umweltbundesamt

AUSTRIA'S ANNUAL AIR EMISSION INVENTORY 1980-2005

Submission under the UNECE Convention on Long-range Transboundary Air Pollution

REPORT
REP-0072

Wien, 2007

Project management
Manuela Wieser

Authors
Michael Anderl
Elisabeth Kampel
Traute Köther
Barbara Muik
Barbara Schodl
Stephan Poupa
Manuela Wieser

Editor
Brigitte Read

Layout and typesetting
Lisa Lössl

Reviewed and approved by
Daniela Wappel

The authors of this report want to express their thanks to all experts at the Umweltbundesamt as well as experts from other institutions involved in the preparation of the Austrian Air Pollutant Inventory for their contribution to the continous improvement of the inventory.

This report was prepared on behalf of the Austrian *Federal Ministry of Agriculture, Forestry, Environment and Water Management.*

For further information about the publications of the Umweltbundesamt please go to:
http://www.umweltbundesamt.at/

Imprint

Owner and Editor: Umweltbundesamt GmbH
Spittelauer Lände 5, 1090 Vienna/Austria

Printed on recycling paper

© Umweltbundesamt GmbH, Vienna, 2007
All rights reserved
ISBN 3-85457-869-5

CONTENT

LIST OF TABLES

LIST OF TABLES IN THE ANNEX

LIST OF FIGURES

EXECUTIVE SUMMARY

As a party to the UNECE Convention on Long Range Transboundary Air Pollution (LRTAP) Austria is required to annually report data on emissions of air pollutants covered in the Convention and its Protocols: these are the main pollutants NO_x, SO_2, NMVOC, NH_3 and CO, Particulate Matter (PM), Persistent Organic Pollutants (POPs) and Heavy Metals (HM). To be able to meet this reporting requirement Austria compiles an Air Emission Inventory ("Österreichische Luftschadstoff-Inventur – OLI") which is updated annually. The preparation and review of Austria's Air Emission Inventory are the responsibility of the Department of Air Emissions of the Umweltbundesamt.

The emission data presented in this report were compiled according to the guidelines for estimating and reporting emission data (EB.AIR/GE.1/2002/7), which define the format of reporting emission data (Nomenclature For Reporting – NFR) as well as standards for providing supporting documentation which should ensure the transparency of the inventory.

The complete set of tables in the NFR format, including sectoral reports, sectoral background tables and footnotes to the NFR tables, are submitted separately in digital form only. A summary of emission data is presented in the Annex to this report.

The report at hand complements the reported emission data by providing background information. It follows the template for a "minimum version" of the "Informative Inventory Report" (IIR) as elaborated by the LRTAP Convention's "Task Force on Emission Inventories and Projections" (TFEIP).

The first chapter of this report provides general information on the institutional arrangements for inventory preparation, on the inventory preparation process, methodologies and data sources used and on QA/QC activities. Furthermore it presents the key source analysis and gives information on completeness and uncertainty of emission estimates.

Chapter 2 gives information on reduction or stabilization targets as set out in the Protocols to the Convention compared to actual emission trends.

The third chapter presents major changes (so called "recalculations") related to the previous submission (emission data report 2006 under the UNECE/LRTAP Convention) which are the result of continuous improvement of Austria's Air Emission Inventory. Data presented in this report replace data reported earlier under the reporting framework of the UNECE/LRTAP Convention.

More detailed information will be given in "Austria's Informative Inventory Report 2007", a comprehensive report on methodological issues for each sector and pollutants that will be published and submitted to the UNECE in autumn 2007.

1 INTRODUCTION

1.1 Institutional Arrangement for Inventory Preparation

Austria, as a party to the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP), has to report its national emissions of air pollutants annually. The formal reporting responsibility lies with the Minister for Agriculture, Forestry, Environment and Water Management.

Umweltbundesamt, as the federal environment agency in Austria, has been designated as single national entity responsible for the preparation of the annual air pollutant inventory by law. The Environmental Control Act[1] regulates responsibilities of environmental control in Austria and lists the tasks of the Umweltbundesamt. One task is to provide technical expertise and the data basis for the fulfilment of the emission related reporting obligations under the UNECE LRTAP Convention. To that end, the Umweltbundesamt prepares and annually updates the Austrian air emissions inventory ("Österreichische Luftschadstoff-Inventur OLI"), which covers greenhouse gases (GHG) and emissions of other air pollutants as stipulated in the reporting obligations further explained in the following chapters.

For the Umweltbundesamt a national air emission inventory that identifies and quantifies the sources of pollutants in a consistent manner is of a high priority. Such an inventory provides a common means for comparing the relative contribution of different emission sources and hence can be a basis for policies to reduce emissions.

Within the Umweltbundesamt, the department of air emissions is responsible for the preparation of the inventory and all work related to inventory preparation.

Umweltbundesamt is an ISO 17020 accredited inspection body for Greenhouse Gas Inventories (Id. No. 241) in accordance with the Austrian Accreditation Law (AkkG)[2] by decree of the Minister of Economics and Labour (BMWA), issued on 19.01.2006, valid from 23.12.2005.[3] The requirements of EN ISO/IEC 17020 (Type A) are fulfilled.

1.1.1 Austria's Obligations

Austria has to comply with the following air emission related obligations:

- Austria's obligation under the UNECE Convention on Long-range Transboundary Air Pollution (LRTAP)[4]: Austria signed the convention in 1979; since its entry into force in 1983 the Convention has been extended by eight protocols which identify specific obligations or measures to be taken by Parties. These obligations as well as information regarding the status of ratification are listed in Table 1.
- Austria's annual obligations under the Directive 2001/81/EC of the European Parliament and of the Council of 23.10.2001 on national emission ceilings for certain atmospheric pollutants (NEC-Directive).[5] The Austrian implementation of the European NEC-Directive[6] also entails the obligation for a national emissions inventory of the covered air pollutants NO_x, SO_2, NMVOC and NH_3.

---

[1] Umweltkontrollgesetz; Federal Law Gazette 152/1998
http://www.umweltbundesamt.at/fileadmin/site/umweltkontrolle/gesetze/ukg.pdf

[2] Federal Law Gazette No. 468/1992 last amended by federal law gazette I No. 85/2002, by decree of the Minister of Economics and Labour, No. BMWA- 92.715/0036-I/12/2005, issued on 19 January, valid from 23 December 2005.
http://www.bmwa.gv.at/NR/rdonlyres/4E4C573C-4628-4B05-9DB6-D0A7C6E7EF81/216/Akkreditierungsgesetz_Englisch1.pdf

[3] http://www.bmwa.gv.at/NR/rdonlyres/E956BE3D-B8A9-4922-9A2A-420182E8ED7A/22576/Akkrd.pdf

[4] http://www.unece.org/env/lrtap/

[5] http://www.umweltbundesamt.at/fileadmin/site/umweltthemen/luft/Richtlinie_2001.81.EG.pdf

- Austria's annual obligations under the European Council Decision 280/2004/EC ("Monitoring Decision"[7]; replacing Decision 389/1992/EEC amended by Decision 296/1999/EEC) concerning a mechanism for monitoring Community greenhouse gas emissions and for implementing the Kyoto Protocol.
- Austria's obligation under the "United Nations Framework Convention on Climate Change (UNFCCC)(1992)[8] and the Kyoto Protocol (1997)[9].
- Obligation under the Austrian "ambient air quality law"[10] comprising the reporting of national emission data on SO_2, NO_x, NMVOC, CO, heavy metals (Pb, Cd, Hg), benzene and particulate matter (PM).
- Austria's obligation according to Article 15 of the European IPPC Directive 1996/61/EC is to implement a European Pollutant Emission Register (EPER)[11]. Article 15 of the IPPC Directive can be associated with Article 6 of the Aarhus Convention (United Nations: Aarhus, 1998) which refers to the right of the public to access environmental information and to participate in the decision-making process of environmental issues.

Table 1: Protocols of UNECE Convention on Long-range Transboundary Air Pollution (LRTAP)

	Tools of UNECE Convention on Long-range Transboundary Air Pollution (LRTAP)	**Parties**	**entered into force**	**signed/ratified by Austria**
1984	Geneva Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe (EMEP)	41	28.01.1988	16.12.1982 (r)
1985	Helsinki Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent	22	02.09.1987	09.07.1985 04.06.1987
1988	Sofia Protocol concerning the Control of Nitrogen Oxides or their Transboundary Fluxes	28	14.02.1991	01.11.1988 15.01.1990
1991	Geneva Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes	21	29.09.1997	19.11.1991 23.08.1994
1994	Oslo Protocol on Further Reduction of Sulphur Emissions	25	05.08.1998	14.06.1994 27.08.1998
1998	Aarhus Protocol on Heavy Metals	27	29.12.2003	24.06.1998 17.12.2003
1998	Aarhus Protocol on Persistent Organic Pollutants (POPs)	23	23.10.2003	24.06.1998 27.08.2002
1999	"The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone	18	17.05.2005	01.12.1999 (s)

Abbreviation: signed (s)/ratified (r)

Source: http://www.unece.org/env/lrtap/welcome.html

[6] Emissionshöchstmengengesetz- Luft *EG-L* (*air emissions ceilings law*) BGBl, I, 34/2003; http://www.umweltbundesamt.at/fileadmin/site/umweltkontrolle/gesetze/EG-L.pdf

[7] http://europa.eu.int/eur-lex/pri/de/oj/dat/2004/l_049/l_04920040219de00010008.pdf

[8] http://unfccc.int/files/essential_background/convention/status_of_ratification/application/pdf/ratlist.pdf

[9] http://unfccc.int/files/essential_background/kyoto_protocol/application/pdf/kpstats.pdf

[10] Immissionsschutzgesetz-Luft *IG-L* (*ambient air quality law*) BGBl, I, 115/1997 http://www.umweltbundesamt.at/fileadmin/site/umweltkontrolle/gesetze/2001-IG-L.pdf

[11] see www.umweltbundesamt.at/eper/

1.1.2 National Inventory System Austria (NISA)

Regulations under the UNECE/LRTAP Convention and its Protocols define standards for the preparation of and reporting on national emission inventories. In 2002, the Executive Body adopted new guidelines for estimating and reporting emission data to ensure that the transparency, consistency, comparability, completeness and accuracy of reported emissions are adequate for current CLRTAP needs (EB.AIR/GE.1/2002/7[12] and its supporting addendum).

The Austrian air emission inventory (OLI) covers all pollutants, i.e. air pollutants reported to UNECE and greenhouse gases as reported to the UNFCCC to streamline efforts and benefit from a common approach to inventory preparation in one single National Inventory System for Austria (NISA).

It is designed to comply with the (in general more stringent) standards for national emission inventories under the UNFCCC and the Kyoto Protocol and also meets all the requirements of the LRTAP Convention and other reporting obligations as presented above (chapter 1.1.1).

The 'National Inventory System Austria' (NISA) includes all institutional, legal and procedural arrangements made for the preparation of emission inventories and for reporting and archiving inventory information and should ensure the quality of the inventory: timeliness, transparency, consistency, comparability, completeness and accuracy.

As there are many different obligations which are subject to continuous development, Austria's National Inventory System (NISA) has to be adapted continually to these changes. The present structure is illustrated in Figure 1.

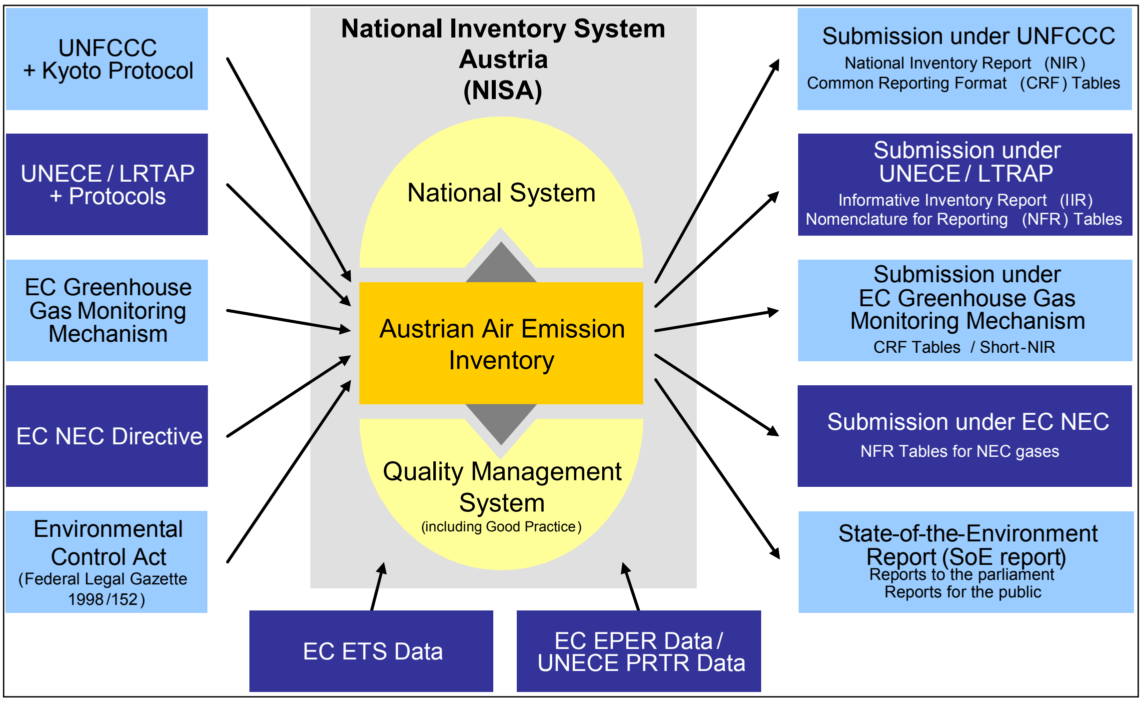

Figure 1: Structure of National Emission Inventory System Austria (NISA)

[12] http://www.unece.org/env/eb/welcome.20.html

As illustrated in Figure 1 the Austrian Air Emission Inventory comprising all air pollutants stipulated by various national and international obligations is the centre of NISA. The national system as required under the Kyoto Protocol and the Quality Management System (ISO/IEC 17020) are incorporated into NISA as complementary sections.

A brief history of the development and the activities of NISA is given below:

- Austria established measurements for SO_2 under EMEP in 1978 (Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe) and joined the UNECE in 1983. At that time Austria reported mainly SO_2 emissions.
- As an EFTA country Austria participated in CORINAIR 90, which was an air emission inventory for Europe. It was part of the CORINE[13] work plan set up by the European Council of Ministers in 1985. The aim of CORINAIR 90[14] was to produce a complete, consistent and transparent emission inventory for the pollutants: SO_x as SO_2, NO_x as NO_2, NMVOC, CH_4, CO, CO_2, N_2O and NH_3.
- As a Party to the Convention, Austria signed the UNFCCC on June 8th, 1992 and subsequently submitted its instrument of ratification on February 28th, 1994.[15]
- In 1994 the first so-called Austrian Air Emission Inventory (OLI) was carried out.
- In 1997 emission data were reported for a time period (for each of the years from 1980 to 1995) for the first time.
- In 1998 also emissions of heavy metals, POPs and fluorinated compounds (SF_6, PFCs, HFCs) were included in the inventory.
- Inventory data for particulate matter (PM) were included in the inventory in 2001.

For more details on NISA see the report "NISA – NATIONAL INVENTORY SYSTEM AUSTRIA - Implementation Report" [16] which presents an overview of NISA and evaluates its compliance with the guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol as specified under the Marrakesh Accord (decision 20/CP.7)[17].

1.1.3 Reporting obligation under the UNECE/LRTAP Convention and its Protocols

As a minimum requirement, each Party shall report on emissions of the substances relevant to the Protocol to which they are a Party, as required by that Protocol. Since Austria has signed all eight protocols of the UNECE/LRTAP Convention, the annual reporting obligation enfolds emission data of four groups: main pollutants, particulate matter (PM), heavy metals, and POPs. Table 2 gives the present set of components which have to be reported (minimum) and which can be reported voluntarily (additional).

[13] Coordination d'Information Environmentale

[14] http://reports.eea.eu.int/92-9167-036-7/en

[15] http://unfccc.int/parties_and_observers/parties/items/2146.php

[16] http://www.umweltbundesamt.at/fileadmin/site/publikationen/REP0004.pdf

[17] http://unfccc.int/cop7/accords_draft.pdf

Table 2: Emission Reporting Programme: YEARLY (MINIMUM and ADDITIONAL)

YEARLY	**Components (Minimum and *additional*)**	**Reporting years**
A. National totals		
1. Main pollutants	SO_x, NO_x, NH_3, NMVOC, CO	From 1980 to 2005
2. Particulate matter	PM2,5, PM10, TSP	For 1990, 1995, and for 1999 to 2005
3. Heavy metals	Pb, Cd, Hg, *As, Cr, Cu, Ni, Se, Zn*	From 1990 to 2005
4. POPs	aldrin, chlordane, chlordecone, DDT, dieldrin, endrin, heptachlor, hexachlorobenzene (HCB), mirex, toxaphene, hexachlor-ocyclohexane (HCH), hexabromobiphenyl, polychlorinated biphenyls (PCBs), dioxins/furans (PCDD/F), polycyclic aromatic hydrocarbons (PAHs), short-chain chlorinated paraffins (SCCP), pentachlorophenol (PCP)	From 1990 to 2005
B. Sector emissions		
1. Main pollutants	SO_x, NO_x, NH_3, NMVOC, CO	From 1980 to 2005
2. Particulate matter	PM2,5, PM10, TSP	For 1990, 1995, and for 1999 to 2005
3. Heavy metals	Pb, Cd, Hg, *As, Cr, Cu, Ni, Se, Zn*	From 1990 to 2005
4. POPs	aldrin, chlordane, chlordecone, DDT, dieldrin, endrin, heptachlor, HCB, mirex, toxaphene, HCH, hexabromobiphenyl, PCBs, PCDD/F, PAHs, SCCP, PCP	From 1990 to 2005

Table 3: Emission Reporting Programme: 5-YEARLY (MINIMUM and ADDITIONAL as well as FOR REVIEW AND ASSESSMENT PURPOSES)

5-YEARLY: MINIMUM REPORTING		
C. Gridded data in the EMEP 50x50 km^2 grid		
1. National totals 2. Sector emissions	Main pollutants, PM, Pb, Cd, Hg, PAHs, HCB, dioxins/furans	1990, 1995, 2000, 2005 (PM: 2000)
D. Emissions from large point sources		
	Main pollutants, HM, PCDD/F, PAH, HCB, PM	2000, 2005
E. Historical and Projected activity data and projected national total emissions		
1. National total emissions	See table IV 2A in EB/AIR/GE.1/2002/7	2010, 2015, 2020
2. Energy consumption	See tables IV 2B, 2C in EB.AIR/GE.1/2002/7	1990, 1995, 2000, 2005, 2010, 2015 and 2020
3. Energy consumption for transport sector	See table IV 2D in EB.AIR/GE.1/2002/7	1990, 1995, 2000, 2005, 2010, 2015 and 2020
4. Agricultural activity	See table IV 2E in EB.AIR/GE.1/2002/7	1990, 1995, 2000, 2005, 2010, 2015 and 2020

5-YEARLY: ADDITIONAL REPORTING/FOR REVIEW AND ASSESSMENT PURPOSES	
VOC speciation/Height distribution/Temporal distribution	Parties are encouraged to review the information used for modelling at the Meteorological Synthesizing Centres available for review at **http://webdab.emep.int/** and the **Additional Reporting Tables**
Land-use data/Mercury breakdown	
% of toxic congeners of PCDD/F emissions	
Pre-1990 emissions of PAHs, HCB, PCDD/F and PCB	
Information on natural emissions	

Emission estimates should be prepared using the methodologies agreed upon by the Executive Body. These are in particular

- the EMEP/CORINAIR Emission Inventory Guidebook – 2005, Technical report No 30[18]
- the EEA core set of indicators – Guide, Technical report No 1/2005[19]
- the Recommendations for Revised Data Systems for Air Emission Inventories, Topic report No 12/1996[20]
- the Guidance Report on preliminary assessment under EC air quality directives, Technical report No 11[21]

as well as other internationally applied methodologies and guidelines including:

- Integrated Pollution Prevention and Control (IPPC)[22] and European Pollutant Emission Register (EPER)[23]
- IPPC Best Available Techniques Reference Documents[24]
- Guidelines for Emission Inventory Reporting from the Large Combustion Plant Directive[25]
- Organization for Economic Co-operation and Development (OECD) and Pollution Release and Transfer Register (PRTR) Guidance[26]
- Revised 1996 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories[27] and the IPCC Good Practice Guidance[28]

1.2 Inventory Preparation Process

The present Austrian Air Pollutant Inventory for the period 1980 to 2005 was compiled according to the recommendations for inventories as set out by the UN ECE Executive Body in the guidelines mentioned above.

