnes] 1990–2022 based on fuel used. (Source: Umweltbundesamt)

	NFR Sectors								
	1	1 A	1 B	2	3	5	6		
	ENERGY	FUEL COMBUSTION ACTIVITIES	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	AGRICULTURE	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1990	70.93	68.93	2.00	1.93	0.00	0.07	NO	72.94	0.25
1991	68.04	66.74	1.30	1.61	0.00	0.06	NO	69.71	0.28
1992	51.79	49.79	2.00	1.36	0.00	0.04	NO	53.20	0.30
1993	50.53	48.43	2.10	1.11	0.00	0.04	NO	51.69	0.32
1994	45.15	43.87	1.28	1.12	0.00	0.05	NO	46.32	0.34
1995	45.26	43.73	1.53	1.07	0.00	0.05	NO	46.38	0.38
1996	42.16	40.96	1.20	0.99	0.00	0.05	NO	43.20	0.42
1997	38.94	38.87	0.07	0.96	0.00	0.06	NO	39.96	0.43
1998	34.00	33.96	0.04	0.87	0.00	0.06	NO	34.94	0.45
1999	32.37	32.32	0.04	0.81	0.00	0.06	NO	33.24	0.44
2000	30.15	30.11	0.04	0.78	0.00	0.06	NO	31.00	0.48
2001	30.98	30.93	0.05	0.71	0.00	0.06	NO	31.75	0.47
2002	29.83	29.79	0.04	0.71	0.00	0.06	NO	30.60	0.43
2003	29.54	29.49	0.05	0.71	0.00	0.06	NO	30.31	0.40
2004	25.72	25.68	0.04	0.72	0.01	0.06	NO	26.51	0.47
2005	25.05	25.01	0.04	0.72	0.00	0.06	NO	25.84	0.55
2006	25.84	25.79	0.05	0.73	0.00	0.05	NO	26.62	0.58
2007	22.51	22.46	0.05	0.75	0.00	0.04	NO	23.30	0.61
2008	19.42	19.38	0.04	0.78	0.00	0.03	NO	20.24	0.61
2009	13.98	13.93	0.06	0.70	0.00	0.02	NO	14.70	0.53
2010	15.22	15.18	0.05	0.70	0.00	0.01	NO	15.94	0.57
2011	14.44	14.40	0.05	0.68	0.00	0.01	NO	15.13	0.60
2012	14.09	14.05	0.05	0.65	0.00	0.01	NO	14.76	0.57
2013	13.71	13.67	0.04	0.58	0.00	0.01	NO	14.31	0.54
2014	13.91	13.87	0.04	0.56	0.00	0.01	NO	14.48	0.54
2015	13.49	13.46	0.04	0.55	0.00	0.01	NO	14.06	0.58
2016	12.65	12.63	0.02	0.56	0.00	0.01	NO	13.22	0.54
2017	12.17	12.14	0.04	0.57	0.00	0.01	NO	12.75	0.52
2018	10.97	10.94	0.02	0.56	0.00	0.01	NO	11.54	0.59
2019	10.52	10.50	0.02	0.59	0.00	0.01	NO	11.13	0.68
2020	9.78	9.75	0.02	0.59	0.00	0.01	NO	10.38	0.24
2021	10.24	10.21	0.03	0.59	NA	0.01	NO	10.84	0.27
2022	10.15	10.11	0.03	0.59	NA	0.02	NO	10.76	0.45

Table A.II-2: NO_x emissions [in kilotonnes] 1990–2022 based on fuel used. (Source: Umweltbundesamt)

