ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

AUSTRIA'S INFORMATIVE INVENTORY REPORT (IIR) 2021

Submission under the UNECE Convention on Long-range Transboundary Air Pollution and Directive (EU) 2016/2284 on the reduction of national emissions of certain atmospheric pollutants

SUMMARY – ACCESSIBLE FORMAT

REP-0762

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Since 23 December 2005 the Umweltbundesamt has been accredited as Inspection Body for emission inventories, Type A (ID No. 0241), in accordance with EN ISO/IEC 17020 and the Austrian Accreditation Law (AkkG), by decree of Accreditation Austria (first decree, No. BMWA-92.715/0036-I/12/2005, issued by Accreditation Austria / Federal Ministry of Economics and Labour on 19 January 2006).

The information covered refers to the following accreditation scope of the IBE: EMEP 2019 (www.bmdw.gv.at/akkreditierung).

EXECUTIVE SUMMARY

ES.1 Reporting obligations under UNECE/LRTAP and Directive (EU) 2016/2284 (NEC Directive)

Austria's Informative Inventory Report (IIR) and the complete set of NFR tables (the latter are submitted in digital format only) represent Austria's official submission under the United Nations Economic Commission for Europe (UNECE) Convention on Long-rage Transboundary Air Pollution (LRTAP) and under Directive (EU) 2016/2284 (NEC Directive). The Umweltbundesamt in its role as single national entity regarding emission inventories compiles Austria's annual delivery, and the Austrian Federal Ministry of 'Climate Action, Environment, Energy, Mobility, Innovation and Technology' (BMK) submits it officially to the Executive Secretary of UNECE as well as to the European Commission.

As a party to the UNECE/LRTAP Convention and under the NEC Directive, Austria is required to annually report data on emissions of air pollutants covered in the Convention and its Protocols:

- main pollutants: nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOC), sulphur oxides (SO_x), ammonia (NH_3) and carbon monoxide (CO);
- particulate matter (PM): primary PM (fine particulate matter ($PM_{2.5}$) and coarse particulate matter (PM_{10})[1];
- priority heavy metals (HMs): lead (Pb), cadmium (Cd) and mercury (Hg);
- persistent organic pollutants (POPs): polychlorinated dibenzodioxins/dibenzofurans (PCDD/Fs), polycyclic aromatic hydrocarbons (PAHs), hexachlorobenzene (HCB) and polychlorinated biphenyls (PCBs).

In order to fulfil these reporting requirements, Austria compiles an Air Emission Inventory ("Österreichische Luftschadstoff-Inventur – OLI"), which is updated annually. The IIR contains information on Austria's inventories of air pollutants for all years from 1990 to 2019 for the main pollutants, for POPs and HMs and for the years 1990, 1995 and from 2000 onwards for PM. In accordance with the NEC Directive (EU) 2016/2284, Table A (*Annual emission reporting requirements*) and Table C (*Reporting requirements on emissions and projections*), Austria does not report emissions of BC (notation key NR is used).

From submission 2020 onwards, Austria reports all pollutants in the NFR19 reporting format from 1990 to the latest inventory year. Emissions of the years before 1990 were last updated and published in submission 2014.[2]

In addition, the report includes both detailed descriptions of methods, data sources and uncertainties and information on quality assurance and quality control (QA/QC) activities as well as analyses of emission trends.

The emission data presented in this report were compiled according to the revised 2014 Reporting Guidelines (ECE/EB.AIR.125) that were approved by the Executive Body for the UNECE/LRTAP Convention at its 36th session.

The Austrian inventory is complete with regard to reported gases, reported years and reported emissions from all sources, and also complete in terms of geographic coverage.

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[1] According to the CLRTAP Reporting GL the reporting of total suspended particules (TSPs) is not mandatory, but reported by Austria.

[2] Austria´s submission 2014 under the Convention on Long-range Transboundary Air Pollution covering the years 1980–2012: https://cdr.eionet.europa.eu/at/un/CLRTAP_AT/envuvyara/

ES.2 Differences with other reporting obligations

NEC Directive (EU) 2016/2284 sets out national emission reduction commitments for the pollutants SO_2, NO_x, VOC, NH_3 and $PM_{2.5}$. Austria uses the national emission totals calculated on the basis of *fuel used* (thus excluding emissions from fuel exports in the vehicle tank) for assessing compliance with the 2010 emission ceilings under the NEC Directive.