The preparation of the inventory includes the following three stages as illustrated below.

Figure 2: Three stages of inventory preparation

[18] and previous editions: EMEP/CORINAIR Emission Inventory Guidebook – 3rd edition October 2002 UPDATE (http://reports.eea.eu.int/EMEPCORINAIR3/en)

[19] http://reports.eea.eu.int/technical_report_2005_1/en

[20] http://reports.eea.eu.int/92-9167-033-2/en

[21] http://reports.eea.eu.int/TEC11a/en/tab_relations_RLR

[22] http://eippcb.jrc.es/ and http://europa.eu.int/comm/environment/ippc/index.htm

[23] http://www.eper.cec.eu.int/eper/default.asp

[24] http://eippcb.jrc.es/pages/FActivities.htm

[25] http://rod.eionet.eu.int/show.jsv?id=9&aid=500&mode=A

[26] http://www.oecd.org/department/0,2688,en_2649_34411_1_1_1_1_1,00.html

[27] http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm

[28] http://www.ipcc-nggip.iges.or.jp/public/gp/english/

I. Inventory planning

In the first stage specific responsibilities are defined and allocated: as mentioned before, the Umweltbundesamt has the overall responsibility for the national inventory, comprising greenhouse gases as well as other air pollutants.

Inventory planning also includes planning of how to distribute available resources, and thus, as resources are limited, also includes a prioritization of planned improvements. Considerations on which part of the inventory (in terms of pollutants and/or sectors) to focus efforts to improve the inventory include political or public awareness due to current environmental problems or emission reduction limits that are hard to meet. A tool to prioritize between sectors within the inventory is the key source analysis, where efforts are focused on important sources/sectors in terms of emissions, trends or concerning the influence on the overall quality of the inventory.

In the Austrian improvement programme emphasis has been laid on the so-called NEC gases SO_x, NO_x, NMVOC, and NH_3 where continuous efforts have been taken to improve the inventory. However, in the previous year, emissions from HM, PM and POPs have been re-evaluated and updated where possible.

Within the inventory system specific responsibilities for the different emission source categories are defined ("sector experts") as well as for all activities related to the preparation of the inventory, including QA/QC, data management and reporting.

Emissions of air pollutants are estimated together with greenhouse gases in a single data base based on the CORINAIR[29] systematic, which was formerly also used as reporting format under the UNECE. This nomenclature was designed by the ETC/AE (European Topic Centre on Air Emissions) to estimate emissions of all kind of air pollutants as well as greenhouse gases.

The CORINAIR system's nomenclature is called SNAP[30], which may be expanded to adapt to national circumstances by so-called SPLIT codes, and additionally each SNAP/SPLIT category can be extended using a fuel code.

II. Inventory preparation

In the second stage, the inventory preparation process, sector experts collect activity data, emission factors and all relevant information needed for finally estimating emissions. The sector experts are also responsible for methodological choices and for contracting studies, if needed.

As the source of emission factors and/or the methodology of emission estimation for HM, POPs and PM is different compared to the "main" pollutants for a lot of source categories, emission inventories for these pollutants were prepared in studies that were contracted out; however, the incorporation into the inventory system and the update of emission calculations for subsequent years is the responsibility of the sector experts.

All data collected together with emission estimates are fed into a database (see below), where data sources are documented for future reconstruction of the inventory.

As mentioned above, the Austrian Inventory is based on the SNAP systematic, and has to be transformed into the current reporting format under the LRTAP Convention - the NFR[31] format. Additionally to actual emission data also background tables of the NFR are filled in by the sector

---

[29] CORINAIR: CORINE - CO-oRdination d'INformation Environnementale and include a project to gather and organise information on emissions into the air relevant to acid deposition; Council Decision 85/338/EEC (OJ, 1985)

[30] **SNAP** (Selected Nomenclature for sources of Air Pollution) 90 or 97respectivley means the stage of development

[31] **NFR** – Nomenclature For Reporting - is a classification system developed by the UN/ECE TFEIP for the Reporting Guidelines described in eb.air.ge.1.2001.6.e.doc

experts, and finally QA/QC procedures as defined in the inventory planning process are carried out before the data is submitted under the UNECE/LRTAP.

III. Inventory management.

For the inventory management a reliable data management to fulfil the data collecting and reporting requirements is needed. As mentioned above, data collection is performed by the different sector experts and the reporting requirements grow rapidly and may change over time.

Data management is carried out by using MS Excel™ spreadsheets in combination with Visual Basic™ macros, which is a very flexible system that can easily be adjusted to new requirements. The data is stored on a central network server which is backed up daily for the needs of data security. The inventory management also includes quality management (see Chapter 1.5) as well as documentation on QA/QC activities.

1.3 Methodologies and Data Sources Used

For large point sources the Umweltbundesamt preferably uses – after careful assessment of plausibility of this data – emission data that are reported by the "operator" of the source because these data usually reflect the actual emissions better than data calculated using general emission factors, as the operator has the best information about the actual circumstances.

If such data is not available, and for area sources, national emission factors are used or, if there are no national emission factors, international emission factors are used to estimate emissions. Where no applicable data is found, standard emission factors e.g. from the CORINAIR Guidebook are applied.

The following table presents the main data sources for activity data as well as information on who did the actual calculations.

Table 4: Main data sources for activity data and emission values

Sector	Data Sources for Activity Data	Emission Calculation
Energy	• energy balance[32] from STATISTICS AUSTRIA • steam boiler data base[33] administrated by Umweltbundesamt • data from industry[34] • national studies	Umweltbundesamt, plant operators
Industry	• national production statistics • import / export statistics from STATISTICS AUSTRIA • direct information from industry • direct information from associations of industry	Umweltbundesamt, plant operators
Solvent and Other Product Use	• production statistics • consumption statistics • import / export statistics } from STATISTICS AUSTRIA	Contractors: Forschungsinstitut für Energie u. Umweltplanung, Wirtschaft und Marktanalysen/Institut für industrielle Ökologie (IIÖ)[35]

[32] compatible with requirements of the International Energy Agency (IEA Joint Questionnaires)

[33] reporting obligation to § 10 (7) of LRG-K; data are used to verify the data from the national energy balance

[34] data are used to verify the data from the national energy balance

Sector	Data Sources for Activity Data	Emission Calculation
Agriculture	• national agricultural statistics "Grüner Bericht" from STATISTICS AUSTRIA • national report on water protection "Gewässerschutzbericht" from LEBENSMINISTERIUM[36] • national studies • direct information from agricultural association	Contractors: University of Natural Resources and Applied Life Sciences, Research Center Seibersdorf, Austria
Waste	• database on landfills administrated by Umweltbundesamt • National reports from STATISTICS AUSTRIA • sewage plant inventory administrated by Umweltbundesamt • national report on water protection "Gewässerschutzbericht" from LEBENSMINISTERIUM[36]	Umweltbundesamt

1.3.1 Main Data Suppliers

STATISTICS AUSTRIA

- The main data supplier for the Austrian air emission inventory is STATISTICS AUSTRIA[37], which provides the underlying energy data. The Austrian energy balances are based on several databases mainly prepared by the Ministry of Economic Affairs and Labour[38], "Bundeslastverteiler" and STATISTICS AUSTRIA. Their methodology follows the International Energy Agency (IEA)[39] and Eurostat[40] conventions. The aggregates of the balances, for example transformation input and output or final energy use, are harmonised with the IEA tables as well as their sectoral breakdown which follows the NACE[41] classification.
- Activity data for some sources is obtained from STATISTICS AUSTRIA which provides statistics on production data[42]. The methodology of the statistics changed in 1996, no data is available for that year and there are some product groups that are not reported anymore in the new statistics.
- Activity data needed for the calculation of non energetic emissions are based on several statistics collected by STATISTICS AUSTRIA and national and international studies.
- Activity data for Solvent and Other Product Use are based on import/export statistics also prepared by STATISTICS AUSTRIA

[35] Research Institute for Energy and Environmental Planning, Economy and Market Analysis Ltd. / Institute for Industrial Ecology, Austria

[36] www.lebensministerium.at

[37] www.statistik.at

[38] BUNDESMINISTERIUM für WIRTSCHAFT und ARBEIT (BMWA); www.bmwa.gv.at

[39] http://www.iea.org/

[40] www.europa.eu.int/comm/eurostat/

[41] Classification of Economic Activities in the European Community

[42] "Industrie und Gewerbestatistik" published by STATISTICS AUSTRIA for the years until 1995; "Konjunkturstatistik im produzierenden Bereich" published by STATISTICS AUSTRIA for the years 1997 to 2005.

INFORMATION FROM INDUSTRY

- Activity data and emission values for some subcategories in the industry sector are obtained from association of industries or directly from individual plants. If emission data are reported (e.g. by the plant owner) this data is – after assessment of plausibility - taken over into the inventory.

DATABASES

- Operators of steam boilers with more than 50 MW report their NO_x, SO_2, CO and TSP emissions and their activity data directly to the steam boiler data base administrated by the Umweltbundesamt (see Table 4).
- Operators of landfill sites also report their activity data directly to Umweltbundesamt. Emissions for the years 1998–2005 are calculated on the basis of these data.
- EPER: The European Pollutant Emission Register (EPER) is the first Europe-wide register for emissions from industrial facilities both to air and to water. The legal basis of EPER is Article 15 of the IPPC Directive (EPER Decision 2000/479/EG)[43], the scope is to provide information to the public[44].

  It is covering 50 pollutants including NO_x, SO_2, NMVOC, NH_3, CO, heavy metals, POPs and particulate matter (PM). However, emissions only have to be reported if they exceed certain thresholds.

  The Umweltbundesamt implemented EPER in Austria using an electronic system that enabled the facilities and the authorities to fulfil the requirements of the EPER decision electronically via the internet.

  The Austrian industrial facilities had to report their annual emissions of the year 2001 or 2002 and 2004. There were about 400 facilities in Austria that had to report to EPER. As the thresholds for reporting emissions are relatively high only about 130 of them reported emissions according to the EPER Regulation. The plausibility of the reports is checked by competent authorities. The Umweltbundesamt finally checked the data for completeness and consistency with the national inventory.

  However, data from EPER could not be used as data source for the national inventory. The EPER report only contains very little information beyond the emission data, the only information included is whether emissions are estimated, measured or calculated, also included is one activity value that is often not useful in the context of emissions. Additionally emission information of EPER is not complete regarding NFR sectors, and it is difficult to include this point source information when no background information (such as fuel consumption data) is available.

  Thus the top-down approach of the national inventory was considered more reliable and data of EPER was not used as point source data for the national inventory but for verification purposes only.

---

[43] http://www.umweltbundesamt.at/fileadmin/site/daten/EPER/EPER_Entscheidung_EK.pdf

[44] data can be obtained from: http://www.umweltbundesamt.at/eper/

LITERATURE

- National and sometimes international studies are also used as data suppliers (references are given in the sector analysis chapters).

Studies on HM, POPs and PM emissions

Emissions of HM and some POPs have already been estimated in the course of CORINAIR 1990 and 1994, respectively[45]. With these data and other Austrian publications as a basis comprehensive emission inventories of HM, POPs and PM for different years were prepared by contractors of the Umweltbundesamt and incorporated into the inventory system afterwards.

- WINDSPERGER, A. et. al. (1999): Entwicklung der Schwermetallemissionen – Abschätzung der Emissionen von Blei, Cadmium und Quecksilber für die Jahre 1985, 1990 und 1995 gemäß der CORINAIR-Systematik. Institut für Industrielle Ökologie und Österreichisches Forschungszentrum Seibersdorf. Wien. [Nicht veröffentlicht]

  Development of Heavy Metal Emissions – Estimation of emissions of Lead, Cadmium and Mercury for the years 1985, 1990 and 1995 according to the CORINAIR-systematics. Department for industrial ecology and Austrian Research Centers Seibersdorf. Vienna. [not published]

- Österreichische Emissionsinventur für Cadmium, Quecksilber und Blei

  (Austrian emission inventory for Cd, Hg and Pb) 1995-2000" prepared by FTU – Forschungsgesellschaft Technischer Umweltschutz GmbH. Vienna November 2001 [not published].

- HÜBNER, C. (2001): Österreichische Emissionsinventur für POPs 1985–1999. FTU – Forschungsgesellschaft Technischer Umweltschutz GmbH. Werkvertrag des Umweltbundesamt, IB-650. Wien. [Nicht veröffentlicht]

  Austrian emission inventory for POPs 1985–1999. Prepared by FTU – Research Center Technical environment protection (Ltd.). Study commissioned by Umweltbundesamt IB-650. Vienna. [not published]

- WINIWARTER, W.; TRENKER, C.; HÖFLINGER, W. (2001): Österreichische Emissionsinventur für Staub. Österreichisches Forschungszentrum Seibersdorf. Wien.

  Austrian emission inventory for PM. Austrian Research Centers Seibersdorf. Vienna.

1.3.2 Summary of methodologies applied for estimating emissions

In Table 5 a summary of methodologies applied for estimating emissions is given.

The following abbreviations are used:

D DEFAULT

L Literature

CS COUNTRY SPECIFIC

PS PLANT SPECIFIC

Dark shaded cells indicate that no such emissions arise from this source; light shaded cells (green) indicate key sources.

[45] ORTHOFER, R. (1996); HÜBNER, C. (1996); HÜBNER, C. & WURST, F. (1997); HÜBNER, C. (2000)

Table 5: Summary of methodologies applied for estimating emissions

		SO_2	NO_x	NMVOC	NH_3	CO	Cd	Hg	Pb	PAH	Diox	HCB	TSP	PM10	PM2.5
1 A 1 a	Public Electricity and Heat Production	PS, CS	PS, CS	CS	CS	PS, CS	D/CS	D/CS	D/CS	L/CS	L/CS	L/CS	PS, CS	PS, CS	PS, CS
1 A 1 b	Petroleum refining	PS	PS		CS	PS	CS	CS	CS	L/CS	L/CS	CS	PS	PS	PS
1 A 1 c	Manufac.of Solid fuels a. Oth. Energy Ind.		CS	CS	CS	CS					L/CS	CS	CS	CS	CS
1 A 2 mobile	Other mobile in industry	CS	CS	CS	CS	CS	CS	CS	CS	L/CS	L/CS	CS	CS	CS	CS
1 A 2 stat (l)	Manuf. Ind. & Constr. stationary LIQUID	PS, CS	PS, CS	PS, CS	CS	PS, CS	D/CS	D/CS	D/CS	L/CS	L/CS	CS	PS, CS	PS, CS	PS, CS
1 A 3 a	Civil Aviation	CS	CS	CS	CS	CS	CS	CS	CS				CS	CS	CS
1 A 3 b 1	R.T., Passenger cars	CS	CS	CS	CS	CS	CS	CS	CS	L/CS	L/CS	CS	CS	CS	CS
1 A 3 b 2	R.T., Light duty vehicles	CS	CS	CS	CS	CS	CS	CS	CS	L/CS	L/CS	CS	CS	CS	CS
1 A 3 b 3	R.T., Heavy duty vehicles	CS	CS	CS	CS	CS	CS	CS	CS	L/CS	L/CS	CS	CS	CS	CS
1 A 3 b 4	R.T., Mopeds & Motorcycles		CS	CS	CS	CS	CS	CS	CS	L/CS	L/CS	CS			
1 A 3 b 5	R.T., Gasoline evaporation			CS											
1 A 3 b 6	R.T., Automobile tyre and break wear						L						CS	CS	CS
1 A 3 c	Railways	CS	CS	CS	CS	CS	D/CS	D/CS	D/CS	L/CS	L/CS	CS	CS	CS	CS
1 A 3 d	Navigation	CS	CS	CS	CS	CS	CS	CS	CS	L/CS	L/CS	CS	CS	CS	CS
1 A 3 e	Other	NA	CS	CS	CS	CS						CS	CS	CS	CS
1 A 4 mob	Other Sectors – mobile	CS	CS	CS	CS	CS	CS	CS	CS	L/CS	L/CS	CS	CS	CS	CS
1 A 4 stat (b)	Other Sectors stationary BIOMASS	CS	CS	CS	CS	CS	D/CS	D/CS	D/CS	L/CS	L/CS	CS	CS	CS	CS
1 A 5	Other	CS	CS	CS	CS	CS	CS	CS	CS	L/CS	L/CS	CS	CS	CS	CS

		SO_2	NO_x	NMVOC	NH_3	CO	Cd	Hg	Pb	PAH	Diox	HCB	TSP	PM10	PM2.5
1 B	FUGITIVE EMISSIONS FROM FUELS	PS		D, PS									CS	CS	CS
2 A	MINERAL PRODUCTS					L							CS	CS	CS
2 B	CHEMICAL INDUSTRY	CS	CS	CS	PS	CS	CS	CS	CS				CS	CS	CS
2 C	METAL PRODUCTION	CS	CS	CS		CS	CS	CS	CS	CS	CS	CS	CS	CS	CS
2 D	OTHER PRODUCTION		CS	L		CS				CS	CS	CS	CS	CS	CS
2 G	OTHER				CS										
3	SOLVEN & OTHER PRODUCT USE			CS			PS		CS						
4 B 1	Cattle				CS										
4 B 3	Sheep				D										
4 B 4	Goats				D										
4 B 6	Horses				D										
4 B 8	Swine				CS										
4 B 9	Poultry				D										
4 B-13	Other				D										
4 D	AGRICULTURAL SOILS		D	D	D								L	L	L
4 F	FIELD BURNING OF AGRIC. RESIDUES	CS	CS	CS	D	CS	CS	CS	CS	CS	CS	CS			
4 G	Agriculture – Other												D	D	D
6	WASTE	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS	CS

1.4 Key Source Analysis

To help prioritising efforts in inventory preparation, the identification of key sources is a helpful tool. A key source is a source within an inventory which has a strong influence on the total inventory's properties such as the absolute emission level, the trend of emissions or the quality of the inventory regarding its certainty or uncertainty.

As stated in the "Good Practice Guidance for CLRTAP Emission Inventories" (see Part B of the EMEP/CORINAIR Emission Inventory Guidebook, 3rd edition), the choice of parameter which is considered key also depends on the application of the inventory: for compliance assessments the trend is essential, whereas in the case that emission reporting obligations are formulated as emission ceilings, the emission level uncertainty is relevant.

However, quantitative uncertainties for the current inventory have not been assessed (for further information see Chapter 1.6). A simplified approach is to only analyse absolute emission levels, and according to the GPG for GHG inventories this quantitative approach is a so-called Tier 1 analysis, the "level assessment"[46].

In a first step, a level assessment for all pollutants reported to the LRTAP convention was performed and reported in this report. For the next years also a qualitative approach for the gases covered by the multi-effects protocol is planned ("Tier 2 analysis"). In this approach sources are identified whose uncertainty of emission levels has a significant effect on the total inventories uncertainty. As for these pollutants absolute emission ceilings have to be met, the uncertainty of reported emissions is – as mentioned above – essential.

Level Assessment

For the level assessment the contribution from each source (fraction of total emission) is listed and ranked until 95% of the total emission is accounted for. The analysis was made for the last year of the inventory (2005).

However, in a first step the source categories have to be aggregated according to applied methodologies: sources estimated using the same methodology and the same source of activity data and emission factors are aggregated.

Identification of Source Categories

This is an important step in terms of correlation of input data, which could otherwise falsify results of a key source analysis which usually assumes that input data are not dependent on each other.

A very detailed analysis e.g. on the level of detail given in the NFR might result in many categories with the same source of (correlating) input data, whereas on the other hand a high level of aggregation could mask some information. That's why the identification of source categories for the key source analysis was made in two steps:

After an initial analysis at a high level of aggregation further splits were made for categories that contributed significantly to total emissions of one pollutant, but only if the methodologies for the sub-sources are not the same (e.g. Solvent and Other Product Use the methodology for NMVOC emissions uses the same input data for all sub-sources, and the input data are dependant on each other, which is why no further dissaggregation was made).

[46] The so-called "trend assessment" is also a Tier 1 approach using not the absolute emission value but the trend of emissions as key parameter

For reasons of transparency, the same level of aggregation for all pollutants was used.

In the following the rationale for the aggregation per sector is given:

1 A Combustion Activities

1 A Combustion Activities is the most important sector for emissions reported to UNECE. To account for this fact and help prioritising efforts this sector was analysed in greater detail.

As methodologies for mobile and stationary sources are generally different, this split was used for all sub-categories. Furthermore, for mobile sources the different means of transport were considered separately, and additionally the sub-category road transport was further disaggregated as it is an important source for many pollutants.

For stationary sources a split following the third level of the NFR was used (1 A 2, 1 A 4), and additionally a fuel split was made, except for 1 A 1 Energy Industries where the disaggregation followed NFR level four with no fuel split and 1 A 5 where no further split was made as this category is of minor importance in terms of emission levels.

The following figure explains the disaggregation used for 1 A Combustion Activities.