	NFR Sectors								
	1	1 A	1 B	2	3	5	6		
	ENERGY	FUEL COMBUSTION ACTIVITIES	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	AGRICULTURE	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1990	184.43	184.43	IE	1.53	13.66	0.12	NO	199.75	2.48
1991	186.51	186.51	IE	1.51	13.58	0.11	NO	201.72	2.80
1992	178.80	178.80	IE	1.41	13.16	0.08	NO	193.45	3.06
1993	173.01	173.01	IE	1.51	12.91	0.07	NO	187.50	3.27
1994	169.12	169.12	IE	1.38	12.71	0.07	NO	183.27	3.43
1995	168.62	168.62	IE	0.90	12.78	0.07	NO	182.37	3.85
1996	169.18	169.18	IE	0.87	12.60	0.07	NO	182.72	4.24
1997	169.46	169.46	IE	0.86	12.60	0.07	NO	182.99	4.43
1998	167.77	167.77	IE	0.83	12.61	0.07	NO	181.28	4.59
1999	168.27	168.27	IE	0.82	12.18	0.07	NO	181.34	4.52
2000	168.25	168.25	IE	0.83	11.93	0.07	NO	181.08	6.44
2001	171.38	171.38	IE	0.78	11.84	0.07	NO	184.06	6.32
2002	170.87	170.87	IE	0.79	11.79	0.07	NO	183.51	5.67
2003	175.72	175.72	IE	0.81	11.30	0.07	NO	187.90	5.21
2004	176.61	176.61	IE	0.69	10.74	0.07	NO	188.10	6.09
2005	179.34	179.34	IE	0.70	10.78	0.06	NO	190.89	6.99
2006	180.68	180.68	IE	0.58	10.82	0.05	NO	192.14	7.54
2007	177.03	177.03	IE	0.48	10.98	0.05	NO	188.53	7.99
2008	169.93	169.93	IE	0.56	11.51	0.04	NO	182.04	7.90
2009	157.76	157.76	IE	0.41	11.27	0.03	NO	169.47	6.86
2010	158.95	158.95	IE	0.55	10.38	0.02	NO	169.91	7.60
2011	157.60	157.60	IE	0.52	10.93	0.02	NO	169.06	7.98
2012	153.76	153.76	IE	0.55	11.03	0.02	NO	165.35	7.68
2013	150.98	150.98	IE	0.45	10.90	0.02	NO	162.35	7.46
2014	147.63	147.63	IE	0.46	11.19	0.02	NO	159.31	7.49
2015	145.72	145.72	IE	0.52	11.58	0.02	NO	157.84	8.18
2016	141.45	141.45	IE	0.52	11.83	0.02	NO	153.82	10.28
2017	134.91	134.91	IE	0.47	11.60	0.02	NO	147.02	10.06
2018	124.55	124.55	IE	0.41	11.32	0.02	NO	136.31	11.54
2019	117.42	117.42	IE	0.50	10.85	0.02	NO	128.81	13.47
2020	104.18	104.18	IE	0.48	10.86	0.03	NO	115.54	4.54
2021	102.57	102.57	IE	0.46	11.03	0.03	NO	114.09	5.35
2022	96.28	96.28	IE	0.40	10.59	0.03	NO	107.30	8.91

Table A.II-3: NMVOC emissions [in kilotonnes] 1990–2022 based on fuel used. (Source: Umweltbundesamt)

	NFR Sectors								
	1	1 A	1 B	2	3	5	6		
	ENERGY	FUEL COMBUSTION ACTIVITIES*	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	AGRICULTURE	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1990	159.38	143.79	15.59	118.97	44.66	0.17	NO	323.18	0.18
1991	155.44	140.20	15.23	112.45	43.99	0.17	NO	312.04	0.20
1992	146.01	130.70	15.30	105.71	41.98	0.16	NO	293.85	0.21
1993	136.11	121.34	14.77	99.03	42.60	0.16	NO	277.90	0.23
1994	122.94	111.71	11.23	92.42	42.16	0.15	NO	257.68	0.24
1995	115.25	105.65	9.60	85.75	41.66	0.15	NO	242.81	0.26
1996	109.88	101.30	8.58	84.21	40.64	0.14	NO	234.88	0.31
1997	98.87	90.79	8.07	82.86	40.05	0.14	NO	221.91	0.35
1998	89.86	83.31	6.55	81.58	39.93	0.14	NO	211.51	0.39
1999	83.72	77.93	5.79	78.83	39.22	0.13	NO	201.89	0.38
2000	76.74	70.94	5.80	62.61	37.70	0.13	NO	177.17	0.42
2001	72.18	68.23	3.95	61.02	37.07	0.12	NO	170.39	0.41
2002	66.57	62.43	4.14	60.61	36.34	0.12	NO	163.65	0.37
2003	63.30	59.23	4.07	59.21	35.92	0.12	NO	158.55	0.34
2004	59.56	55.87	3.69	50.02	35.60	0.12	NO	145.30	0.40
2005	56.79	53.33	3.46	57.19	35.01	0.12	NO	149.11	0.47
2006	54.48	51.00	3.48	62.99	34.73	0.11	NO	152.32	0.50
2007	51.86	48.75	3.11	61.99	34.73	0.11	NO	148.69	0.53
2008	50.10	47.22	2.89	59.48	34.55	0.10	NO	144.23	0.52
2009	47.41	44.69	2.72	49.31	34.93	0.10	NO	131.75	0.45
2010	49.01	46.44	2.57	48.71	34.81	0.09	NO	132.61	0.49
2011	45.28	42.74	2.54	48.79	34.20	0.09	NO	128.36	0.51
2012	45.05	42.52	2.53	47.36	33.82	0.08	NO	126.31	0.49
2013	44.36	41.92	2.44	42.36	33.88	0.08	NO	120.68	0.46
2014	39.66	37.09	2.57	40.60	33.95	0.07	NO	114.28	0.46
2015	39.83	37.34	2.48	36.84	33.90	0.07	NO	110.64	0.50
2016	39.23	36.80	2.43	36.14	33.91	0.07	NO	109.36	0.23
2017	38.78	36.33	2.45	37.01	33.99	0.07	NO	109.85	0.20
2018	35.54	33.20	2.34	37.07	33.45	0.06	NO	106.13	0.22
2019	35.46	33.05	2.41	37.47	32.97	0.06	NO	105.96	0.24
2020	33.97	31.94	2.03	40.86	32.66	0.06	NO	107.55	0.10
2021	37.91	35.89	2.02	37.08	32.55	0.06	NO	107.60	0.12
2022	31.75	29.88	1.86	35.34	32.50	0.06	NO	99.64	0.19