The annual greenhouse gas reporting under the UNFCCC and the Kyoto Protocoll also requires the reporting of indirect GHGs (NO_x, CO, NMVOC) and SO_2 emissions based on *fuel sold*. In contrast to UNFCCC requirements, emissions from aviation under the NEC Directive and the LRTAP Convention include domestic LTO and cruise. Furthermore, international navigation of inland waterways is covered under NEC and CLRTAP.

ES.3 Overview of emission trends

Main Pollutants

In 1990, national total SO_2 emissions amounted to 74 kt. Since then emissions have decreased quite steadily. In the year 2019, emissions were reduced by 85% compared to 1990 and amounted to 11 kt. This decline is mainly caused by a reduction of the sulphur content in mineral oil products and fuels (according to the Austrian Fuel Ordinance), the installation of desulphurisation units in plants (according to the Clean Air Act for boilers) and an increased use of low-sulphur fuels like natural gas. The economic crisis in 2009 caused a decrease in emissions, followed by an increase due to the recovery of the economy. From 2018 to 2019 emissions decreased by 5.9%, mainly because of lower coal consumption in power plants and lower emissions of oil refinery.

In 1990, national total NO_x emissions amounted to 217 kt. After an all-time high of emissions between 2003 and 2005 emissions are decreasing continuously. This is mainly due to reduced emissions from heavy trucks, especially because of improvements in the after treatment technology. In 2019, NO_x emissions amounted to 144 kt and were about 34% lower than in 1990. From 2018 to 2019 emissions decreased by 4.8%. This was caused by a decline in road traffic, especially passenger cars and heavy duty vehicles. In 2019 52% of the total nitrogen oxides emissions originate from road transport (including fuel exports). Austria is a landlocked country and fuel prices vary between neighbouring countries. So Austria has experienced a considerable amount of 'fuel export' in the last decades and the share of NO_x emissions caused by fuel sold in Austria but used abroad is notable. Emissions for 2019 based on fuel used amount to 131 kt and are about 14 kt lower than based on fuel sold; the decrease between 1990 and 2019 is slightly stronger (-35%).

In 1990, national total NMVOC emissions amounted to 336 kt. Emissions have decreased steadily since then and in the year 2019 emissions were reduced by 68% to 109 kt compared to 1990. The largest reductions since 1990 have been achieved in the road transport sector due to an increased use of catalytic converters and diesel cars. Reductions in the solvent sector were due to various regulations (Solvent Ordinance, Cogeneration Act, VOC Emissions Ordinance). From 2018 to 2019 emissions decreased by 0.4%.

In 1990, national total NH_3 emissions amounted to 62 kt; emissions have increased over the period from 1990 to 2019. In 2019, emissions were 3.2% above 1990 levels and amounted to 64 kt. NH_3 in Austria is almost exclusively emitted in the agricultural sector. The higher NH_3 emissions can be explained by an increased number of cattle kept in loose house systems (for reasons of animal welfare and stipulated by EU law), an increase in the number of cows with

higher milk yields and an increased use of urea as nitrogen fertilizer (cost-saving, but less efficient than other types of mineral fertilizer). Compared to the previous year, emissions in 2019 decreased by 1.6%. The main reasons for this short-term decrease are on the one hand a significantly lower consumption of mineral fertilizers and on the other hand a smaller number of cattle.

In 1990, national total CO emissions amounted to 1 254 kt. Emissions considerably decreased from 1990 to 2019. In 2019, emissions were 60% below 1990 levels and amounted to 498 kt. This reduction was mainly due to decreasing emissions from road transport (catalytic converters). The emissions increased between 2018 and 2019 by 2.9%, mainly due to sector iron and steel.

Particulate Matter

Particulate matter emissions in Austria mainly arise from industrial processes, road transport, agriculture and small heating installations.

Particulate matter (PM) emissions show a decreasing trend over the period 1990 to 2019: TSP emissions decreased by 28%, PM_{10} emissions were about 35% below the level of 1990, and $PM_{2.5}$ emissions dropped by about 48%. Between 2018 and 2019 PM_{10} and $PM_{2.5}$ emissions decreased by 0.1% (PM_{10}) and 1.2% ($PM_{2.5}$). TSP emissions increased by 0.4%. The short-term decrease of PM_{10} and $PM_{2.5}$ was mainly due to lower emissions from *1.A.3 Road transport* (passenger cars). In the transport sector PM emissions show a general decrease since several years as a result of improved technology. TSP emissions increased slightly compared to the previous year because of rising emissions from *2.A Mineral Products* and *2.B Chemical Industry*.

Heavy Metals

Emissions of all three priority heavy metals (Cd, Pb and Hg) have decreased since 1990.