Figure 3: Disaggregation used for 1 A Combustion Activities

1 A Combustion Activities	1 A 1 Energy Industries	1 A 1 a Public Electricity and Heat Production		
		1 A 1 b Petroleum refining		
		1 A 1 c Manufacture of Solid fuels and Other Energy Industries		
	1 A 2 Manufacturing Industries and Constructions		• Stationary sources	○ Liquid Fuels ○ Solid Fuels ○ Gaseous Fuels ○ Biomass ○ Other
			• Mobile sources	
	1 A 3 Transport	1 A 3 a Civil Aviation		
		1 A 3 b Road Transport	• Passenger Cars • Light Duty Vehicles • Heavy Duty Vehicles • Mopeds & Motorcycles • Gasoline Evaporation • Automobile Tyre and Breakwear	
		1 A 3 c Railways		
		1 A 3 d Navigation		
		1 A 3 e Other		
	1 A 4 Other Sectors		• Stationary sources	○Liquid Fuels ○Solid Fuels ○Gaseous Fuels ○Biomass ○Other
			• Mobile sources	
	1 A 5 Other			

1 B Fugitive Emissions

No further disaggregation as emission data has the same source for all subcategories.

2 Industrial Processes

Level two of the NFR was used (2 A / 2 B / 2 C / 2 D) as emission data has the same source for most sub-categories or, in the case of 2 C Metal Production, one sub-source is clearly dominating.

3 Solvent and Other Product Use

No further disaggregation as one model was used for all NMVOC emissions and considering other pollutants only HM emissions arise from one sub-category.

4 Agriculture

Level two of the NFR was used (4 B/ 4 D/ 4 F); only the sub-category 4 B was further disaggregated as this is an important source for NH_3 and the methodology is different for the animal categories.

6 Waste

No further disaggregation was used as this category is of minor importance concerning emissions of pollutants reported to the UNECE.

The applied aggregation resulted in 44 source categories (not including categories that are not relevant for Austria).

Results of the Level Assessment

As the analysis was made for all different pollutants reported to the UNECE and as these pollutants differ in their way of formation, most of the identified categories are key for one pollutant or more: as in last year's analysis, 33 key sources were identified. The results of the analysis are presented in Table 8.

However, compared to last year's analysis, two other key sources were identified, and two sources identified in last year's analysis were not identified in this year's analysis (this is due to recalculations, for explanations for recalculations please refer to Chapter 3):

- Additional sources
  - *6 Waste*
  - *1 A 3 b 4 Road Traffic: Mopeds & Motorcycles*
- Sources identified in last year's analysis but not in this year's
  - *1 A 3 c Railways*
  - *1 A 4 Other Sectors stationary - other*

1.5 Quality Assurance and Quality Control (QA/QC)

A quality management system (QMS) has been designed to contribute to the objectives of *good practice guidance (GPG)*, namely to improve transparency, consistency, comparability, completeness and confidence in national inventories of emissions estimates.

The QMS was primarily developed to meet the requirement of reporting greenhouse gas emissions under the Kyoto Protocol. For this reason the emphasis was placed on greenhouse gases. All air pollutants are covered by the QMS; however, in the first instance the inspection body applied to accreditation for greenhouse gases only.

The *Department of Air Emissions* of the Umweltbundesamt has decided to implement a QMS based on the International Standard ISO 17020 *General Criteria for the operation of various types of bodies performing inspections*[47]. Consequently the QMS contains all relevant features of international standard such as strict independence, impartiality and integrity of accredited bodies. Furthermore the QMS ensures the fulfilment of requirements as stipulated in Chapter 8 of the IPCC-GPG[48].

The QMS was fully implemented by the end of 2003, and the accreditation audit of the *Department for Air Emissions* as inspection body took place in autumn 2005. In January 2006, the official notification concerning the accreditation for greenhouse gases of the *Department for Air Emissions* was received.[49/50]

QA/QC Activities

QA/QC activities for non-GHG focus on Tier 1 and Tier 2 quality control procedures, they follow largely the procedures described in the LRTAP GPG. Also Tier 1 Quality Assurance procedures are performed, however they are not made by a third party but as a so-called 2nd party audit (e.g. the data manager who is not directly involved in the preparation of the inventory of the different sectors is performing checks as listed below).

QA/QC activities are performed at all stages of inventory preparation, they include during

- inventory preparation/ data collection (performed by sector experts):
  - checking if applied methodology is applicable or if any comments have been made e.g. by the review team, incorporating last year's planned improvements
  - transparent and comprehensible documenting and archiving that allows reproduction of the inventory
- data processing (performed by data manager):
  - electronic checks to screen for incomplete estimates and calculation errors
  - visual checks to screen for time series consistency
- preparation of inventory report (performed by sector experts):
  - check for transcription errors by comparison of data in reporting format with data/information in the inventory database.
  - check for plausibility of estimates by comparison with previous estimates using automatically produced data sheets showing recalculation differences

[47] The International Standard ISO 17020 has replaced the European Standard EN 45004.

[48] Good Practice Guidance by the Intergovernmental Panel on Climate Change

[49] Akkreditierungsbescheid (certificate of accreditation) GZ BMWA-92.715/0036-I/12/2005

[50] For more information see Austria's National Inventory Report 2007 - Submission under the UNFCCC

1.6 Uncertainty Assessment

So far, no quantitative uncertainty assessment for any of the pollutants or pollutant groups relevant for this report has been made. For GHGs a comprehensive uncertainty assessment has already been performed.[50]

However, the quality of estimates for all relevant pollutants has been rated using qualitative indicators as suggested in Chapter "GPG for CLRTAP emission inventories" of the EMEP/CORINAIR Guidebook. The definition of the ratings is given in Table 6, the ratings for the emission estimates are presented in Table 9.

Table 6: Definitions of qualitative rating

Rating	Definition	Typical Error Range
A	An estimate based on a large number of measurements made at a large number of facilities that fully represent the sector	10 to 30%
B	An estimate based on a large number of measurements made at a large number of facilities that represent a large part of the sector	20 to 60%
C	An estimate based on a number of measurements made at a small number of representative facilities, or an engineering judgement based on a number of relevant facts	50 to 150%
D	An estimate based on single measurements, or an engineering calculation derived from a number of relevant	100 to 300%
E	An estimate based on an engineering calculation derived from assumptions only	order of magnitude

Source: Chapter "GPG for CLRTAP emission inventories" of the EMEP/CORINAIR Guidebook

Furthermore, for HM and POPs qualitative "quality indicators" have been assigned to each emission value, and based on these values, a "semi-quantitative" value for the overall uncertainty of the HM and POPs emission inventory was calculated. As uncertainties for HM and POP emissions are generally relatively high (related to uncertainties to e.g. main pollutants or CO_2) and often difficult to determine, this "semi-quantitative" approach is considered to be a good approximation.

First, the main influences on the uncertainty of emission data were identified and the criteria were graded for every emission source:

- Influence on the uncertainty mainly related to the emission factor
  - (i) data availability (1 = representative sample, 2–4 = fair/medium/poor data availability, 5 = no measured data/indirect estimation)
  - (ii) the variation of the emission values (difference of measured or reported values: 10^1 = 1, …, 10^5 or more = 5)
- Influence on the uncertainty mainly related to the activity data
  - (iii) the homogeneity of emitters (1 = similar, …, 3 = different)
  - (iv) quality of activity data (1 = good, …, 3 = poor)

An arithmetic mean of the different grades was calculated; as the first two criteria have a higher impact on the uncertainty of the emission value, there were five grades were to choose from compared to three grades for the other two criteria. Thus the arithmetic mean is more dependent on the more important criteria. This resulted in a single quality indicator for each emission value.

To estimate the overall inventory uncertainty the quality indicators of the different emission sources were weighted according to the share in total emissions and the mean was calculated; This resulted in a single quality indicator for the overall inventory (for total emissions of one pollutant).

Statistically it can be deduced that an increase of the quality indicator by a value of 1 corresponds to a decrease in the quality and thus a increase in the variation by a factor of 2.

Finally, to calculate the variation of total emissions ("uncertainty") from of the weighted quality indicator the following assumption was made: as emission values are usually asymmetrically distributed, the "true" value (the value used for the inventory) reflects the geometrical mean value of the distribution. Using this assumption the variation of total emissions can be calculated using the following formula:

$$\frac{x}{\sqrt{2\exp(QI)}} \le x \le x \bullet \sqrt{2\exp(QI)}$$

QI… weighed quality indicator
x… „true" emission value (value used in the inventory)

The following table presents the results for HM and POPs. For POP emissions a factor of about 3 was determined, and a factor of about 2 for HM emissions.

Table 7: Variation of total emissions ("uncertainty") of HM and POP emissions

Uncertainty[51]	**1999**			**2000**	
	Emission [kg]	**Variation**		**Emission [t]**	**Variation**
Dioxin/Furan	0.18	0.08–0.4	Cd	0.97	0.5–2.1
HCB	47	20–130	Hg	0.88	0.5–1.7
PAHs	28 000	10 000–80 000	Pb	12.4	6.0–26

[51] The analysis was performed in 2001 for emission data of 1999 for POPs and 2000 for HM. As emissions have been recalculated since then the presented emission values differ slightly from values reported now.

Table 8: Level Assessment for the year 2005

Level Assessment 2005		**SO_2**	**NO_x**	**NMVOC**	**NH_3**	**CO**	**Cd**	**Hg**	**Pb**	**PAH**	**Diox**	**HCB**	**TSP**	**PM10**	**PM2.5**
								[%]							
1 A 1 a	**Public Electricity & Heat Production**	**13.4**	**4.0**	0.8	0.3	0.4	**7.4**	**19.2**	**8.3**	0.1	1.5	0.6	0.9	**1.7**	**2.6**
1 A 1 b	**Petroleum refining**	**12.7**	**1.4**		0.1	0.1	**16.6**	0.9	1.8	0.0	0.0	0.0	0.1	0.2	0.3
1 A 1 c	Manufacture of Solid fuels and Other Energy Industries	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1 A 2 mobile	**Other mobile in industry**	0.1	**5.0**	**1.2**	0.0	**1.8**	**5.6**	**8.0**	**14.3**	1.4	**11.7**	**2.5**	**2.8**	**5.3**	**8.2**
1 A 2 stat (l)	**Manuf. Ind. and Constr. stationary LIQUID**	**11.6**	**2.2**	0.1	0.1	0.6	**6.4**	**5.3**	**4.2**	0.0	0.0	0.1	0.0	0.0	0.0
1 A 2 stat (s)	**Manuf. Ind. and Constr. stationary SOLID**	**17.8**	**2.7**	0.2	0.0	**18.8**	0.2	**7.9**	0.3	0.1	0.0	0.1	0.0	0.0	0.0
1 A 2 stat (g)	**Manuf. Ind. and Constr. stationary GASEOUS**	0.4	**3.4**	0.0	0.2	0.5	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
1 A 2 stat (b)	**Manuf. Ind. and Constr. stationary BIOMASS**	**2.5**	**1.3**	0.1	0.2	0.3	**4.5**	**3.2**	**3.1**	0.4	0.0	0.4	0.0	0.0	0.0
1 A 2 stat (o)	**Manuf. Ind. and Constr. stationary OTHER**	**2.3**	0.7	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1 A 3 a	Civil Aviation	0.3	0.3	0.2	0.0	0.4	0.0	0.0	0.0				0.1	0.2	0.3
1 A 3 b 1	**R.T., Passenger cars**	0.3	**15.3**	**5.9**	**1.7**	**17.3**	0.3	0.1	0.1	**7.3**	1.0	0.2	**2.1**	**4.2**	**7.4**
1 A 3 b 2	**R.T., Light duty vehicles**	0.0	**2.4**	0.4	0.0	0.7	0.0	0.0	0.0	**1.8**	0.3	0.1	0.8	1.5	**2.6**
1 A 3 b 3	**R.T., Heavy duty vehicles**	0.3	**40.4**	**2.9**	0.1	**2.3**	0.2	0.1	0.0	**8.3**	**1.5**	0.3	**2.3**	**4.5**	**7.9**
1 A 3 b 4	**R.T., Mopeds & Motorcycles**	0.0	0.1	**1.1**	0.0	**1.5**	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0
1 A 3 b 5	**R.T., Gasoline evaporation**			**2.5**											
1 A 3 b 6	**R.T., Automobile tyre& break wear**						**7.1**						**12.3**	**8.2**	**9.3**
1 A 3 c	Railways	0.2	0.6	0.1	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0	1.8	1.3	0.8
1 A 3 d	Navigation	0.1	0.3	0.4	0.0	0.4	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.2
1 A 3 e	Other		0.7	0.0	0.0	0.0						0.0	0.0	0.0	0.0
1 A 4 mob	**Other Sectors – mobile**	0.2	**8.1**	**5.6**	0.0	**5.5**	0.0	0.0	0.0	**1.8**	**74.8**	0.1	**11.7**	**21.6**	**34.5**
1 A 4 stat (l)	**Other Sectors stationary LIQUID BIOMASS**	**17.4**	**2.0**	0.1	0.4	**0.9**	0.2	0.1	0.0	0.3	0.0	0.0	0.0	0.0	0.0

Level Assessment 2005		SO_2	NO_x	NMVOC	NH_3	CO	Cd	Hg	Pb	PAH	Diox	HCB	TSP	PM10	PM2.5
								[%]							
1 A 4 stat (s)	**Other Sectors stationary SOLID**	11.3	0.2	1.2	0.0	3.4	2.3	6.5	3.8	3.4	0.0	7.4	0.0	0.0	0.0
1 A 4 stat (g)	**Other Sectors stationary GASEOUS**	0.0	1.7	0.0	0.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1 A 4 stat (b)	**Other Sectors stationary BIOMASS**	3.2	3.7	21.5	0.6	40.1	27.9	15.1	15.4	69.3	0.1	79.4	0.0	0.0	0.0
1 A 4 stat (o)	Other Sectors stationary OTHER	0.3	0.0	0.0	0.0	0.0	0.4	0.1	0.3	0.2	0.0	0.4	0.0	0.0	0.0
1 A 5	Other	0.1	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2
1 B	**FUGITIVE EMISSIONS FROM FUELS**	0.5		2.0									0.7	0.6	0.3
2 A	**MINERAL PRODUCTS**					1.4							26.3	25.4	13.8
2 B	**CHEMICAL INDUSTRY**	2.9	0.3	0.9	0.1	1.5	0.1	0.0	0.0				0.5	0.6	0.5
2 C	**METAL PRODUCTION**	1.7	0.0	0.3		0.4	20.2	31.2	47.8	2.0	8.0	8.1	2.5	3.5	2.7
2 D	**OTHER PRODUCTION**		0.3	1.7		0.1				0.4	0.3	0.1	0.0	0.0	0.0
2 G	OTHER				0.0										
3	**SOLVENT AND OTHER PRODUCT USE**			49.2			0.0		0.2						
4 B 1	**Cattle**				57.3										
4 B 3	**Sheep**				1.3										
4 B 4	Goats				0.2										
4 B 6	Horses				1.1										
4 B 8	**Swine**				14.7										
4 B 9	**Poultry**				8.1										
4 B-13	Other				0.2										
4 D	**AGRICULTURAL SOILS**		2.3	1.1	11.5								30.1	12.7	5.2
4 F	**FIELD BURNING OF AGRICULTURAL RESIDUES**	0.0	0.0	0.1	0.1	0.2	0.2	0.0	0.1	2.3	0.4	0.1			
4 G	**Agriculture – Other**												4.7	7.9	3.0
6	**WASTE**	0.2	0.0	0.1	1.6	0.9	0.1	2.1	0.1	0.0	0.4	0.1	0.2	0.2	0.1

Keys sources are listed in bold, highlighted boxes show for which pollutants the category is key. The given percentage is the contribution of the category to national total emissions, blank fields indicate that no such emissions occur from this source.

Table 9: Quality of emission estimates

		SO_2	NO_x	NMVOC	NH_3	CO	Cd	Hg	Pb	PAH	Diox	HCB	TSP	PM10	PM2.5
1 A 1 a	**Public Electricity and Heat Production**	**A**	**A**	D	E	A	**C**	**C**	**C**	C	**C**	C	**B**	**C**	**C**
1 A 1 b	**Petroleum refining**	**A**	**A**		E	A	**C**	C	**C**	D	D	D	A	B	B
1 A 1 c	Manufacture of Solid fuels & Other Energy Ind.		B	D	E	D					D	D	B	B	B
1 A 2 mobile	**Other mobile in industry**	A	**B**	**B**	C	**B**	C	C	C	D	D	D	**B**	**B**	**B**
1 A 2 stat (l)	**Manuf. Ind. and Constr. stationary LIQUID**	**A**	**B**	D	E	C	**C**	**B**	**C**	C	E	D	C	C	**C**
1 A 3 a	Civil Aviation	A	B	B	C	B	B	B	B				B	B	B
1 A 3 b 1	**R.T., Passenger cars**	A	**B**	**B**	**C**	**B**	B	B	C	**C**	**D**	D	**B**	**B**	**B**
1 A 3 b 2	**R.T., Light duty vehicles**	A	**B**	B	C	B	B	B	C	**C**	D	D	B	**B**	**B**
1 A 3 b 3	**R.T., Heavy duty vehicles**	**A**	**B**	**B**	C	**B**	B	B	C	**C**	**D**	D	**B**	**B**	**B**
1 A 3 b 4	**R.T., Mopeds & Motorcycles**		B	B	C	**B**	B	B	C	D	D	D			
1 A 3 b 5	**R.T., Gasoline evaporation**			**B**											
1 A 3 b 6	**R.T., Automobile tyre and break wear**						**C**	C	C				**C**	**C**	**C**
1 A 3 c	**Railways**	A	B	B	C	B	B	B	C	D	D	D	**B**	**B**	B
1 A 3 d	Navigation	A	B	B	C	B	B	B	C	D	D	D	B	B	B
1 A 3 e	Other		A	D	E	C						D	C	C	C
1 A 4 mob	**Other Sectors – mobile**	A	**B**	**B**	C	**B**	C	C	C	**D**	D	D	**B**	**B**	**B**
1 A 4 stat (b)	**Other Sectors stationary BIOMASS**	**A**	**B**	**C**	E	**C**	**C**	**C**	**D**	**D**	**E**	**D**	**C**	**C**	**C**
1 A 5	Other	B	C	C	D	C	C	C	C	D	D	D	C	C	C

		SO_2	NO_x	NMVOC	NH_3	CO	Cd	Hg	Pb	PAH	Diox	HCB	TSP	PM10	PM2.5
1 B	**FUGITIVE EMISSIONS FROM FUELS**	A		**A**									D	D	D
2 A	**MINERAL PRODUCTS**					**C**							**D**	**D**	**D**
2 B	**CHEMICAL INDUSTRY**	**B**	B	**D**	A	**D**	A	A	B				A	A	A
2 C	**METAL PRODUCTION**	**C**	B	C		B	**B**	**B**	**C**	**C**	**C**	**C**	**B**	**B**	**B**
2 D	**OTHER PRODUCTION**		B	**B**		B				E	E	E	D	D	D
2 G	OTHER				E										
3	**SOLVENT AND OTHER PRODUCT USE**			**A**			B		B						
4 B 1	**Cattle**				**B**										
4 B 3	**Sheep**				**B**										
4 B 4	Goats				B										
4 B 6	Horses				B										
4 B 8	**Swine**				**B**										
4 B 9	**Poultry**				**B**										
4 B-13	Other				B										
4 D	**AGRICULTURAL SOILS**		**B**	E	**B**								**D**	**D**	**D**
4 F	**FIELD BURNING OF AGRIC. RESIDUES**	E	E	E	E	E	E	E	E	**E**	E	E			
4 G	**Agriculture - Other**												**D**	**D**	**D**
6	**WASTE**	D	D	C	C	**C**	B	B	B	D	D	B	D	D	D

Abbreviations: see Table 6;
[dark shaded cells indicate that no such emissions arise from this source, light shaded cells (green) indicate that source is a key source for this pollutant]

1.7 Completeness

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

Geographic Coverage

The geographic coverage is complete. There is no territory in Austria not covered by the inventory.

However, if fuel prices vary considerably in neighbouring countries, fuel sold within the territory of a Party is used outside its territory (so-called 'fuel tourism'). Austria has experienced a considerable amount of 'fuel tourism' in the last few years.

In the 2002 UNECE Emission Reporting Guidelines, Parties are given the choice of whether to report emissions on the basis of fuel used or fuel sold to the final consumer but should clearly state the basis of their calculations in their submissions.

In reports to the UNECE/LRTAP, emissions from mobile sources are reported on the basis of fuel sold. Emissions from 'fuel tourism' are therefore included in the Austrian Total.[52]

Gases, Reporting Years

In accordance with the Austrian obligation, all relevant pollutants mentioned in Table 2 (minimum reporting programme) are covered by the Austrian inventory and are reported for the years 1980–2005 for the main pollutants, from 1985 onwards for POPs and HMs and for the years 1990, 1995 and from 2000 onwards for PM.