** exhaust and non-exhaust emissions (gasoline evaporation) from 1.A.3.b Road Transport calculated on the basis of 'fuel used'*

Table A.II-4: NH_3 emissions [in kilotonnes] 1990–2022 based on fuel used. (Source: Umweltbundesamt)

	NFR Sectors								
	1	**1 A**	**1 B**	**2**	**3**	**5**	**6**		
	ENERGY	FUEL COMBUSTION ACTIVITIES	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	AGRICULTURE	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1990	1.91	1.91	IE	0.34	71.42	0.37	NO	74.04	0.00
1991	2.26	2.26	IE	0.58	71.49	0.38	NO	74.70	0.00
1992	2.48	2.48	IE	0.44	68.80	0.43	NO	72.15	0.00
1993	2.79	2.79	IE	0.29	68.54	0.51	NO	72.13	0.00
1994	2.98	2.98	IE	0.24	68.01	0.60	NO	71.82	0.00
1995	3.18	3.18	IE	0.17	68.11	0.61	NO	72.07	0.00
1996	3.48	3.48	IE	0.16	66.93	0.63	NO	71.21	0.00
1997	3.60	3.60	IE	0.16	66.73	0.62	NO	71.11	0.00
1998	3.75	3.75	IE	0.17	66.87	0.65	NO	71.44	0.00
1999	3.93	3.93	IE	0.19	65.02	0.70	NO	69.83	0.00
2000	3.88	3.88	IE	0.17	63.40	0.74	NO	68.19	0.00
2001	3.90	3.90	IE	0.15	62.93	0.77	NO	67.74	0.00
2002	3.70	3.70	IE	0.13	61.83	0.79	NO	66.45	0.00
2003	3.61	3.61	IE	0.14	61.51	0.81	NO	66.07	0.00
2004	3.45	3.45	IE	0.12	60.79	1.00	NO	65.36	0.00
2005	3.38	3.37	0.00	0.13	60.79	1.09	NO	65.39	0.00
2006	3.34	3.33	0.01	0.14	61.23	1.12	NO	65.82	0.00
2007	3.24	3.23	0.01	0.14	62.73	1.15	NO	67.26	0.00
2008	3.07	3.07	0.00	0.14	62.73	1.15	NO	67.09	0.00
2009	2.87	2.87	0.00	0.15	64.24	1.14	NO	68.40	0.00
2010	2.94	2.94	0.00	0.15	63.68	1.17	NO	67.94	0.00
2011	2.73	2.72	0.00	0.16	63.69	1.17	NO	67.74	0.00
2012	2.64	2.64	0.00	0.15	64.13	1.18	NO	68.10	0.00
2013	2.50	2.50	0.00	0.16	64.22	1.11	NO	67.99	0.00
2014	2.32	2.32	0.00	0.15	65.26	1.15	NO	68.88	0.00
2015	2.36	2.36	0.00	0.14	66.16	1.17	NO	69.83	0.00
2016	2.27	2.27	0.00	0.15	67.23	1.22	NO	70.86	0.00
2017	2.32	2.32	0.00	0.17	67.74	1.20	NO	71.42	0.00
2018	2.25	2.25	0.00	0.14	66.55	1.19	NO	70.12	0.00
2019	2.27	2.27	0.00	0.16	65.20	1.20	NO	68.84	0.01
2020	2.16	2.16	0.00	0.16	65.02	1.24	NO	68.58	0.00
2021	2.31	2.31	0.00	0.14	65.22	1.28	NO	68.96	0.00
2022	2.22	2.22	0.00	0.13	64.23	1.23	NO	67.81	0.00