The overall Cd emissions reduction of 34% from 1990 to 2019 is mainly due to a decline in the industrial processes and energy sector, which is due to reduced use of heavy fuel oil and lower process emissions from iron and steel production. In the last years emissions remained quite stable, the increased emission level 2017 was due to higher emissions from iron and steel production and from industrial processes.

The overall reduction of Hg of about 54% for the period 1990 to 2019 was due to decreasing emissions from cement industries and the industrial processes sector as well as due to reduced use of coal for residential heating and public electricity and heat production. Several bans in different industrial sub-sectors and in the agriculture sector led to the sharp fall of total Hg emission in Austria by the year 2000. Between 2018 and 2019 emissions increased by 2.7% because of larger emissions from NFR *2.C.1 Iron and Steel Production.*

The overall reduction trend of Pb emissions was minus 91% for the period 1990 to 2019, which is mainly a result of the ban of lead in gasoline. However, abatement techniques and product substitutions also contributed to the emission reduction. Compared to the previous year Pb emissions show an increase of 5.9% mainly as a result of rising emissions from *Iron and Steel Production (NFR 2.C.1)* and *Other product manufacture and use (NFR 2.G).*

Persistent Organic Pollutants (POPs)

Emissions of all POPs decreased remarkably from 1990 to 2019 (HCB -79%, PAH -66%, PCDD/F -73% and PCBs -26%), where the highest achievement was made until 1995. The significant increase of HCB emissions in the years 2012, 2013 and 2014 was due to unintentional releases of HCB by an Austrian cement plant.

In 2019 PCDD/F emissions increased by 0.3% compared to the previous year 2018, PAH emissions increased by 0.8% and HCB emissions by 7.6% in the same time. This increase of HCB emissions was mainly due to higher emissions from sectors *3.D.f Use of pesticides* and *2.C.1 Iron and Steel Production*. PAH emissions and PCDD/F emissions rose because of higher emissions from sectors *2 Industrial Processes* and *1.A.4 Other Sectors (only PAH)*.

In 2019 PCB emissions increased by 8.5% compared to the previous year 2018, due to increased emissions from *sector 2.C.1 Iron and Steel Production*.

The most important source for PAH, PCDD/F and HCB emissions in Austria is residential heating. In the 1980s industry and waste incineration were still important sources regarding POP emissions. Due to legal regulations concerning air quality emissions from industry and waste incineration decreased remarkably from 1990 to 1993. For PCB emissions the most important source category is *2.C Metal Production*.

ES.4 Key categories

To determine key categories, a trend and a level assessment have been carried out, which resulted in 44 identified key categories. It shows that the residential sector has been identified as the most important key category: all air pollutants except for NH_3 and PCB are found key in either the trend or the level assessment. In the following table the top 5 ranked key categories are listed.

Table 1: Most relevant key categories in Austria for air emissions 2019.

Name of key category	No of occurrences as key category
1.A.4.b.1 – Residential: stationary	25 times (SO_2, NO_x, NMVOC, CO, Cd, Pb, Hg, PAH, DIOX, HCB, TSP, PM_{10}, $PM_{2.5}$)
2.C.1 – Iron and Steel Production	13 times (Cd, Pb, Hg, DIOX, HCB, PCB, TSP, PM_{10}, $PM_{2.5}$)
1.A.3.b.1 – R.T., Passenger cars	12 times (NO_x, NMVOC, CO, Pb, TSP, PM_{10}, $PM_{2.5}$)
1.A.1.a – Public Electricity and Heat Production	14 times (SO_2, NO_x, Cd, Pb, Hg, DIOX, TSP, PM_{10}, $PM_{2.5}$)
1.A.3.b.3 – R.T., Heavy duty vehicles	7 times (SO_2, NO_x, TSP, PM_{10}, $PM_{2.5}$)

ES.5 Main differences in the inventory since the last submission

As a result of the continuous improvement process of Austria's Annual Air Emission Inventory, emissions for some sources have been recalculated, e.g. on the basis of updated activity data or revised methodologies. Thus emission data for the whole time series submitted this year differ from the data reported previously.

In NFR sector ***1 Energy***, changes are mainly due to revisions of the energy balance. Natural gas gross inland consumption has been revised for 1999–2004. In addition, natural gas consumption has been shifted from 'energy sector use' to 'final energy consumption' for the years 1994–1996 and 1999–2018. Final energy consumption has also been shifted to different sectors. For liquid fuels, gross inland consumption has been revised for the year 2018 for motor gasoline only. Furthermore, considerable amounts of LPG fuel consumed in the period 1990–2018 have been removed from category 1.A.1.a and included in 'oil refinery' instead (use of en-

ergy sector). For solid fuels, gross inland consumption has been revised for the years 2017 and 2018. Gross inland consumption for solid biomass fuels has been revised for 2005–2018.