Sources

Notation keys are used according to the Guidelines for Estimating and Reporting Emission Data under LRTAP (UNECE 2003 – see Table 10)[53] to indicate where emissions are not occurring in Austria, where emissions have not been estimated or have been included elsewhere as suggested by EMEP/CORINAIR. The main reason for different allocations to categories are the allocation in national statistics, insufficient information on the national statistics, national methods, and the impossibility to disaggregate emission declarations; explanations for each the case is given in the NFR-Table IV 1 F1-F4.

---

[52] For more information, see UMWELTBUNDESAMT (2007): Austria's National Air Emission Inventory 1990–2005: Submission under Directive 2001/81/EC on national emission ceilings for certain atmospheric pollutants. Vienna.
http://www.umweltbundesamt.at/fileadmin/site/publikationen/REP0058.pdf

[53] AIR POLLUTION STUDIES No. 15

Table 10: Notation keys used in the NFR

Abbreviation	Meaning	Objective
NO	not occurring	for emissions by sources of compounds that do not occur for a particular compound or source category within a country;
NA	not applicable	is used for activities in a given source category which are believed not to result in significant emissions of a specific compound;
NE	not estimated	for existing emissions by sources of compounds that have not been estimated. Where "NE" is used in an inventory the Party should indicate why emissions could not be estimated.
IE	included elsewhere	for emissions by sources of compounds that are estimated but included elsewhere in the inventory instead of in the expected source category. Where "IE" is used in an inventory, the Party should indicate where in the inventory the emissions from the displaced source category have been included and the Party should give the reasons for this inclusion deviating from the expected category;
C	confidential	for emissions by sources of compounds which could lead to the disclosure of confidential information. Where "C" is used in an inventory, reference should be made to the Protocol provision that authorizes such practice.
NR	not relevant	According to Para. 9 in the Emission Guidelines, Emission inventory reporting should cover all years from 1980 onwards, if data are available. However, "NR" (Not Relevant) is introduced to ease the reporting where emissions are not strictly required by the different Protocols. E.g. for some Parties emissions of NMVOC prior to 1988.

2 TREND IN TOTAL EMISSIONS

2.1 Emission Targets

Stabilisation or reduction targets for SO_2, NO_x, NMVOC, NH_3, heavy metals and POPs respectively, have been set out in the different protocols of UNECE/LRTAP Convention mentioned in Chapter 1.1.3 and listed in Table 1. Information on these targets as well as on the status of Austria fulfilling these targets is provided below.

2.1.1 The 1985 Helsinki Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes

The Protocol to the UNECE/LRTAP Convention on the Reduction of Sulphur Emissions or their Transboundary Fluxes by at least 30 per cent entered into force in 1987. The base year to the protocol was 1980 and the reduction target should have been met by 1993.

Twenty-two ECE countries are Parties to this Protocol; all Parties have reached the reduction target. Taken as a whole, the 22 Parties to the 1985 Sulphur Protocol reduced 1980 sulphur emissions by more than 50 % by 1993 (using the latest available figure, where no data were available for 1993).

In Austria, SO_2 emissions in the base year 1980 amounted to 344 Gg, by the year 1993 emissions were reduced to 53 Gg corresponding to a reduction of 84 %. In 2005, SO_2 emissions in Austria amounted to 26 Gg, which is a decrease by 92 % compared to 1980. This reduction could be archieved mainly due to lower emissions from residential heating, combustion in industries and energy industries.

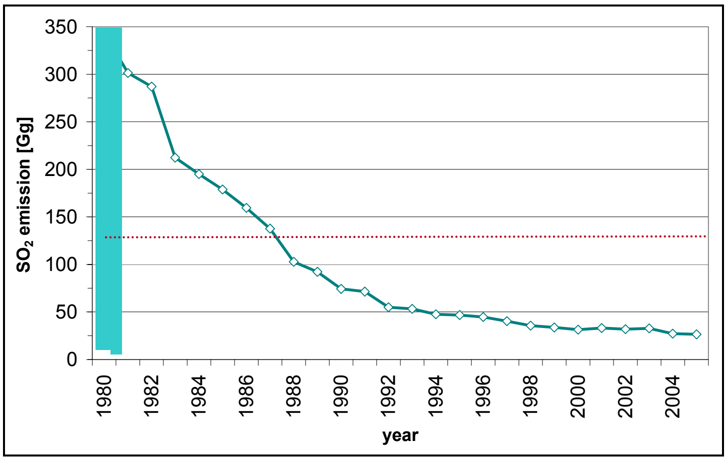

Figure 4: SO_2 emissions in Austria 1980–2005

2.1.2 The 1988 Sofia Protocol concerning the Control of Emissions of Nitrogen Oxides or their Transboundary Fluxes

This Protocol requires freezing emissions of nitrogen oxides or their transboundary fluxes. The general reference year is 1987 (with the exception of the United States that chose to relate its emission target to 1978).

Taking the sum of emissions of Parties to the NO_x Protocol in 1994 (or a previous year, where no recent data are available) also a reduction of 9% compared to 1987 can be noted. Nineteen of the 25 Parties to the 1988 NO_x Protocol have reached the target and stabilized emissions at 1987 (or in the case of the United States 1978) levels or reduced emissions below that level according to the latest emission data reported.

Austria was successful in fulfilling the stabilisation target set out in the Protocol: NO_x emissions decreased steadily from the base year 1987 until the mid-1990s and remained quite stable with only minor fluctuations until 2000. However, since then emissions have been increasing again, in 2003 emissions even slightly exceeded 1987 levels. The main reason for the increase of NO_x emissions are strongly increasing emissions from heavy duty vehicles, which is mainly caused by 'fuel tourism'.

Austrian NO_x emissions in the base year under this Protocol amounted to 226 Gg, by the year 1995 emissions were reduced to 192 Gg corresponding to a reduction of 15 %. In 2005, NO_x emissions in Austria amounted to 225 Gg, which is a decrease by 0.4 % compared to 1987.[54]

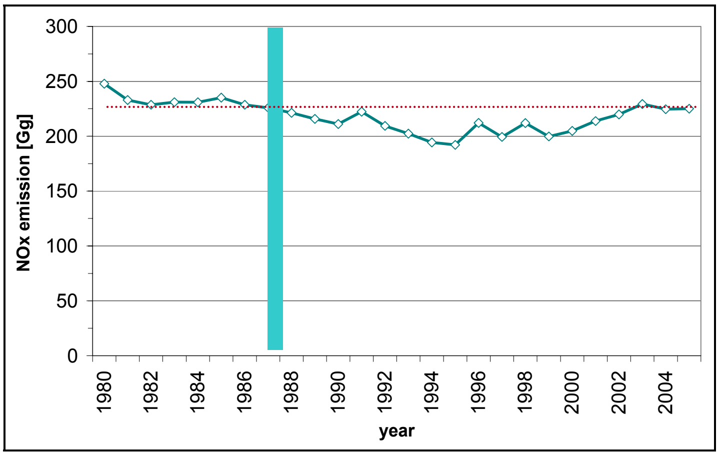

Figure 5: NO_x emissions in Austria 1980–2005

2.1.3 The 1991 Geneva Protocol concerning the Control of Emissions of Volatile Organic Compounds or their Transboundary Fluxes

In November 1991, the Protocol to the Convention on Long-range Transboundary Air Pollution on the Control of Emissions of Volatile Organic Compounds (other than methane – NMVOC) or their Transboundary Fluxes, the second major air pollutant responsible for the formation of ground level ozone, was adopted. The protocol entered into force on 29th of September 1997.

This Protocol specifies three options for emission reduction targets that have to be chosen upon signature or upon ratification. Austria opted for a reduction of its emissions of non-methane volatile organic compounds (NMVOC) by 30 % by 1999 using the year 1988 as a basis.

Austria met the reduction target: in the base year NMVOC emissions amounted to 372 Gg, in 1999 emissions were reduced by 54 % to 171 Gg. From 1999 to 2005 a further reduction of 10 % (154 Gg) can be noted.

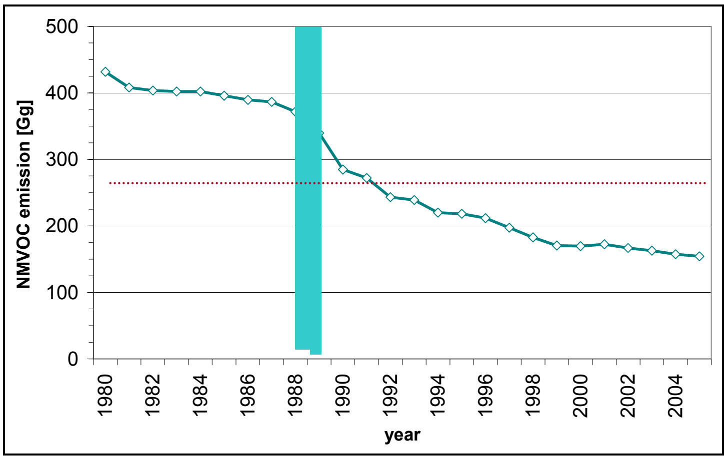

Figure 6: NMVOC emissions in Austria 1980–2005

[54] Please note that emissions from mobile sources are calculated based on fuel sold, which for the last few years is considerably higher than fuel used: emissions for 2005 based on fuel used amount to 159 Gg, which is about 29% less (see Chapter 1.7 Completeness for more information regarding 'fuel tourism', Austria's emissions based on fuel used – thus excluding 'fuel tourism' - are presented in Table 1 in the Annex).

2.1.4 The 1998 Aarhus Protocol on Heavy Metals

The Executive Body adopted the Protocol on Heavy Metals on 24th June 1998 in Aarhus (Denmark). It targets three particularly harmful metals: cadmium, lead and mercury. According to one of the basic obligations, Parties will have to reduce their emissions for these three metals below their levels in 1990 or an alternative year between 1985 and 1995. The Protocol entered into force on 29th December 2003.

The Protocol aims to cut emissions from industrial sources (iron and steel industry, non-ferrous metal industry), combustion processes (power generation, *road transport*), and waste incineration. It lays down stringent limit values for emissions from stationary sources and suggests best available techniques (BAT) for these sources, such as special filters or scrubbers for combustion sources or mercury-free processes. The Protocol requires Parties to phase out leaded petrol. It also introduces measures to lower heavy metal emissions from other products, such as mercury in batteries, and proposes the introduction of management measures for other mercury-containing products, such as electrical components (thermostats, switches), measuring devices (thermometers, manometers, barometers), fluorescent lamps, dental amalgam, pesticides and paint.

Austria has chosen 1985 as a base year and current emissions are well below the level of the base year (see Chapter 2.4).

2.1.5 The 1998 Aarhus Protocol on Persistent Organic Pollutants (POPs):

The Executive Body adopted the Protocol on Persistent Organic Pollutants on 24th June 1998 in Aarhus (Denmark). It entered into force on 23rd October 2003. It focuses on a list of 16 substances that have been singled out according to agreed risk criteria. The substances comprise eleven pesticides, two industrial chemicals and three by-products/contaminants. The ultimate objective is to eliminate any discharges, emissions and losses of POPs. The Protocol bans outright the production and use of some products (aldrin, chlordane, chlordecone, dieldrin, endrin, hexabromobiphenyl, mirex and toxaphene). Others are scheduled for elimination at a later stage (DDT, heptachlor, hexaclorobenzene, PCBs). Finally, the Protocol severely restricts the use of DDT, HCH (including lindane) and PCBs. The Protocol includes provisions for dealing with the wastes of products that will be banned.

The Protocol obliges Parties to reduce their emissions of dioxins, furans, PAHs and HCB below their levels in 1990 or an alternative year between 1985 and 1995. It determines specific upper limits for the incineration of municipal, hazardous and medical waste.

Austria has chosen 1985 as a base year and current emissions are well below the level of the base year (see Chapter 2.5).

2.1.6 The 1999 Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-level Ozone "Multi-Effect Protocol"

The Executive Body adopted the Protocol to Abate Acidification, Eutrophication and Ground-level Ozone in Gothenburg (Sweden) on 30th November 1999.

The Protocol sets emission ceilings for 2010 for four pollutants: sulphur, NO_x, NMVOC and ammonia. These ceilings were negotiated on the basis of scientific assessments of pollution effects and abatement options. Parties where emissions have a more severe environmental or health impact and where emissions are relatively cheap to reduce will have to make the biggest cuts. Once the Protocol is fully implemented, Europe's sulphur emissions should be cut by at least

63 %, its NO_x emissions by 41 %, its NMVOC emissions by 40 % and its ammonia emissions by 17 % compared to 1990.

The Protocol also sets tight limit values for specific emission sources and requires best available techniques to be used to keep emissions down. NMVOC emissions from such products as paints or aerosols will also have to be cut. Finally, farmers will have to take specific measures to control ammonia emissions. Guidance documents adopted together with the Protocol provide a wide range of abatement techniques and economic instruments for the reduction of emissions in the relevant sectors, including transport.

Information on emission trends of pollutants covered by this protocol is given in Chapter 2.2.

2.2 Emission Trends for Air Pollutants covered by the Multi- Effect Protocol as well as CO

Table 11 and Figure 7 show national total emissions and trends (1990–2005) as well as emission targets[55] for air pollutants covered by the Multi- Effect Protocol.

Please note that emissions from mobile sources are calculated based on fuel sold in Austria, thus national total emissions include 'fuel tourism'.[56]

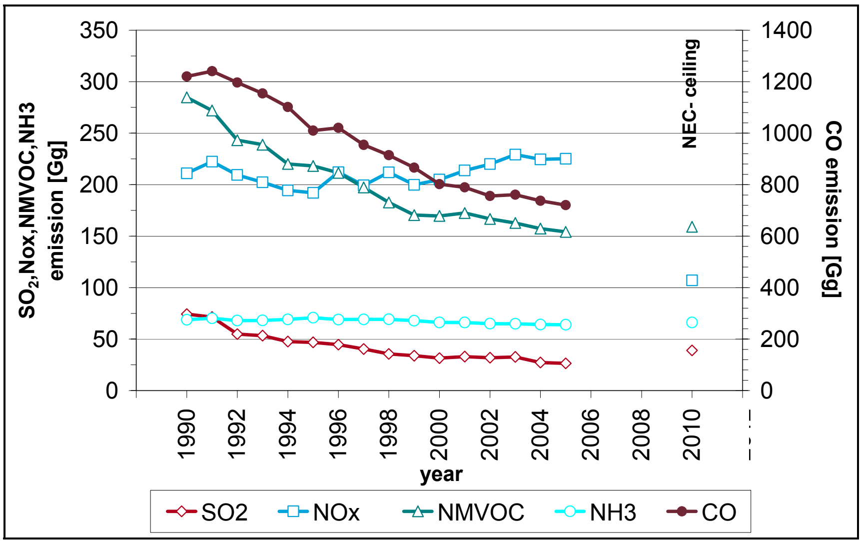

Figure 7: Emission trends and reduction targets for air pollutants covered under the Multi-Effect Protocol and CO

Table 11: National total emissions and trends 1990–2005 as well as emission targets for air pollutants covered by the Multi-Effect Protocol and CO

Year	Emission [Gg]				
	SO_2	NO_x	NMVOC	NH_3	CO
1990	74.22	211.07	284.74	68.81	1 220.77
1991	71.35	222.34	271.99	70.19	1 241.05
1992	54.91	209.44	243.21	67.91	1 196.97
1993	53.32	202.33	238.79	68.06	1 154.12
1994	47.56	194.36	220.02	69.10	1 101.71
1995	46.81	192.07	218.19	70.68	1 010.05
1996	44.66	212.10	211.50	68.94	1 021.13
1997	40.35	199.32	197.37	69.10	954.60
1998	35.56	211.98	182.71	69.20	914.85
1999	33.74	199.83	170.47	67.90	865.91
2000	31.41	204.82	169.58	66.24	802.29
2001	33.02	213.78	172.40	66.09	789.35

[55] For NO_x the National Emission Ceilings Directive (NEC Directive) of the European Union, who also signed the Multi-Effect Protocol, sets a tighter emission target for Austria than the CLRTAP Protocol (103 Gg vs. 107 Gg).

[56] see Chapter 1.7 Completeness for more information regarding 'fuel tourism'; Austria's emissions based on fuel used – thus excluding 'fuel tourism' – are presented in the Annex.

Year	Emission [Gg]				
	SO_2	NO_x	NMVOC	NH_3	CO
2002	31.92	219.90	166.68	64.95	755.85
2003	32.63	229.28	162.71	64.90	760.81
2004	27.26	224.63	157.34	64.16	737.35
2005	26.41	225.06	154.14	63.94	720.31
Trend 1990–2005	***-64 %***	***7 %***	***-46 %***	***-7 %***	***-41 %***
Absolute Emission Target 2010	**39.00**	**107.00**	**159.00**	**66.00**	-

2.2.1 SO_2 Emissions

In 1990, national total SO_2 emissions amounted to 74 Gg; emissions have decreased steadily since then and by the year 2005 emissions were reduced by 64 % mainly due to lower emissions from residential heating, combustion in industries and energy industries.

As shown in Table 12, the main source for SO_2 emissions in Austria with a share of 94 % in 1990 and 95 % in 2005 is Category *1 A Fuel Combustion Activities*. Within this source residential heating has the highest contribution to total SO_2 emissions. SO_2 emissions have decreased steadily mainly due to lower emissions from residential heating, combustion in industries and energy industries, mainly caused by a swich from high sulfur fuels (like coal and heavy oil) to fuels with lower sulfur content, and the implementation of desulfurizsation units. The peak of SO_2 emissions in 2004 in Sector *Agriculture* (< 0.01% to national total) is due to a larger area of stubble fields burnt that year.

The 2010 national emission ceiling for SO_2 emissions in Austria as set out in Annex II of the Multi-Effects Protocol is 39 Gg (see Table 11). In 2005 Austrian total SO_2 emissions (26 Gg) were well below the ceiling.

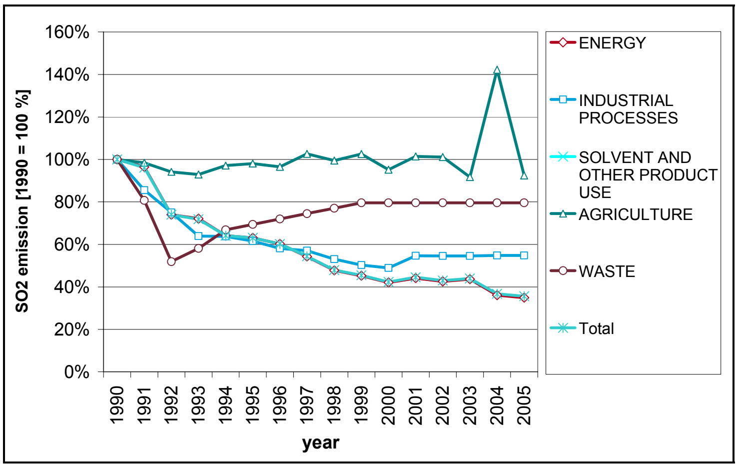

Figure 8: SO_2 emission trend per NFR Category 1990–2005

Table 12: SO_2 emissions per NFR Category 1990 and 2005, their trend 1990–2005 and their share in total emissions

NRF Category		SO_2 Emissions [Gg]		Trend	Share in National Total	
		1990	2005	1990–2005	1990	2005
1	Energy	71.92	25.13	-65 %	97 %	95 %
1 A	*Fuel Combustion Activities*	*69.92*	*25.00*	*-64 %*	*94 %*	*95 %*
1 B	*Fugitive Emissions from Fuels*	*2.00*	*0.13*	*-93 %*	*3 %*	*1 %*
2	Industrial Processes	2.22	1.22	-45 %	3 %	5 %

NRF Category		SO_2 Emissions [Gg]		Trend	Share in National Total	
		1990	2005	1990–2005	1990	2005
3	Solvent and Other Product Use	NA	NA			
4	Agriculture	< 0.01	< 0.01	-8 %	*< 1 %*	*< 1 %*
6	Waste	0.07	0.06	-20 %	*< 1 %*	*< 1 %*
	National Total	**74.22**	**26.41**	**-64%**	**100%**	**100%**

2.2.2 NO_x Emissions

In 1990, national total NO_x emissions amounted to 212 Gg; emissions were slightly decreasing until the mid-1990 but have been increasing again in the last years: in 2005, they were about 7 % above the level of 1990.

As can be seen in Table 13, the main source for NO_x emissions in Austria with a share of 95 % in 1990 and 97 % in 2005 is *Fuel Combustion Activities.* Within this source *road transport*, with about 60 % of national total emissions, has the highest contribution to total NO_x emissions.

The 2010 national emission ceiling for NO_x emissions in Austria as set out in Annex II of the Multi-Effects Protocol is 107 Gg (in the European National Emissions Ceiling Directive the national emission ceiling is 103 Gg – see Table 11 and Figure 7). With 225 Gg NO_x emissions in 2005 emissions in Austria are at the moment well above this ceiling.