Table A.II-5: $PM_{2.5}$ emissions [in kilotonnes] 1990–2022 based on fuel used. (Source: Umweltbundesamt)

	NFR Sectors								
	1	1 A	1 B	2	3	5	6		
	ENERGY	FUEL COMBUSTION ACTIVITIES *	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	AGRICULTURE	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1990	22.06	21.95	0.11	4.07	0.34	0.25	NO	26.72	0.27
1995	21.18	21.09	0.09	3.46	0.34	0.25	NO	25.24	0.41
2000	19.77	19.68	0.09	3.22	0.32	0.24	NO	23.56	0.52
2001	19.90	19.80	0.09	3.14	0.33	0.24	NO	23.61	0.51
2002	19.07	18.98	0.10	2.73	0.32	0.25	NO	22.37	0.46
2003	18.74	18.64	0.10	2.67	0.32	0.25	NO	21.97	0.43
2004	18.13	18.04	0.09	2.62	0.36	0.25	NO	21.37	0.51
2005	18.03	17.95	0.09	2.54	0.31	0.22	NO	21.11	0.59
2006	18.02	17.94	0.09	2.28	0.31	0.22	NO	20.83	0.63
2007	17.45	17.37	0.08	2.13	0.31	0.27	NO	20.16	0.66
2008	16.76	16.69	0.08	2.20	0.31	0.26	NO	19.53	0.66
2009	15.84	15.78	0.06	2.05	0.30	0.25	NO	18.45	0.57
2010	16.39	16.32	0.07	2.02	0.30	0.30	NO	19.01	0.62
2011	15.44	15.37	0.07	2.07	0.28	0.29	NO	18.09	0.65
2012	15.12	15.05	0.07	1.97	0.27	0.31	NO	17.66	0.62
2013	14.58	14.51	0.07	1.98	0.26	0.27	NO	17.10	0.59
2014	13.09	13.02	0.06	1.97	0.27	0.32	NO	15.65	0.59
2015	12.96	12.90	0.07	1.93	0.26	0.33	NO	15.49	0.63
2016	12.64	12.58	0.06	1.96	0.26	0.32	NO	15.19	0.70
2017	12.48	12.41	0.07	1.97	0.26	0.32	NO	15.03	0.67
2018	11.53	11.47	0.06	1.92	0.26	0.28	NO	13.99	0.76
2019	11.26	11.20	0.06	1.94	0.26	0.33	NO	13.78	0.88
2020	10.76	10.71	0.05	1.84	0.25	0.33	NO	13.18	0.31
2021	11.66	11.61	0.05	1.96	0.25	0.35	NO	14.22	0.37
2022	10.34	10.30	0.05	1.86	0.25	0.36	NO	12.81	0.59

* *exhaust and non-exhaust emissions (tyre and break wear, road abrasion) from 1.A.3.b Road Transport calculated on the basis of 'fuel used'*

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Austria's Annual Air Emission Inventory 1990–2022 provides an overview of national emissions of sulphur dioxide (SO_2), nitrogen oxides (NO_x), ammonia (NH_3), non-methane volatile organic compounds (NMVOC) and particulate matter ($PM_{2.5}$) for the years 1990 to 2022. Emission trends and recalculations of these air pollutants, regulated in the European NEC Directive, are described.

The results show emission reductions for all pollutants between 2021 and 2022: SO_2 declined by 0.9 %, NO_x by 7.1 %, NMVOC by 7.4 %, NH_3 by 1.7 %, and $PM_{2.5}$ by 9.6 %. The reductions, except for NH_3, were largely resulting from the households sector (1.A.4.b.1), where the milder winter and price changes on the energy market led to a significant decrease in household combustion for heat. The main reasons for reduced NH_3 emissions were lower amounts of mineral fertilizer and the increased use of band spreading techniques. The 2022 emissions comply with national emission reduction commitments for all pollutants, except for NH_3, which exceeded the target by 4 %.

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