The recalculations of the $PM_{2.5}$ emissions in the category *Coal Mining and Handling (1.B.1.a)* for the years 2014, 2016, 2017 and 2018 are also due to a revision of the energy balance.

In NFR sector ***1.A.3 Transport***, the mileage model for the vehicle categories had to be recalibrated as a result of the update of the energy data (LPG, biogas) in accordance with the energy balance. This has led to minor changes in the activity data and emissions for each vehicle category over the entire time series. According to the bottom-up/top-down methodology applied for the calculation of domestic fuel consumption and fuel exports, an increased use of domestic fuels always results in a reduction of exported fuel quantities, and vice versa.

Recalculations in category *Domestic navigation (1.A.3.d)* result from slightly updated domestic fuel consumption data on the basis of a new study on Austria's off-road emissions with focus on shipping, especially passenger ships.

In NFR sector ***2 Industrial Processes and Product Use*** recalculations have been carried out mainly in subcategory *Solvent Use (2.D.3)*: The changes in the emission estimates result from improved allocations of activity data to the different categories, combined with higher/lower IEFs leading to an increase in the emissions.

In the categories Quarrying and mining of minerals other than coal (2.A.5.a), Construction and demolition (2.A.5.b) and Aluminium production (2.C.3) recalculations have been carried out due to changes of activity data.

Due to recalculations of the energy balances, the activity data in category Wood processing (2.I) had to be updated. Thus, particulate matter emissions since 2005 have changed.

The main reasons for revised emissions in NFR sector ***3 Agriculture*** are due to the availability of new information on input materials for Austria's biogas plants as well as revised emissions from inorganic N fertilizers due to the implementation of a new EF for N-stabilised fertilizers. Furthermore, grassland and cropland areas have been adjusted.

In NFR sector ***5 Waste****,* revisions werde made in categories Waste disposal on land (5.A), Biological treatment of waste (5.B) and Wastewater (5.D): The method for extrapolating the amount of collected landfill gas was improved, which led to reduced landfill gas amounts and subsequent downward revisions of NMVOC in category *5.A*. Revisions in category *5.B* are due to new information available on input materials for Austria's biogas plants (see also sector *3 Agriculture*). For NMVOC from category *5.D.1 domestic wastewater* a recalculation for 2018 was carried out as new data on wastewater volumes became available and new data on the level of connection of the with sewer systems in 2018.

For more detailed information see Chapter 7 – Recalculations and Improvements.

ES.6 Improvement Process

The Austrian Air Emission Inventory is subject to a continuous improvement programme resulting in annual recalculations (see Chapter ES.5 above). Furthermore, the regularly conducted reviews under the LRTAP Convention and the NEC Directive trigger improvements.

The last CLRTAP Stage 3 ("In-depth") review of the Austrian Inventory took place in 2017 (UNITED NATIONS 2017). The findings for Austria are summarized and commented in Table 330. The next Stage 3 review is currently not scheduled, but is expected within the next five years.

In addition to the CLRTAP Review, from 2017 onwards the national emission inventory data is also checked by the European Commission as set out in Article 10 of Directive 2016/2284. The inventories are checked annually in order to verify the transparency, accuracy, consistency, comparability and completeness of information submitted and to identify possible inconsistencies with the requirements set out under international law, in particular under the LRTAP Convention. Synergies are maximised with the 'Stage 3' reviews conducted by the LRTAP Convention. The findings under the NEC Review 2020 (EC 2020) for Austria are summarized and commented in Table 331.

Recalculations and improvements are summarized in Chapter 7 – Recalculations and Improvements and described in detail in the sector-specific chapters of this report.

ES.7 Condensable component of PM_{10} and $PM_{2.5}$

The Parties to the LRTAP Convention have been formally requested by the Executive Body at its thirty-eight session to provide information on the reporting of the condensable component of particulate matter (PM) in their Informative Inventory Reports. The purpose is the provision of transparent information for the modellers. As a consequence, Annex II (Recommended structure for the Informative Inventory Report (IIR)) of the CLRTAP Reporting GL has been updated accordingly. Austria included the following information in its IIR from 2019 on:

- appendix including a table summarising whether PM_{10} and $PM_{2.5}$ emission factors for each source sector include or exclude the condensable component (and references for their emission factors) (see chapter 12.3).
- indication in the methodology sections whether PM_{10} and $PM_{2.5}$ emission estimates include or exclude the condensable component (please refer to the methodological chapters 3-6).