Please note that emissions from mobile sources are calculated based on fuel sold in Austria, which for the last few years is considerably higher than fuel used: emissions for 2005 based on fuel used amount to 159 Gg, which is about 29 % less, but still well above the NEC ceilling.[57]

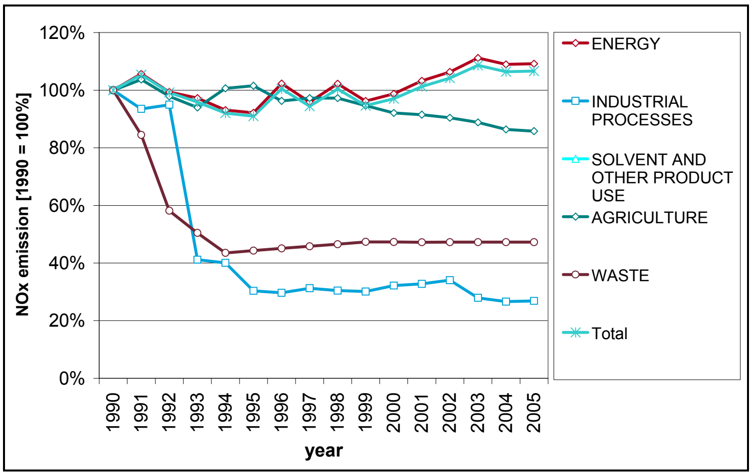

Figure 9: NO_x emission trend per NFR Category 1990–2005

Table 13: NO_x emissions per NFR Category 1990 and 2005, their trend 1990–2005 and their share in total emissions

NRF Category		NO_x Emissions [Gg]		Trend	Share in National Total	
		1990	2005	1990–2005	1990	2005
1	Energy	200.09	218.50	9 %	95 %	97 %
1 A	*Fuel Combustion Activities*	*200.09*	*218.50*	*9 %*	*95 %*	*97 %*
1 B	*Fugitive Emissions from Fuels*	*IE*	*IE*			
2	Industrial Processes	4.80	1.29	-73 %	2 %	1 %
3	Solvent and Other Product Use	NA	NA			

[57] see Chapter 1.7 Completeness for more information regarding 'fuel tourism'; Austria's emissions based on fuel used – thus excluding 'fuel tourism' - are presented in Table 1 in the Annex.

4	Agriculture	6.09	5.22	-14 %	3 %	2 %
6	Waste	0.10	0.05	-53 %	0 %	0 %
0	**National Total**	211.07	225.06	7 %	100 %	100 %

2.2.3 NMVOC Emissions

In 1990 national total NMVOC emissions amounted to 285 Gg; emissions have decreased steadily since then and by the year 2005 emissions were reduced by 46 %.

As can be seen in Table 14, the main sources of NMVOC emissions in Austria are *Fuel Combustion Activities* with a share of 50 % in 1990 and 45 % in 2005, and *Solvent and Other Product Use* with a contribution to the national total of 41 % in 1990 and 49 % in 2005 respectively.

NMVOC emissions decreased considerably in both main sectors: the reduction in the energy sector is due to decreasing emissions from road transport due to low emission combustion and also from residential heating, which is due to the replacement of ineffective heating systems.

The reduction in Sector Solvents is due to legal abatement measures such exhaust systems and after-treatment.

The national emission ceiling 2010 for NMVOC emissions in Austria as set out in Annex II of the Multi-Effects Protocol is 159 Gg (see Table 11). In 2005 Austria's NMVOC emissions amounted to 154 Gg, and thus were already 3 % below this target.

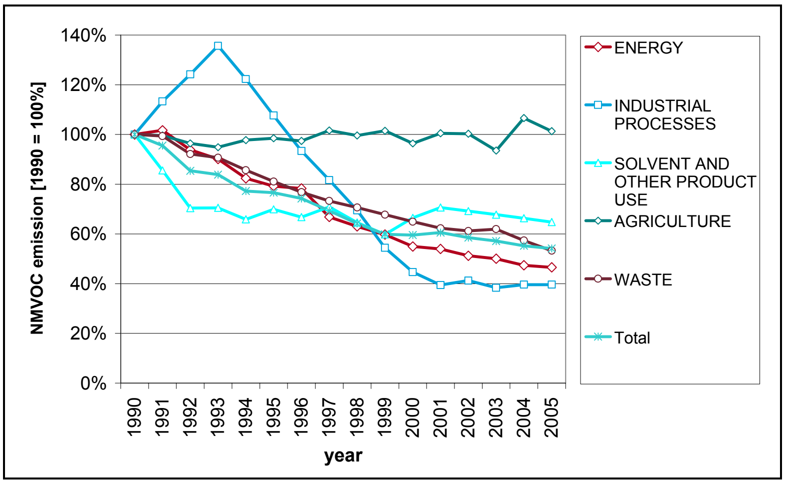

Figure 10: NMVOC emission trend per NFR Category 1990–2005

Table 14: NMVOC emissions per NFR Category 1990 and 2005, their trend 1990–2005 and their share in total emissions

NRF Category		NMVOC Emissions [Gg]		Trend	Share in National Total	
		1990	**2005**	**1990–2005**	**1990**	**2005**
1	Energy	154.68	72.01	-53 %	54 %	47 %
1 A	Fuel Combustion Activities	*142.47*	*68.92*	*-52 %*	*50 %*	*45 %*
1 B	Fugitive Emissions from Fuels	*12.22*	*3.09*	*-75 %*	*4 %*	*2 %*
2	Industrial Processes	11.10	4.40	-60 %	4 %	3 %
3	Solvent and Other Product Use	116.95	75.77	-35 %	41 %	49 %
4	Agriculture	1.85	1.87	1 %	1 %	1 %
6	Waste	0.16	0.09	-47 %	0 %	0 %
0	**National Total**	**284.74**	**154.14**	**-46 %**	**100 %**	**100 %**

2.2.4 NH_3 Emissions

In 1990, national total NH_3 emissions amounted to 69 Gg; emissions have slightly decreased over the period from 1990 to 2005, in 2005 emissions were 7 % below 1990 levels.

As can be seen in Table 15, NH_3 emissions in Austria are almost exclusively emitted by the agricultural sector. The share in national total NH_3 emissions is about 94 % for 2005. Within this source manure management – cattle has the highest contribution to total NH_3 emissions: the share in national total emissions of manure management of cattle was 88 % in 2005.

The national emission ceiling 2010 for NH_3 emissions in Austria as set out in Annex II of the Multi- Effects Protocol is 66 Gg (see Table 11). In 2005 Austrian total NH_3 emissions (64 Gg) were already below this ceiling.

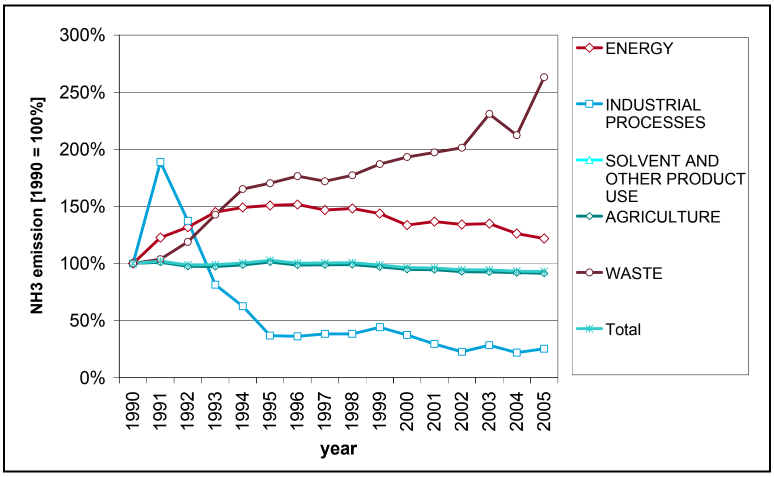

Figure 11: NH_3 emission trend per NFR Category 1990–2005

Table 15: NH_3 emissions per NFR Category 1990 and 2005, their trend 1990–2005 and their share in total emissions

NRF Category		NH_3 Emissions [Gg]		Trend	Share in National Total	
		1990	2005	1990–2005	1990	2005
1	Energy	2.04	2.49	22 %	3 %	4 %
1 A	*Fuel Combustion Activities*	*2.04*	*2.49*	*22 %*	*3 %*	*4 %*
1 B	*Fugitive Emissions from Fuels*	*IE*	*IE*			
2	Industrial Processes	0.27	0.07	-75 %	0 %	0 %
3	Solvent and Other Product Use	NA	NA			
4	Agriculture	66.12	60.39	-9 %	96 %	94 %
6	Waste	0.38	0.99	163 %	1 %	2 %
0	**National Total**	**68.81**	**63.94**	**-7 %**	**100 %**	**100 %**

2.2.5 Carbon monoxide (CO) Emissions

CO is a colourless and odourless gas, formed when carbon in fuel is not burned completely. It is a component of motor vehicle exhaust, other sources of CO emissions include industrial processes, non-transportation fuel combustion, and natural sources such as wildfires. Peak CO concentrations typically occur during the colder months of the year when CO automotive emissions are greater and night-time inversion conditions are more frequent.

In 1990 national total CO emissions amounted to 1 221 Gg; emissions have considerably decreased over the period from 1990 to 2005, in 2005 emissions were 41 % below 1990 levels.

As can be seen in Table 16, CO emissions in Austria are almost exclusively emitted by the energy sector, and more specifically, fuel combustion activities. The share in national total CO emissions is about 96 % for 2005. Emissions decreased mainly due to decreasing emissions from road transport and residential heating, which is due to the swich to improved technologies. The peak of CO emissions in 2004 of Sector *Agriculture* (contribution < 0.1% to national total) is due to a larger area of stubble fields burnt that year.

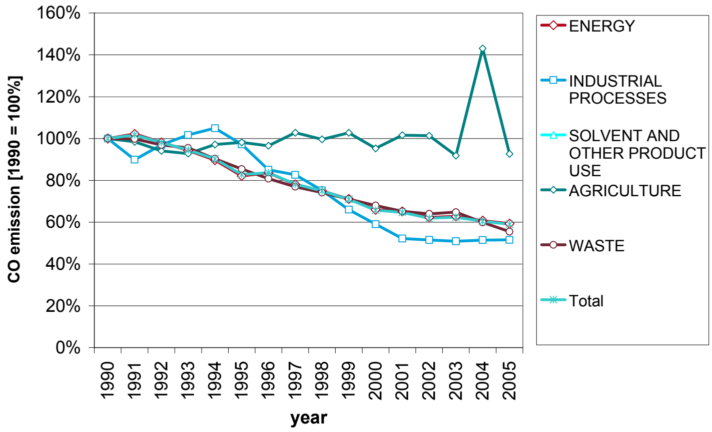

Figure 12: CO emission trend per NFR Category 1990–2005

Table 16: CO emissions per NFR Category 1990 and 2005, their trend 1990–2005 and their share in total emissions

NRF Category		**CO Emissions [Gg]**		**Trend**	**Share in National Total**	
		1990	**2005**	**1990–2005**	**1990**	**2005**
1	Energy	1161.83	688.99	-41 %	95 %	96 %
1 A	*Fuel Combustion Activities*	*1161.83*	*688.99*	*-41 %*	*95 %*	*96 %*
1 B	*Fugitive Emissions from Fuels*	*IE*	*IE*			
2	Industrial Processes	46.37	23.89	-48 %	4 %	3 %
3	Solvent and Other Product Use	NA	NA			
4	Agriculture	1.20	1.12	-7 %	< 0.1 %	< 0.1 %
6	Waste	11.37	6.31	-45 %	1 %	1 %
0	**National Total**	**1220.77**	**720.31**	**-41 %**	**100 %**	**100 %**

2.3 Emission Trends for Particulate matter (PM)

Dust is a complex mixture consisting of both directly emitted and secondarily formed components of both natural and anthropogenic origin (e.g. dust, geological material, abraded particles and biological material) and has a rather inhomogeneous composition of sulphate, nitrate, ammonium, organic carbon, heavy metals, PAH and dioxins/furans. PM is either formed during industrial production and combustion processes as well as during mechanical processes like abrasion of surface materials and generation of fugitive dust or by secondary formation from SO_2, NO_x, NMVOC or NH_3.

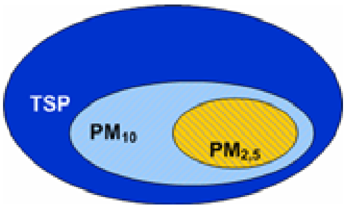

Figure 13: Distribution of TSP, PM10 and PM2,5 (schematic)

PM does not only have effects on the chemical composition and reactivity of the atmosphere but also affects human and animal health and welfare. When breathed in, a particle-loaded atmosphere impacts on the respiratory tract. The observable effects are dependent on the particle size, that's why for legislative issues particulate matter (PM) is classified according to its size (see Figure 13).

Fine particles often have a seasonal pattern: Whereas PM2.5 values are typically higher in the season when sulfates are more readily formed from SO_2 emissions from power plants, fine particle concentrations tend to be higher in the fourth calendar quarter because fine particle nitrates are more readily formed in cooler weather, and wood stove and fireplace use produces more carbon.

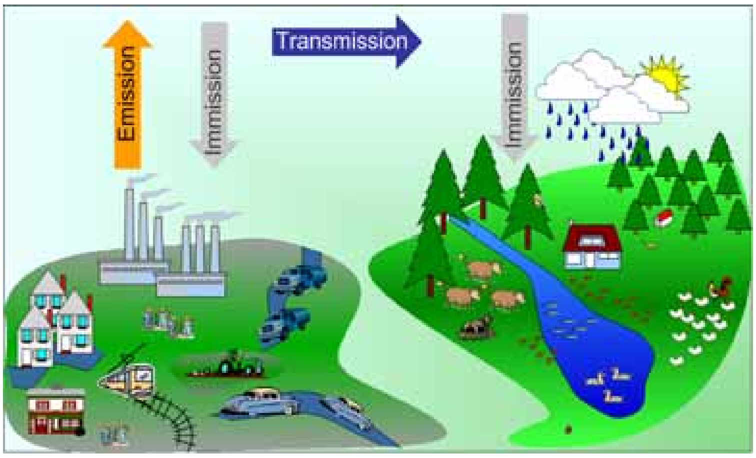

Figure 14: Interrelation of emission, transmission and immission

Particulate matter (PM) emissions remained quite stable from the period from 1990 to 2005: TSP emission were on the same level as 1990, PM10 and PM2.5 emissions decreased slightly (by 4 % and 9 % respectively) over the period 1990 to 2005. Emission trends for particulate matter from 1985 to 2005 are presented in Figure 15 and Table 17 presents emissions of particulate matter relative to 1990. Apart from industry and traffic, private households and the agricultural sector are considerable contributor to emissions of PM. The explanation for these trends is given in the following chapters.

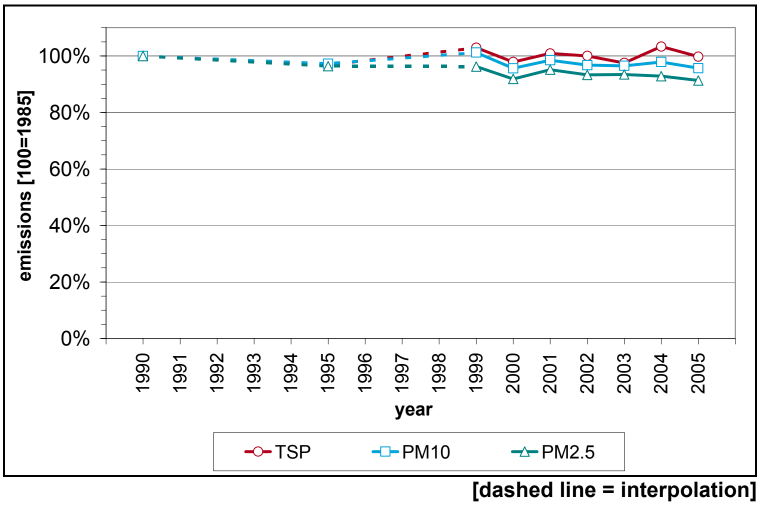

Figure 15: National total emissions for PM 1990–2005

Table 17: National total emissions and emission trends for particulate matter (PM) 1990–2005

Year	Emissions [Mg]		
	TSP	**PM10**	**PM2.5**
1990	91 572	47 592	28 606
1995	88 636	46 292	27 566
1999	94 255	48 164	27 532
2000	89 616	45 520	26 277
2001	92 398	46 868	27 218
2002	91 611	46 064	26 685
2003	89 303	45 925	26 733
2004	94 619	46 581	26 562
2005	91 336	45 533	26 119
Trend 1990–2005	***-0.3 %***	***-4.3 %***	***-8.7 %***

2.3.1 Total suspended particulate matter (TSP) Emissions

Total suspended particulate matter (TSP) refers to the entire range of ambient air matter that can be collected, from the sub-micron level up to 100 µm in aerodynamic diameter (d_{ae}). Particles with a d_{ae} larger than 100 µm will not remain in air for a significant length of time. TSP remains in the air for relatively short periods of time and are therefore generally not carried long distances. As a result TSP tend to be a local rather than a regional problem, occurring close to industrial sources, such as metal processing plants and mining operations, along roads because of the re-suspension, and close to stables and agricultural crop land.

TSP emissions and emission trends in Austria

National total TSP emissions amounted to 91.6 Gg in 2005, which is about the same value as in 1990 (emissions in 1990 amounted to 91.3 Gg – see Table 18).

As shown in Table 18 the main sources for TSP emissions in Austria with a share of 35 % each were combustion processes in the energy sector (mainly small combustion plants, oven or stoves fired with wood or coke in households and re-suspended dust from roads.), and agricultural activities (livestock husbandry and cultivation). The decrease in agricultural production (soil cultivation, harvesting,…) is responsible for the decrease in TSP emissions. The industrial processes sector had a contribution of 29 % to the national total emission in 2005.

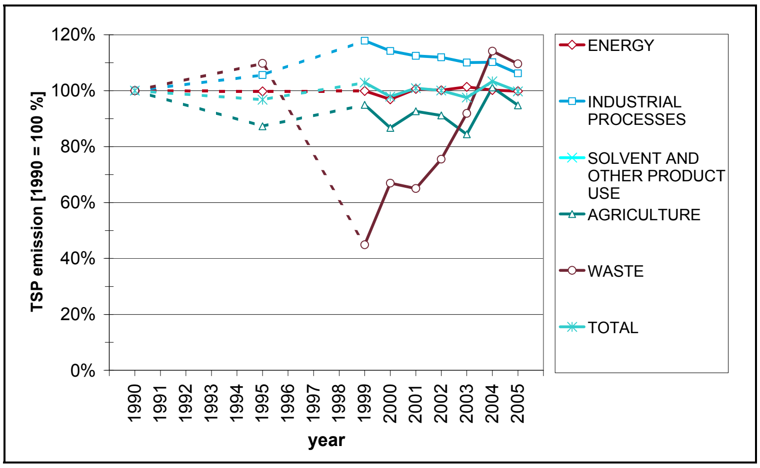

Figure 16: TSP emission trend per NFR Category 1990–2005

The increasing emissions from industry are due to intensive activities in mineral production and the construction branch. In the energy sector neither an overall reducing nor an increasing trend could be noted. The emissions within the energy sector are very inhomogeneous: the decrease of TSP emission in especially the manufacturing industries and construction branch, is completely compensated by enormously increasing TSP emission from transportation activities. The increase of the TSP emission in the waste sector resulted from restoring of landfill sites and the reuse of these abandoned hazardous sites as landfills (see Figure 16).

Table 18: TSP emissions per NFR Category 1990 and 2005, their trend 1990–2005 and their share in total emissions

NRF Category		TSP Emissions [Mg]		Trend	Share i. National Total	
		1990	2005	1990–2005	1990	2005
1	Energy	32 631.46	32 576.05	<1%	36%	36%
1 A	*Fuel Combustion Activities*	*31 984.43*	*31 962.22*	*<1%*	*35%*	*35%*
1 B	*Fugitive Emissions f. Fuels*	*647.03*	*613.83*	*-5%*	*1%*	*1%*
2	Industrial Processes	25 170.41	26 734.31	6%	27%	29%
3	Solvent a. Other Product Use	NA	NA			
4	Agriculture	33 602.55	31 841.48	-5%	37%	35%
6	Waste	167.89	184.04	10%	<1%	<1%
	National Total	**91 572.31**	**91 335.88**	**<1%**	**100%**	**100%**

2.3.2 PM10 Emissions

PM10 is the fraction of suspended particulate matter in the air with d_{ae} less than or equal to a 10 µm, which are collected with 50 % efficiency by a PM10 sampling device. These particles are small enough to be breathable and could be deposited in lungs, which may cause deteriorated lung functions.

PM10 emissions and emission trends in Austria

National total PM10 emissions amounted to 47.6 Gg in 1990 and decreased by about 4 % until 2005 (emissions in 2005 amounted to 45.5 Gg – see Table 19).

As shown in Table 19 the main source for PM10 emissions in Austria are combustion processes in the energy sector with a share of 50 % in national total emissions in 2005. These emissions are mainly due to transport activities including mechanical abrasion from road surfaces, and re-suspended dust from roads, and on the other hand activities in the energy processing in small combustion plants and households (oven, stove etc.). The industrial processes sector had a

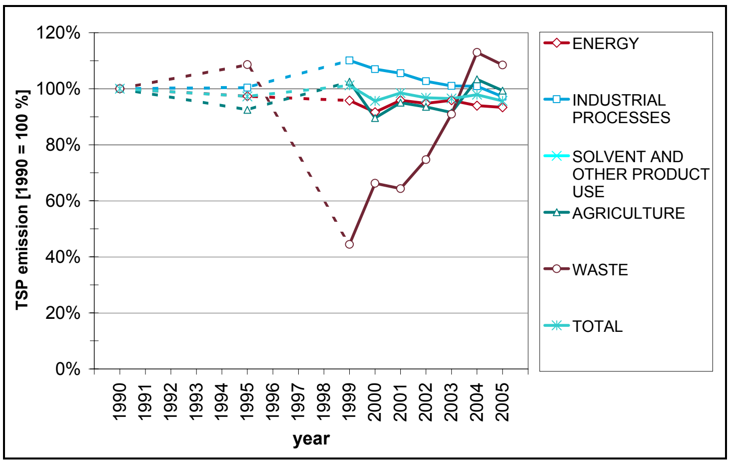

Figure 17: PM10 emission trend per NFR Category 1990–2005

share of 30 % in national total emissions.

Another important source for PM 10 emissions in Austria with a share of about 21 % is the agricultural sector (livestock husbandry and cultivation). The decrease in agricultural production (soil cultivation, harvesting, etc.) is responsible for the slight decrease in PM10 emissions in Sector *Agriculture*.

As presented in Figure 17, this overall decrease is mainly due to decreasing emissions in the energy sector. However, the achievements made by installing of flue gas cleaning systems where almost completely compensated by enormous increasing PM10 emission of the transportation sector due to increased transport activities. Decreasing emissions of 3 % in the sector industrial processes can be noted, here especially in the iron and steel industry. The decrease of PM10 emission in the mineral production and the construction branch is due to protective enclosure and sprinkling during the activities.

Table 19: PM10 emissions per NFR Category 1990 and 2005, their trend 1990–2005 and their share in total emissions

NRF	Category	PM10 Emissions [Mg]		Trend	Share i. National Total	
		1990	**2005**	**1990–2005**	**1990**	**2005**
1	Energy	24 225.12	22 615.50	-7%	51%	50%
1 A	*Fuel Combustion Activities*	*23 920.41*	*22 325.78*	*-7%*	*50%*	*49%*
1 B	*Fugitive Emissions f. Fuels*	*304.71*	*289.72*	*-5%*	*1%*	*1%*
2	Industrial Processes	13 845.69	13 451.52	-3%	29%	30%
3	Solvent a. Other Product Use	NA	NA			
4	Agriculture	9 440.43	9 378.58	-1%	20%	21%
6	Waste	80.26	87.07	8%	<1%	<1%
	National Total	**47 591.50**	**45 532.66**	**-4%**	**100%**	**100%**

2.3.3 PM2.5 Emissions

The size fraction PM2.5 refers to particles with an d_{ae} less than or equal to 2.5 µm that are collected by measuring devices with 50% collection efficiency. Exposure to considerable amounts of PM2.5 can cause respiratory and circulatory complaints in sensitive individuals. PM2.5 also causes reductions in visibility and solar radiation due to enhanced scattering of light. Furthermore, aerosol precursors such as ammonia (the source of which is mainly agriculture) form PM2.5 as secondary particles through chemical reactions in the atmosphere.

PM2.5 emissions and emission trends in Austria

National total PM2.5 emissions amounted to 28.6 Gg in 1990 and have decreased steadily so that by the year 2005 emissions were reduced by 9 % (to 26.1 Gg).

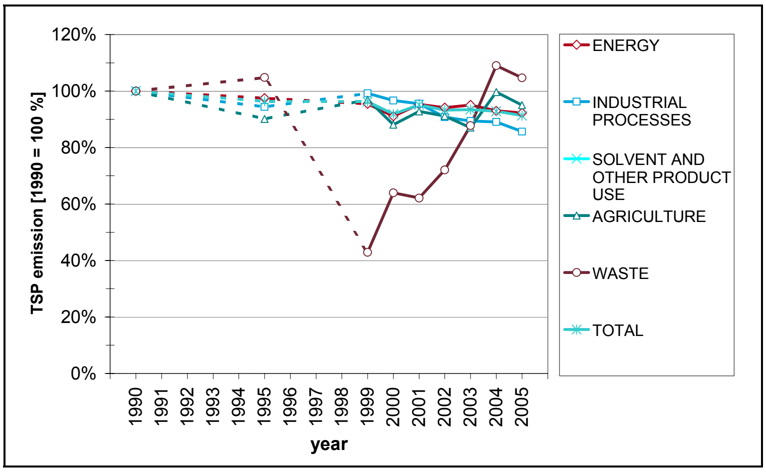

Figure 18: PM2.5 emission trend per NFR Category 1990–2005

As it is shown in Table 20 PM2.5 emissions in Austria mainly arose from combustion processes in the energy sector with a share of 75 % in the total emissions in 2005. Besides the sources already mentioned in the context of TSP and PM10, PM2.5 emissions resulted on a big scale from power plants with flue gas cleaning systems, which filter larger particles. The industrial processes sector had a share of 17% and the agricultural sector had a share of 8% in national total emissions. The decrease in agricultural production (soil cultivation, harvesting, etc.) is responsible for the decrease in PM2.5 emissions in Sector *Agriculture*.

In general the reduction of PM2.5 emission is due to the installation of modern flue gas cleaning technologies in several branches.

Table 20: PM2.5 emissions per NFR Category 1990 and 2005, their trend 1990–2005 and their share in total emissions

NRF Category		PM2.5 Emissions [Mg]		Trend	Share i. National Total	
		1990	2005	1990–2005	1990	2005
1	Energy	21 135.60	19 503.85	-8%	74%	75%
1 A	*Fuel Combustion Activities*	*21 040.64*	*19 412.96*	*-8%*	*74%*	*74%*
1 B	*Fugitive Emissions f. Fuels*	*94.96*	*90.89*	*-4%*	*0%*	*0%*
2	Industrial Processes	5 188.60	4 444.15	-14%	18%	17%
3	Solvent a. Other Product Use	NA	NA			
4	Agriculture	2 256.11	2 143.80	-5%	8%	8%
6	Waste	26.17	27.40	5%	0%	0%
	National Total	**28 606.47**	**26 119.19**	**-9%**	**100%**	**100%**

2.4 Emission Trends for Heavy Metals

In general emissions of heavy metals decreased remarkably from 1985 to 2005. Emission trends for heavy metals from 1985 to 2005 are presented in Table 21. Figure 19 presents emissions of heavy metals relative to 1985. Emissions for all three priority heavy metals (Cd, Pb, Hg) are well below their 1985 level, which is the obligation for Austria as a Party to the Heavy Metals Protocol.

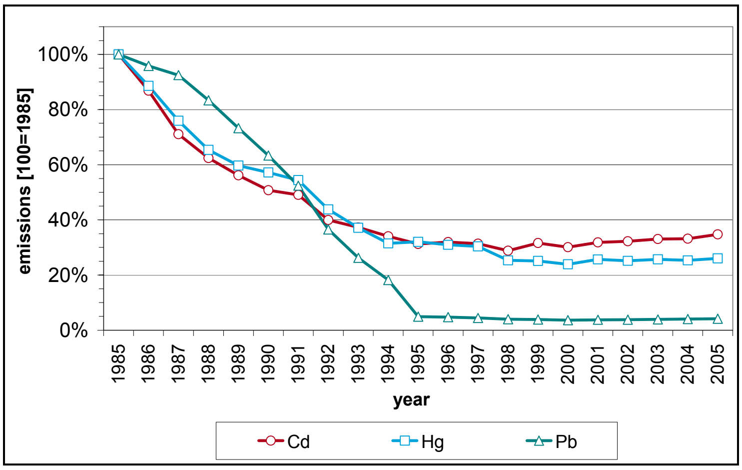

Figure 19: National total emissions for heavy metals 1985–2005

Table 21: National total emissions and emission trends for heavy metals 1985–2005

Year	Emissions [Mg]		
	Cd	Hg	Pb
1985	3.10	3.74	326.70
1986	2.70	3.32	312.94
1987	2.21	2.84	302.04
1988	1.94	2.45	272.23
1989	1.74	2.24	239.36
1990	1.57	2.14	206.85
1991	1.52	2.04	171.17
1992	1.24	1.64	119.30
1993	1.16	1.39	85.78
1994	1.06	1.18	59.40
1995	0.97	1.20	16.08
1996	0.99	1.16	15.50
1997	0.97	1.14	14.55
1998	0.89	0.95	12.99
1999	0.98	0.94	12.64
2000	0.93	0.90	11.91
2001	0.99	0.96	12.34
2002	1.00	0.94	12.55
2003	1.03	0.96	12.79
2004	1.03	0.95	13.14
2005	1.08	0.98	13.57
Trend 1985–2005	***-65 %***	***-74 %***	***-96 %***

2.4.1 Cadmium (Cd) Emissions

Cadmium (Cd) has been ubiquitously distributed in the natural environment for millions of years. It occurs in the earth's crust with a content estimated to be between 0.08 and 0.5 ppm.[58] Unlike some other heavy metals, such as lead or mercury, which have been used since ancient times, Cd has been refined and utilized only since 100 years, but it was already discovered in 1817. The production and consumption of Cd has risen distinctly only since the 1940's. The primary uses are electroplated cadmium coatings, nickel-cadmium storage batteries, pigments, and stabilizers for plastics. Publicity about the toxicity of cadmium has affected the consumption significantly.

For human beings Cd does not have a biological function unlike many other elements. The smoking (of tobacco) stands for an important exposure to Cd: smokers generally have about twice as high cadmium concentrations in the renal cortex compared to non-smokers. For the non-smoking population food is an important source of exposure because Cd is accumulated in the human and animal bodies due to its long half-life. Cd compounds and complexes are classified as an unambiguous carcinogenic working material.

Cadmium emissions and emission trends in Austria

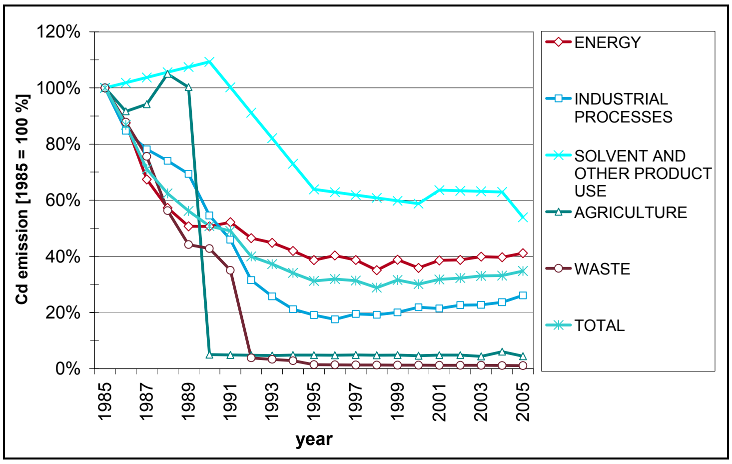

Figure 20: Cd emission trend per NFR Category 1990–2005

National total Cd emissions amounted to 3.1 Mg in 1985, and amounted to 1.57 Mg in 1990; since then emissions have decreased steadily and by the year 2005 emissions were reduced by 31 % (1.05 Mg).

As shown in Table 22 the main source for Cd emissions in Austria with a share of 79 % is the energy sector. These emissions mainly arise from combustion of heavy fuel oil, wood and wood waste as well as black liqour. The sub sectors with the highest contribution to Cd emissions from the energy sector are residential plants with 29 %, petroleum refining with 21 %, road transportation (10 %) and pulp, paper and print (10% in 2005). The industrial processes sector contributed about 20 % to national total Cd emission.

The overall reduction from 1985 to 2005 is mainly due to decreasing emissions from the industrial processes and energy sector (electricity and heat production) because of a decrease in the use of heavy fuel oil and improved or newly installed flue gas abatement techniques. The significantly emission reduction in the Sector *Solvent and Other Product Use* results from the ban of Cd in paint.

As can be seen in Figure 20, Cd emissions are increasing again in the last few years, which is due to the growing activities in the industrial processes sector and energy sector. The increasing Cd-emission in the energy sector were due increasing use of wood and wooden litter in small combustion plants, the combustion of heavy fuel oil and residues from the petroleum processing in the refinery as well as the thermal utilisation of industrial residues and residential

[58] Ullmann's Encyclopedia of Industrial Chemistry (2003): Cadmium and Cadmium Compounds. Wiley-VCH Verlag

waste. The use of hard coal has increased also. Another reason is the continuously growing activity in the transport sector, especially of heavy duty vehicles.

Table 22: Cd emissions per NFR Category 1985 and 2005, their trend 1985–2005 and their share in total emissions

NRF Category		Cd Emissions [Mg]			Trend		Share in National Total		
		1985	1990	2005	1985–2005	1990–2005	1985	1990	2005
1	Energy	2.08	1.06	0.86	-59%	-19%	67%	67%	79%
1 A	*Fuel Combustion Activities*	*2.08*	*1.06*	*0.86*	*-59%*	*-19%*	*67%*	*67%*	*79%*
1 B	*Fugitive Emissions f. Fuels*	*NE*	*NE*	*NE*					
2	Industrial Processes	0.84	0.46	0.22	-74%	-52%	27%	29%	20%
3	Solvent a. Other Product Use	0.00	0.00	0.00	-46%	-51%	<1%	<1%	<1%
4	Agriculture	0.04	0.00	0.00	-96%	-11%	1%	<1%	<1%
6	Waste	0.14	0.06	0.00	-99%	-97%	4%	4%	<1%
	National Total	**3.10**	**1.57**	**1.08**	**-65%**	**-31%**	**100%**	**100%**	**100%**

2.4.2 Mercury (Hg) Emissions

Mercury (Hg) has been ubiquitously distributed in the natural environment for millions of years. It occurs in the earth's crust with a content estimated to be about $4 \cdot 10^{-5}$%.[59] Because of its special properties, mercury has had a number of uses for a long time: the conventional application is the thermometer, barometer, and hydrometer; other important areas of use are the lighting industry and for electrical components. Mercury forms alloys with a large number of metals, these alloys also have a wide range of applications.

Mercury emissions and emission trends in Austria

In 1985 national total Hg emissions amounted to 3.7 Mg and amounted to 2.1 Mg in 1990; emissions have decreased steadily and by the year 2005 emissions were reduced by 74 %.

As it is shown in Table 23 Hg emissions mainly arise from the energy sector by combustion processes with a share of 67 % of the total emissions in 2005. These emissions are composed of emissions from combustion of coal, heavy fuel oil and waste in manufacturing idustries and construction, the combustion of wood, wood waste and coal in residential plants and combustion of coal and heavy fuel oil in public electricity and heat production.

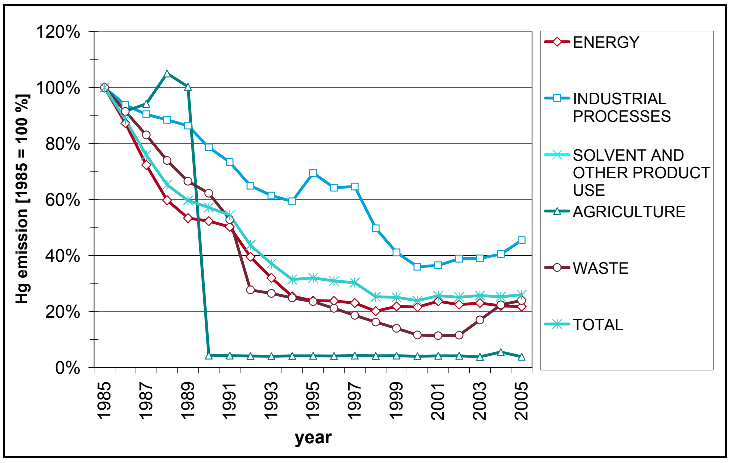

Figure 21: Hg emission trend per NFR Category 1990–2005

[59] Ullmann's Encyclopedia of Industrial Chemistry Copyright (2003): Mercury and Mercury Compounds.

Process related emissions in the sector industrial processes (especially metal industries) account for about 31 % of national total Hg emissions in 2005. Hg emissions mainly arise from the same sub-sectors as Cd emissions, which are residential heating, industry and energy industries.

The overall reduction of about 74 % for the period 1985 to 2005 was due to decreasing emissions from the industrial processes sector and residential heating due to a decrease in the use of heavy fuel oil and wood as fuel and also due to improved emission abatement techniques in industry. Several bans in different industrial sub-sectors as well in the agriculture sector lead to the sharp fall of total Hg emission in Austria.

Table 23: Hg emissions per NFR Category 1985 and 2005, their trend 1985–2005 and their share in total emissions

NRF Category		Hg Emissions [Mg]			Trend		Share in National Total		
		1985	**1990**	**2005**	**1985–2005**	**1990–2005**	**1985**	**1990**	**2005**
1	Energy	2.98	1.56	0.65	-78%	-58%	80%	73%	67%
1 A	*Fuel Combustion Activities*	*2.98*	*1.56*	*0.65*	*-78%*	*-58%*	*80%*	*73%*	*67%*
1 B	*Fugitive Emissions f. Fuels*	*NE*	*NE*	*NE*					
2	Industrial Processes	0.67	0.53	0.30	-55%	-42%	18%	25%	31%
3	Solvent a. Other Product Use	NA	NA	NA					
4	Agriculture	0.01	0.00	0.00	-96%	-10%	<1%	<1%	<1%
6	Waste	0.09	0.05	0.02	-76%	-62%	2%	3%	2%
	National Total	**3.74**	**2.14**	**0.98**	**-74%**	**-54%**	**100%**	**100%**	**100%**

2.4.3 Lead (Pb) Emissions

In the past, automotive sources were the major contributor of lead emissions to the atmosphere. Due to Austrian regulatory efforts to reduce the content of lead in gasoline the contribution of air emissions of lead from the transportation sector has drastically declined over the past two decades. Today, industrial processes, primarily metals processing, are the major sources of lead emissions. The highest air concentrations of lead are usually found in the vicinity of smelters and battery manufacturers. Exposure to lead occurs mainly through inhalation of air and ingestion of lead in food, water, soil, or dust. It accumulates in the blood, bones, and soft tissues and can adversely affect the kidneys, liver, nervous system, and other organs. Lead can also be deposited on the leaves of plants, which pose a hazard to grazing animals and humans through ingestion via food chain.

Lead emissions and emission trends in Austria

In 1985 national total Pb emissions amounted to 326.7 Mg and to 206.9 Mg in 1990; emissions have decreased steadily and by the year 2005 emissions were reduced by 93 % (13.6 Mg).

In 1985 the main emission source for Pb emissions with a share of about 79 % was the sector energy especially the sub-sector *road transport*. From 1990 to 1995 Pb emissions from this sector decreased by 100% due to prohibition of the addition of lead to petrol. As it is shown in Table 23 today's Pb emissions mainly arise from the energy sector by combustion processes with a share of about 52 % of the Austrian Pb emissions.

In addition to emission reduction in the energy sector the sector industrial proesses reduced its emissions remarkably due to improved dust abatement technologies. The significantly emission reduction in the sector solvent and other product use results from the ban of Pb in this production field or products.

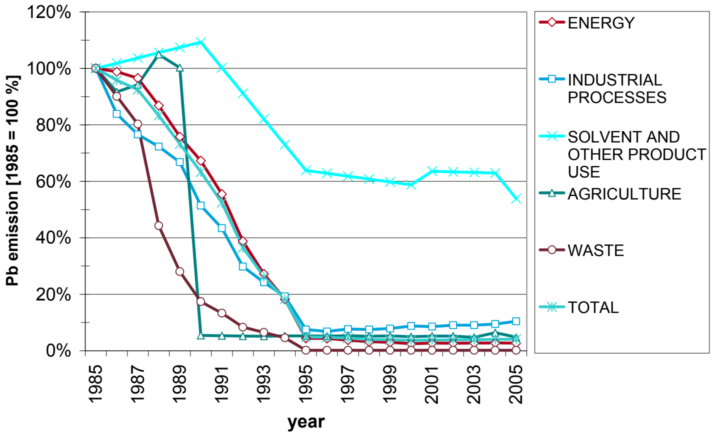

Figure 22: Pb emission trend per NFR Category 1990–2005

Table 24: Pb emissions per NFR Category 1985 and 2005, their trend 1985–2005 and their share in total emissions

NRF Category		Pb Emissions [Mg]			Trend		Share i. National Total		
		1985	1990	2005	1985–2005	1990–2005	1985	1990	2005
1	Energy	258.11	173.66	7.02	-97%	-96%	79%	84%	52%
1 A	*Fuel Combustion Activities*	*258.11*	*173.66*	*7.02*	*-97%*	*-96%*	*79%*	*84%*	*52%*
1 B	*Fugitive Emissions f. Fuels*	*NE*	*NE*	*NE*					
2	Industrial Processes	62.45	32.09	6.49	-90%	-80%	19%	16%	48%
3	Solvent & Other Product Use	0.06	0.07	0.03	-46%	-51%	<1%	<1%	<1%
4	Agriculture	0.23	0.01	0.01	-95%	-12%	<1%	<1%	<1%
6	Waste	5.85	1.02	0.01	-100%	-99%	2%	<1%	<1%
	National Total	**326.70**	**206.85**	**13.57**	**-96%**	**-93%**	**100%**	**100%**	**100%**

2.5 Emission Trends for POPs

Emissions of Persistent Organic Pollutants (POPs) decreased remarkably from 1985 to 2005. As can be seen in Table 25, emissions for all three POPs are well below their 1985 level, which is the obligation for Austria as a Party to the POPs Protocol (see Chapter 1.1.1).

The most important source for POPs in Austria is residential heating. In the 80ties 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, which is the main reason for the overall decrease in national total POP emissions. Figure 23 presents emissions of POPs relative to 1985.

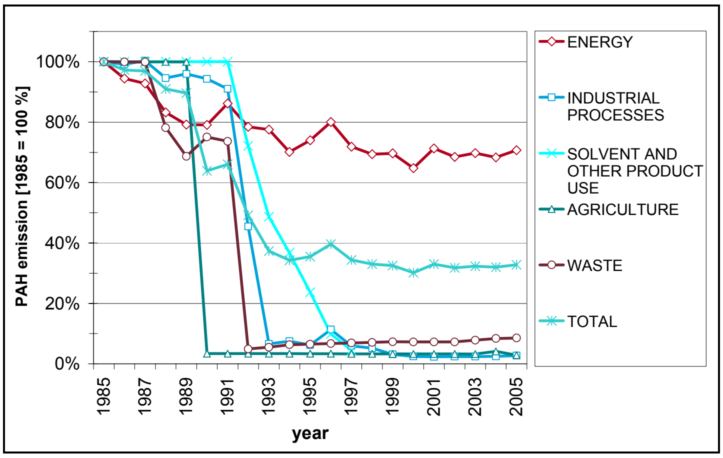

Figure 23: Emission of Persistent Organic Pollutants 1985–2005 relative to 1985 (1985=100)

Table 25: Emissions and emission trends for POPs 1985–2005

Year	Emission		
	PAH [Mg]	Dioxin [g]	HCB [kg]
1985	27.04	186.98	106.18
1986	26.31	185.84	103.57
1987	26.21	187.67	106.29
1988	24.61	172.85	97.61
1989	24.23	164.02	94.48
1990	17.27	159.99	91.51
1991	17.86	134.77	84.25
1992	13.30	76.15	69.22
1993	10.10	66.58	63.68
1994	9.26	55.90	51.65
1995	9.60	58.17	52.84
1996	10.71	59.62	55.64
1997	9.29	59.55	51.83
1998	8.93	56.12	48.98
1999	8.80	53.86	47.70
2000	8.16	51.60	43.89
2001	8.93	54.84	47.99

Year	Emission		
	PAH [Mg]	Dioxin [g]	HCB [kg]
2002	8.60	42.32	45.21
2003	8.75	42.25	45.27
2004	8.65	41.34	43.59
2005	8.87	42.62	45.41
Trend 1985–2005	**-67%**	**-77%**	**-57%**

2.5.1 Polycyclic Aromatic Hydrocarbons (PAH) Emissions

The polycyclic aromatic hydrocarbons (PAH) are molecules built up of benzene rings which resemble fragments of single layers of graphite. PAHs are a group of approximately 100 compounds. Most PAHs in the environment arise from incomplete burning of carbon-containing materials like oil, wood, garbage or coal. Fires are able to produce fine PAH particles, they bind to ash particles and sometimes move long distances through the air. Thus PAHs have been ubiquitously distributed in the natural environment since thousands of years.

Out all different compounds of the pollutant group of PAHs, the four compounds benz(a)pyren, Benzo(b)fluoranthen, benzo(k)fluoranthen and indeno(1,2,3-cd)pyren are used as indicators for the purposes of emission inventories, which has been specified in the UNECE POPs Protocol mentioned above.

PAH emissions and emission trends in Austria

In 1985 national total PAH emissions amounted to about 27 Mg and amounted to about 17 Mg in 1990; emissions have decreased steadily and by the year 2005 emissions were reduced by about 67 % (to 8.9 Mg in 2005).

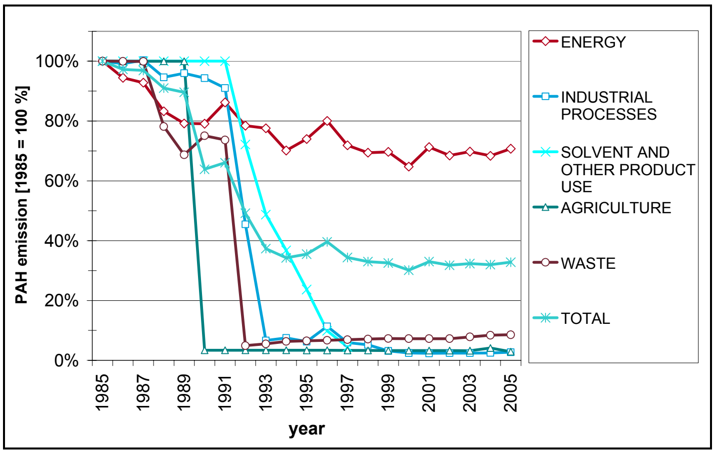

Figure 24: PAH emission trend per NFR Category 1990–2005

In 1985 the main emission sources for PAH emissions were the Sectors Energy (44 %), Industrial processes (29 %) and Agriculture (26 %). In 2005 the main source regarding PAH emissions is *Energy* with a share in the national total of 95 %. From 1985 to 2005 PAH emissions from Agriculture decreased remarkably by 97 % due to prohibition of open field burning, PAH emissions from the sector Industrial processes decreased by 97 % due to the shut down of primary aluminium production in Austria, which was a main source for PAH emissions.

Table 26: PAH emissions per NFR Category 1985 and 2005, their trend 1985–2005 and their share in total emissions

NRF Category		PAH Emissions [Mg]			Trend		Share in National Total		
		1985	**1990**	**2005**	**1985–2005**	**1990–2005**	**1985**	**1990**	**2005**
1	Energy	11.94	9.44	8.45	-29%	-11%	44%	55%	95%
1 A	*Fuel Combustion Activities*	11.94	9.44	8.45	-29%	-11%	44%	55%	95%
1 B	*Fugitive Emissions from Fuels*								
2	Industrial Processes	7.88	7.44	0.22	-97%	-97%	29%	43%	2%
3	Solvent & Other Product Use	0.15	0.15		-100%	-100%	1%	1%	
4	Agriculture	7.07	0.24	0.20	-97%	-15%	26%	1%	2%
6	Waste	0.00	0.00	0.00	-91%	-89%	<1%	<1%	<1%
	National Total	**27.04**	**17.27**	**8.87**	**-67%**	**-49%**	**100%**	**100%**	**100%**

2.5.2 Dioxins and Furan

Dioxins form a family of toxic chlorinated organic compounds that share certain chemical structures and biological characteristics. Several hundred of these compounds exist and are members of three closely related families: the chlorinated dibenzo-p-dioxins (CDDs), chlorinated dibenzofurans (CDFs) and certain polychlorinated biphenyls (PCBs). Dioxins bio-accumulate in humans and wildlife due to their fat solubility and 17 of these compounds are especially toxic.

Dioxins are formed as a result of combustion processes such as commercial or municipal waste incineration and from burning fuels like wood, coal or oil as a main source of dioxins. Dioxins can also be formed when household trash is burned and as a result of natural processes such as forest fires. Dioxins enter the environment also through the production and use of organochlorinated compounds: chlorine bleaching of pulp and paper, certain types of chemical manufacturing and processing, and other industrial processes are able to create small quantities of dioxins. Cigarette smoke also contains small amounts of dioxins.

Thanks to stringent legislation and modern technology dioxin emissions due to combustion and incineration as well as due to chemical manufacturing and processes have been reduced dramatically. Nowadays domestic combustion as well as thermal processes in metals extraction and processing have become more significant.

Dioxin/Furan emissions and emission trends in Austria

In 1985 national total dioxin/furan emissions amounted to about 187 g and amounted to about 160 g in 1990; emissions have decreased steadily and by the year 2005 emissions were reduced by about 77 % (to 43 g in 2005).

In 1985 the main sources for dioxin/furan emissions were the Sectors *Energy* (59 %) and *Industrial Processes* (especially iron and steel production) (27 %). In 2005 the main sector regarding dioxin/furan emissions is *Energy* with a share in National Total of 91 %.

From 1985 to 2005 PAH emissions from the sectors *Waste* and *Solvents and Other Product Use* decreased by almost 100 % due to stringent legislation and modern technology. The dioxin emissions of the sectors *Agriculture* and *Industrial processes* decreased by 93 % and 97 %, respectivley, due to prohibition of open field burning and improved emission abatement technologies in iron and steel industries.

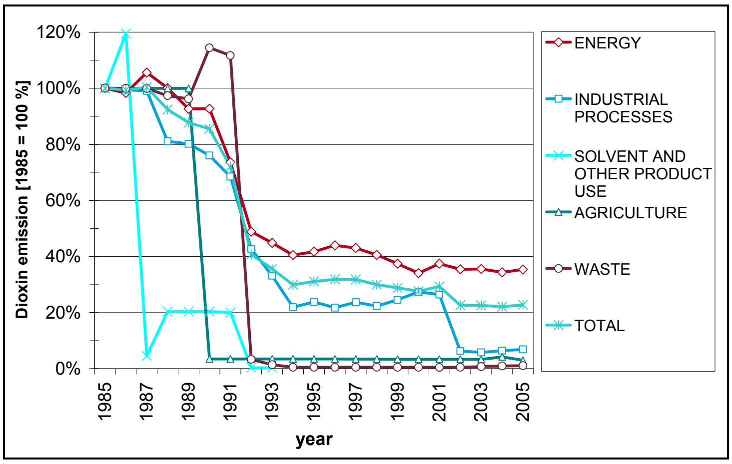

Figure 25: Dioxin emission trend per NFR Category 1990–2005

Table 27: Dioxin emissions per NFR Category 1985 and 2005, their trend 1985–2005 and their share in total emissions

NRF Category		Dioxin Emissions [g]			Trend		Share in National Total		
		1985	1990	2005	1985–2005	1990–2005	1985	1990	2005
1	Energy	109.55	101.56	38.76	-65%	-62%	59%	63%	91%
1 A	*Fuel Combustion Activities*	109.55	101.56	38.76	-65%	-62%	59%	63%	91%
1 B	*Fugitive Emissions from Fuels*								
2	Industrial Processes	51.30	39.00	3.54	-93%	-91%	27%	24%	8%
3	Solvent & Other Product Use	5.19	1.06		-100%	-100%	3%	1%	
4	Agriculture	5.0526	0.1775	0.1508	-97%	-15%	3%	0%	0%
6	Waste	15.90	18.19	0.17	-99%	-99%	9%	11%	0%
	National Total	**186.98**	**159.99**	**42.62**	**-77%**	**-73%**	**100%**	**100%**	**100%**

2.5.3 Hexachlorobenzene (HCB) Emissions

Hexachlorobenzene (HCB) has been widely employed as a fungicide on seeds, especially against the fungal disease 'bunt' that affects some cereal crops. The marketing and use of hexachlorobenzene as a plant protection product was banned in the European Union in 1988.

As there is no more hexachlorobenzene production in the EU, the only man-made releases of hexachlorobenzene are as unintentional by-product; it is emitted from the same chemical and thermal processes as Dioxins/Furans and formed via a similar mechanism.

It is released to the environment as an unintentional by-product in chemical industry (production of several chlorinated hydrocarbons such as drugs, pesticides or solvents) and in metal industries and is formed in combustion processes in the presence of chlorine.

HCB emissions and emission trends in Austria

In 1985 national total HCB emissions amounted to about 106 g and amounted to about 92 g in 1990; emissions have decreased steadily and by the year 2005 emissions were reduced by about 57 % (to 45 g in 2005).

In 1985 the two main sources for HCB emissions were the sectors *Energy* (78 %) and *Industrial processes* (12 %). In 2005 the main sector of HCB emissions is *Energy* with a share in National Total of 92 %.

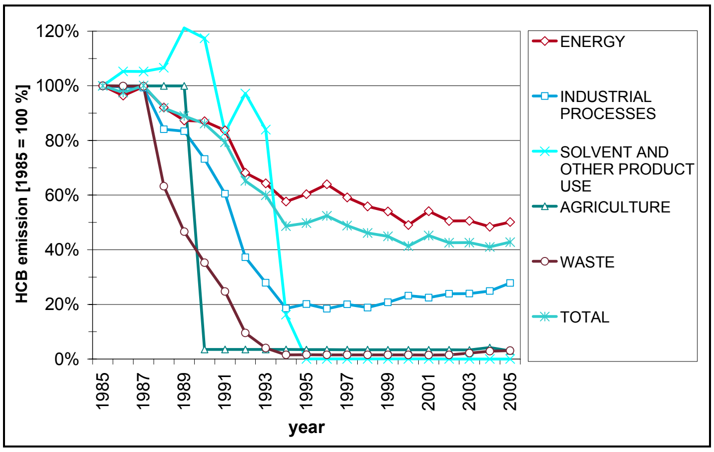

Figure 26: HCB emission trend per NFR Category 1990–2005

From 1985 to 2005 HCB emissions from the sectors *Waste* and *Agriculture* as well as *Solvents and Other Products Use* decreased remarkably by 97 % and more due to stringent legislation and modern technology. HCB emissions of the sectors *Industrial processes* and *Energy* decreased by 72 % or 50% respectively due to improved dust abatement technologies. National total emissions decreased by 57 % in the period from 1985 to 2005.

Table 28: Hexachlorbenzene (HCB) emissions per NFR Category 1985 and 2005, their trend 1985–2005 and their share in total emissions

NRF Category		HCB Emissions [g]			Trend		Share in National Total		
		1985	1990	2005	1985–2005	1990–2005	1985	1990	2005
1	Energy	83.08	72.31	41.65	-50%	-42%	78%	79%	92%
1 A	*Fuel Combustion Activities*	*83.08*	*72.31*	*41.65*	*-50%*	*-42%*	*78%*	*79%*	*92%*
1 B	*Fugitive Emissions from Fuels*								
2	Industrial Processes	13.27	9.71	3.69	-72%	-62%	12%	11%	8%
3	Solvent and Other Product Use	7.71	9.05	NA	-100%	-100%	7%	10%	
4	Agriculture	1.01	0.04	0.03	-97%	-15%	1%	<1%	<1%
6	Waste	1.11	0.39	0.03	-97%	-91%	1%	<1%	<1%
0	**National Total**	**106.18**	**91.51**	**45.41**	**-57%**	**-50%**	**100%**	**100%**	**100%**

3 MAJOR CHANGES

3.1 Relation to data reported earlier

As a result of the continuous improvement of Austria's National Air Emission Inventory, emissions of some sources have been recalculated based on updated data or revised methodologies, thus emission data for 1990 to 2004 submitted this year differ from data reported previously.

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

Table 29: Recalculation difference of Austria's NEC gas, CO, PM, HM and POP emissions compared to the previous submission

	SO_2	NO_x	NMVOC	NH_3	TSP	PM10	PM2.5
1990	0%	0%	0%	0%	2%	2%	0%
2004	-6%	-1%	-9%	0%	0%	0%	-1%

	CO	Cd	Pb	Hg	PAH	Diox	HCB
1990	0%	3%	0%	0%	0%	0%	0%
2004	-1%	-2%	1%	0%	-1%	1%	-1%

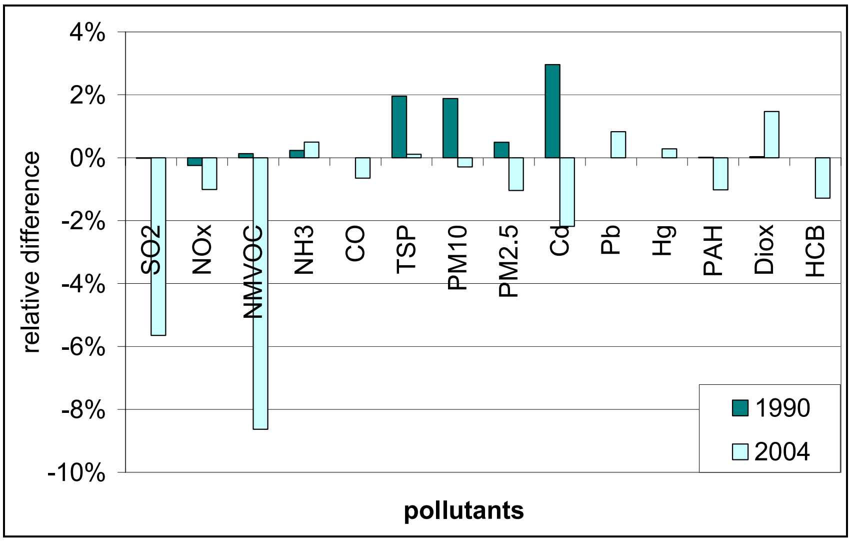

Figure 27: Recalculation difference of Austria's emissions of NEC gas, CO, PM, HM and POP compared to the previous submission

The 9% decrease of NMVOC emissions for 2004 compared to the previous submission is mainly due to a recalculation of *Category 2 B – Chemical Industry* applying new data reported by the Austrian Association of Chemical Industry. An update of activity data in *Category 3 – Solvent and Other Product Use* led to lower emissions in 2004 too.

The 6% decrease of SO_2 emissions for 2004 is mainly due to the revision of the national energy balance and recalculations in *Category 1 A 3 b Road Transportation*.

The light increase of 1 % of dioxin emissions for 2004 compared to the previous submission is due to updating the activity data in Category *1 A 2 b Non-ferrous metals* and *6 C Cremations*. The light decrease of 1 % of PAH and HCB emissions for 2004 compared to the previous submission is mainly due to the revision of emission factors (*Category 1 A 2 f Other*) as well as the overall updated activity data.

The light decrease of 2 % of Cd emissions for 2004 compared to the previous submission is due to an error correction of solid biomass cadmium emission factor (Category 1 A 4 b Residential). The revision is also the main reason for changes in HM emissions; however, the overall change for HM is only 1% and 2%, respectively.

The slight decrease of reported PM2.5 emissions is due updated emission factor in Category *2 C 1 Iron and steel*.

Explanations per sector are given below.

3.2 Explanations and Justifications for Recalculations

Compiling an emission inventory includes data collecting, data transfer and data processing. Data has to be collected from different sources, for instance

- national statistics
- associations
- plant operators
- studies
- personal information
- other publications

The provided data must be transferred from different data formats and units into a unique electronic format to be processed further. The calculation of emissions by applying methodologies on the collected data and the final computing of time series into a predefined format (NFR) are further steps in the preparation of the final submission. Finally the submission must be delivered in due time. Even though a QA/QC system gives assistance so that potential error sources are minimized it is necessary to make some revisions – so called recalculations – under the following circumstances:

- An emission source was not considered in the previous inventory.
- A source/data supplier has delivered new data because previous data were preliminary data only (by estimation, extrapolation) or the methodology has been improved.
- Occurrence of errors in data transfer or processing: wrong data, unit-conversion, software errors, et al.
- Methodological changes: a new methodology must be applied to fulfil the reporting requirements because one of the following reasons:
  - to decrease uncertainties;
  - an emission source becomes a key source;
  - consistent input data needed for applying the methodology is no longer accessible;
  - input data for more detailed methodology is now available;
  - methodology is no longer appropriate.

3.3 Major Changes by Sector

This chapter describes the methodological changes by sector made to the inventory since the previous submission.

3.3.1 Major Changes SECTOR 1 ENERGY

Fuel Combustion (1A)

Update of activity data:

Update of activity data are due to updates of the energy balance compiled by the federal statistics authority Statistik Austria.

1 A 2 b Non-ferrous metals

Update of secondary aluminium activity data from 2001 on.

Update of national energy balance - general improvements

The following improvements affect the years 1999 to 2004 only. It has to be noted that the following recalculations relate to official data published by Statistik Austria ("Österreich-Bilanzen") in November 2005.

Integration of 2003/2004 census data for improvement of the residential sector (*NFR 1 A 4 b*). Definition of improved and more detailed fuel classifications for industrial waste and biomass. Integration of 2004 and 2002 sampling data for recalculation of industrial sub categories from 1999 on. Improvement of companies' allocation to NACE sectors. Integration of 2004 material input survey. Model error correction 1999 to 2000 for residual fuel oil. Consideration of coke oven tar and benzene as refinery input from 2004 on. 1999-2004 correction of coal foreign trade statistics and stock changes which affects coal gross consumption. Integration of 2005 CO_2 emission trading system (ETS) data for improvement and validation of industry sectoral data, especially for non traded fuels and in-plant waste. Update of brown coal NCV by means of ETS data. Because most improvements affect inter-sectoral data without changing gross consumption, category *Commerce and Public Services* is chosen as the "residual category" in most cases. This leads to significant changes of NFR category *1 A 4 a* without enhancement of accuracy.

Update of national energy balance - data harmonisation and consistency

In November 2005 Statistik Austria provided a dataset to emission inventory compilers which was consistent with data submitted to EUROSTAT/IEA but not fully consistent with official data published by Statistik Austria ("Österreich-Bilanzen"). Thus the following inventory recalculations prior to 1999 have been performed additionally to gain consistency with the official dataset.

1 A 2 Manufacturing Industries; 1 A 4 Other Sectors:

1990 to 1998: a share of residual fuel oil final consumption is shifted from *1 A 4 c Agriculture* to *1 A 2 Manufacturing Industries* subcategoories and *1 A 2 a Commercial* (1990: 40 kt). A share of the residual fuel previously considered as low sulphur fuel oil is now considered as high sulphur residual fuel oil and contributes to higher NO_X and SO_2 emissions (1990: 11 kt).

1 A 1 Energy Industries; 1 A 4 Other Sectors:

1990 to 1997: o*ther solid biomass* is shifted from *1A1* to *1A4* (1990: 0.2 PJ).

1 A 3 b Transport – Road:

Energy data, particularly biodiesel consumption 2004, has been revised according to the updated national energy balance.

1 A 3 e Transport - Pipeline compressors:

Revised 2004 natural gas consumption according to the updated national energy balance has been applied.

1 A 4 Other Sectors - Mobile Sources:

Revised energy data for railways (coal, diesel, electricity) up to 2000 according to the updated national energy balance has been applied.

<u>Improvements of methodologies and emission factors</u>

Cross sectoral:

From 2005 on ETS activity data (356 PJ) has been used for refining sub categories activity data of *NFR 1 A 1 and 1 A 2* stationary sources (total 490 PJ). Increased accuracy of activity data for glass, cement, lime, bricks & tiles and magnesium & dolomite manufacturing industry significantly increases accuracy of NO_x emission calculation for these branches.

1 A 1 a Public Electricity and Heat Production:

For plants > 50 MW_{th} update of SO_2 and NO_x emissions for the year 2004 by means of the steam boiler reporting obligation (LRGK).

For biomass fired boilers <= 50 MW update of NO_x emission factors 1990-2004 by means of a sample survey.

For municipal waste incineration in boilers <= 50 MW update of NO_x emission factors 1999-2004 by means of actual measurements.

Steam boiler fuel consumption reported as *fuel wood* is now considered as *other solid biomass.*

Update of brown coal and brown coal briquettes cadmium emission factor according to measurements taken from a national study.

1 A 1 b Petroleum Refining:

Liquid fuels NH_3 emission factor has been updated (error correction).

Error correction of secondary lead dioxin emission factor.

1 A 2 f Other Industries

Change of PAH emission factor for cement production according to actual measurements.

1 A 4 b Residential

Error correction of solid biomass cadmium emission factor.

Fugitive Emissions (1 B)

No recalculations

3.3.2 Major Changes SECTOR 2 INDUSTRIAL PROCESSES

Update of activity data

2 A 1 Cement Production:

Activity data for 2004 has been updated using plant-specific data provided by the Association of the Austrian Cement Industry.

2 C 1 Iron and Steel:

Activity data from iron and steel cast have been updated affecting process-specific Dioxine, PAH, HCB, Cd, Hg and Pb emissions.

2 B 5 Chemical Products – Other (organic chemical industries):

NMVOC Emissions have been updated for the years 1994-2004: From 1999 onwards data reported by the Austrian Association of Chemical Industry has been used; emissions between 1994 and 1998 have been estimated by interpolation. This recalculation results in a decrease of emissions compared to the previous submission, where a constant value was reported from 1993 onwards.

2 D 1 Other Production - Pulp and Paper (chipboard production):

Activity data for 2004 has been updated.

2 D 2 Other Production - Food and Drink (Bread, Wine, Beer and Spirits):

Activity data for 2004 has been updated.

Improvements emission factors

2 C 1 Iron and Steel:

Emission factor for TSP, PM10 and PM2.5 for iron and steel production have been updated.

3.3.3 Major Changes SECTOR 3 SOLVENT USE

Update of activity data

NMVOC emissions from solvent use have been updated from 2002 onwards by using new activity data for 2005 as well as 2001 data of sector-specific technological and economic developments. This resulted in a decrease of total NMVOC emissions from solvent use compared to the previous submission, where emission data were constantly extrapolated from 2002 onwards.

3.3.4 Major Changes SECTOR 4 AGRICULTURE

Update of activity data

4 D 1 Direct Soil Emissions - urea consumption data:

Revised urea application data from 2002 to 2004 have been used. In accordance with the other N mineral fertilizer application data, figures now relate to the economic year of the farmers and not to the calendar year.

4 D 1 Direct Soil Emissions – Grazing:

Unfertilized grassland area data from 2003 to 2005 has been updated, which resulted in lower NH_3 emissions.

Improvements of methodologies and emission factors

4 B 1 a Dairy:

As encouraged in the Draft LRTAP trial Centralized Review 2006, housing systems of dairy cattle have been reviewed: for 2005 a share of dairy cattle held in loose housing systems of 25% and a share of dairy cattle held in tied housing systems of 75% based on expert judgement has been applied, which resulted in higher emissions from dairy cattle.

Expert Judgement was made by the following experts:

– DI Alfred Pöllinger, Agricultural Research and Education Centre Gumpenstein. November 2006.
– Dr. Leopold Kirner, Federal Institute of Agricultural Economics. Expert judgement (November 2006) based on the following study:

  Kirner, L. (2005): Sozioökonomische Aspekte der Milchviehhaltung in Österreich. Studien zu Wettbewerbsfähigkeit, Entwicklungstendenzen und Agrarreform. Schriftenreihe der Bundesanstalt für Agrarwirtschaft Nr. 95. Wien.

4 B 1 b Non-Dairy:

Due to quality checks a transcription error of N excretion values from cattle < 1 year has been corrected (25.7 kg instead of 25.3 kg/animal/year). This resulted in slightly higher NH_3 emissions.

3.3.5 Major Changes SECTOR 6 WASTE

Update of activity data

6 A 1 Managed Waste Disposal:

The activity data for Residual Waste and Non-residual Waste have been updated, this results in recalculated emissions (according to the Landfill Ordinance the operators of landfill sites have to report their activity data annually. Based on reports received after the due date, there are minor changes of the activity data for the whole time series and a major change for 2004 data compared to the previous submission).

NH_3 and NMVOC recalculations also due to quality checks a calculation error in non-residual waste categories was detected and corrected, the effects on emissions are minor.

6 D Other – Compost production:

The changes between 2000 and 2004 are due to updated activity data, which were compiled by looking at the waste management concepts and plans of the federal provinces (Bundesländer). This bottom-up approach led to revised data.

3.4 Recalculations per Gas

The following tables present the implication on emission trends of the methodological changes made as summarized in Chapter 3.3. Changes in the use of notation keys are also shown in the tables[60].

3.4.1 Recalculation difference of air pollutant emissions covered by the Multi-Effect Protocol and of CO emissions with respect to submission 2005

In the following the recalculation difference of air pollutant emissions covered by the Multi-Effect Protocol and of CO emissions with respect to submission 2005 are depicted in the following Table.

Detailed explanations are provided in chapters 3.1 and 3.3.

Table 30: Recalculation difference of emissions of air pollutants covered by the Multi- Effect Protocol and of CO with respect to submission 2005

NRF Category		Absolute difference [Mg]							Relative difference		
		1990	1995	2000	2001	2002	2003	2004	1980 Δ%	1990 Δ%	2004 Δ%
SO_2 emissions											
1	Energy	-0.01	-0.01	-0.09	0.16	-0.91	-0.75	-1.63	0 %	0 %	-6 %
2	Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	=
3	Solvent & Other Product Use										
4	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	-1 %
6	Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	=
Total Emissions		**-0.01**	**-0.01**	**-0.09**	**0.16**	**-0.91**	**-0.75**	**-1.63**	**0 %**	**0 %**	**-6 %**
NOx emissions											
1	Energy	-0.53	-0.51	0.93	0.62	0.19	-0.71	-2.33	0 %	0 %	-1 %
2	Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.05	=	=	4 %
3	Solvent & Other Product Use										
4	Agriculture	0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.02	0 %	0 %	0 %
6	Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	=
Total Emissions		**-0.52**	**-0.51**	**0.92**	**0.61**	**0.17**	**-0.73**	**-2.29**	**0 %**	**0 %**	**-1 %**
NMVOC emissions											
1	Energy	0.37	0.67	1.11	1.39	2.82	0.97	-0.03	0 %	0 %	0 %
2	Industrial Processes	0.00	-3.13	-10.67	-11.03	-10.95	-11.06	-10.96	=	=	-71 %
3	Solvent & Other Product Use	0.00	0.00	0.00	0.00	-1.28	-2.56	-3.84	=	=	-5 %

[60] a "=" in the field for relative difference indicates that reported emissions do not differ from the previous submission; blank fields indicate that no such emissions occur from this sector;

NRF Category		Absolute difference [Mg]							Relative difference		
		1990	1995	2000	2001	2002	2003	2004	1980 Δ%	1990 Δ%	2004 Δ%
4	Agriculture	0.00	0.00	0.00	0.00	0.00	-0.03	-0.03	0 %	0 %	-1 %
6	Waste	0.00	0.00	0.00	0.00	0.00	0.00	-0.01	0 %	0 %	-8 %
Total Emissions		**0.37**	**-2.47**	**-9.56**	**-9.64**	**-9.41**	**-12.67**	**-14.86**	**0 %**	**0 %**	**-9 %**
NH_3 emissions											
1	Energy	0.02	0.02	0.04	0.05	0.06	0.02	0.02	1 %	1 %	1 %
2	Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	=
3	Solvent & Other Product Use										
4	Agriculture	0.14	0.23	0.59	0.65	0.65	-0.07	0.22	0 %	0 %	0 %
6	Waste	0.00	0.00	0.03	0.05	0.06	0.15	0.08	0 %	0 %	11 %
Total Emissions		**0.16**	**0.25**	**0.66**	**0.74**	**0.77**	**0.10**	**0.32**	**0 %**	**0 %**	**0 %**
CO emissions											
1	Energy	-1.09	-0.14	4.79	7.58	18.11	-0.76	-4.20	0%	0%	-1%
2	Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.04	=	=	0%
3	Solvent & Other Product Use										
4	Agriculture	0.00	0.00	0.00	0.00	0.00	-0.02	-0.02	=	=	-1%
6	Waste	0.01	0.01	0.00	0.00	0.00	0.00	-0.63	0%	0%	-9%
Total Emissions		-1.08	-0.14	4.79	7.58	18.11	-0.78	-4.81	0%	0%	-1%

3.4.2 Recalculation difference of particle matter emissions with respect to submission 2005

In the following the recalculation difference of particle matter emissions with respect to submission 2005 is depicted in the following Table.

Detailed explanations are provided in chapters 3.1 and 3.3.

Table 31: Recalculation difference of PM emissions in general with respect to submission 2005

NRF Category	Absolute difference [Mg]							Relative difference		
	1990	1995	2000	2001	2002	2003	2004	1990 Δ%	2000 Δ%	2004 Δ%
TSP emission										
1 Energy	-0.27	-3.47	130.80	155.85	182.99	518.91	13.46	0%	0%	0%
2 Industrial Processes	1272.94	1488.50	1310.51	1281.58	1285.88	-592.42	-597.91	5%	5%	-2%
3 Solvent & Other Product Use										
4 Agriculture	485.38	629.21	610.74	585.29	588.84	600.09	607.09	1%	2%	2%
6 Waste	0.00	0.00	0.17	-2.32	1.23	1.94	11.59	=	-2%	29%
Total Emissions	1758.05	2114.24	2052.21	2020.40	2058.95	528.52	34.23	2%	2%	0%
PM10 emission										
1 Energy	1.27	-1.25	158.64	191.97	208.53	520.63	62.79	0%	1%	0%
2 Industrial Processes	657.73	1008.61	818.18	798.34	799.30	-441.13	-445.07	5%	6%	-3%
3 Solvent & Other Product Use										
4 Agriculture	220.51	285.85	277.46	265.90	267.51	272.62	275.80	2%	3%	3%
6 Waste	0.00	0.00	0.08	-1.10	0.58	0.92	5.48	=	-2%	29%
Total Emissions	879.51	1293.21	1254.36	1255.11	1275.92	353.04	-100.99	2%	3%	0%
PM2.5 emission										
1 Energy	-0.06	-1.34	139.93	168.78	173.55	459.46	54.69	0%	1%	0%
2 Industrial Processes	121.57	434.19	214.44	206.74	202.84	-289.74	-292.13	2%	4%	-6%
3 Solvent & Other Product Use										
4 Agriculture	17.47	22.65	21.99	21.07	21.20	21.60	21.86	1%	1%	1%
6 Waste	0.00	0.00	0.03	-0.35	0.18	0.29	1.73	=	-2%	29%
Total Emissions	138.98	455.50	376.38	396.24	397.77	191.61	-213.85	0%	2%	-1%

3.4.3 Recalculation difference of heavy metal (HM) emissions with respect to submission 2005

In the following the recalculation difference of heavy metal emissions with respect to submission 2005 is depicted in the following Table.

Detailed explanations are provided in chapters 3.1 and 3.3.

Table 32: Recalculation difference of heavy metal emissions in general with respect to submission 2005

NRF Category		Absolute difference [Mg]							Relative difference		
		1990	1995	2000	2001	2002	2003	2004	1985 Δ%	1990 Δ%	2004 Δ%
Cd emission											
1	Energy	0.05	0.03	0.02	0.03	0.04	0.01	-0.02	4%	4%	-3%
2	Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	0%
3	Solvent & Other Product Use	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	=
4	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	-2%
6	Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0%	0%	-5%
Total Emissions		**0.05**	**0.03**	**0.02**	**0.03**	**0.04**	**0.01**	**-0.02**	**2%**	**3%**	**-2%**
Hg emission											
1	Energy	0.00	0.00	0.00	0.01	0.01	-0.01	-0.01	0%	0%	-1%
2	Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	0%
3	Solvent & Other Product Use										
4	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	-2%
6	Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0%	0%	94%
Total Emissions		**0.00**	**0.00**	**0.00**	**0.01**	**0.01**	**-0.01**	**0.00**	**0%**	**0%**	**0%**
Pb emission											
1	Energy	0.02	0.00	-0.03	0.26	0.26	-0.09	0.10	0%	0%	1%
2	Industrial Processes	0.00	0.00	0.01	0.01	0.00	-0.01	0.01	=	=	0%
3	Solvent & Other Product Use	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	=
4	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	-3%
6	Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0%	0%	-1%
Total Emissions		**0.02**	**0.00**	**-0.02**	**0.27**	**0.26**	**-0.10**	**0.11**	**0%**	**0%**	**1%**

3.4.4 Recalculation difference of POP emissions with respect to submission 2005

In the following the recalculation difference of POP emissions with respect to submission 2005 is depicted in the following Tables.

Detailed explanations are provided in chapters 3.1 and 3.3.

Table 33: Recalculation difference of POP emissions in general with respect to submission 2005

NRF Category		Absolute difference [g]							Relative difference		
		1990	1995	2000	2001	2002	2003	2004	1985 Δ%	1990 Δ%	2004 Δ%
dioxin emission											
1	Energy	0.13	0.14	1.57	2.55	3.78	1.71	0.52	0%	0%	1%
2	Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0%	0%	0%
3	Solvent & Other Product Use	0.00	NA=	NA=	NA=	NA=	NA=	NA=	=	=	=
4	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	-2%
6	Waste	0.00	0.00	0.00	0.00	0.00	0.04	0.08	=	=	100%
Total Emissions		**0.14**	**0.15**	**1.57**	**2.56**	**3.78**	**1.75**	**0.60**	**0%**	**0%**	**1%**
HCB emission											
1	Energy	0.11	0.14	1.85	2.45	4.20	1.68	-0.58	0%	0%	-1%
2	Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	0%
3	Solvent & Other Product Use	0.00	0.00	0.00	0.00	NA=	NA=	NA=	=	=	=
4	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	-2%
6	Waste	0.00	0.00	0.00	0.00	0.00	0.01	0.02	=	=	94%
Total Emissions		**0.11**	**0.14**	**1.85**	**2.45**	**4.20**	**1.68**	**-0.57**	**0%**	**0%**	**-1%**
PAH emission											
1	Energy	0.02	0.02	0.36	0.37	0.63	0.21	-0.09	0%	0%	-1%
2	Industrial Processes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	0%
3	Solvent & Other Product Use	0.00	0.00	NA=	NA=	NA=	NA=	NA=	=	=	=
4	Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	-1%
6	Waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00	=	=	16%
Total Emissions		**0.02**	**0.02**	**0.36**	**0.37**	**0.63**	**0.20**	**-0.09**	**0%**	**0%**	**-1%**

4 ABBREVIATIONS

AMA	Agrarmarkt Austria
BAWP	Bundes-AbfallwirtschaftsplanFederal Waste Management Plan
BMLFUW	Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft Federal Ministry for Agriculture, Forestry, Environment and Water Management
BMUJF	Bundesministerium für Umwelt, Jugend und Familie Federal Ministry for Environment. Youth and Family (before 2000. now domain of Environment: BMLFUW)
BUWAL	Bundesamt für Umwelt. Wald und Landschaft. Bern The Swiss Agency for the Environment. Forests and Landscape (SAEFL). Bern
CORINAIR	Core Inventory Air
CORINE	Coordination d´information Environmentale
CRF	Common Reporting Format
DKDB	DampfkesseldatenbankAustrian annual steam boiler inventory
EC	European Community
EEA	European Environment Agency
EIONET	European Environment Information and Observation NETwork
EMEP	Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe
ETS	Emission Trading System
EPER	European Pollutant Emission Register
GLOBEMI	Globale Modellbildung für Emissions- und Verbrauchsszenarien im Verkehrssek-tor(Global Modelling for Emission- and Fuel consumption Scenarios of the Transport Sector) see [HAUSBERGER. 1998]
GPG	Good Practice Guidance (of the IPCC)
HM	Heavy Metals
IEA	International Energy Agency
IEF	Implied emission factor
IFR	Instrument Flight Rules
IIR	Informative Inventory Report
IPCC	Intergovernmental Panel on Climate Change
LTO	Landing/Take-Off cycle
MEET	MEET (1999): MEET – Methodology for calculating transport emissions and en-ergy consumption. European Commission. DG VII. Belgium.
NACE	Nomenclature des activites economiques de la Communaute Europeenne
NAPFUE	Nomenclature for Air Pollution Fuels
NEC	National Emissions Ceiling (Directive 2001/81/EC of The European Parliament And Of The Council of 23 October 2001 on national emission ceilings for certain atmospheric pollutants – NEC Directive)
NFR	Nomenclature for Reporting (Format of Reporting under the UNECE/CLRTAP Convention)
NIR	National Inventory Report (Submission under the United Nations Framework Convention on Climate Change)
NISA	National Inventory System Austria
OECD	Organisation for Economic Co-operation and Development

OLI	Österreichische Luftschadstoff InventurAustrian Air Emission Inventory
PHARE	Phare is the acronym of the Programme's original name:'Poland and Hungary: Action for the Restructuring of the Economy'.It covers now 14 partner countries: Albania. Bosnia and Herzegovina. Bulgaria. Croatia. the Czech Republic. Estonia. the Former Yugoslav Republic of Macedonia (FYROM). Hungary. Latvia. Lithuania. Poland. Romania. Slovakia and Slovenia. (However. Croatia was suspended from the Phare Programme in July 1995.)
PM	Particular Matter
POP	Persistent Organic Pollutants
PRTR	Pollution Release and Transfer Register
QA/QC	Quality Assurance/Quality Control
QMS	Quality Management System
RWA	Raiffeisen Ware Austria (see www.rwa.at)
SNAP	Selected Nomenclature on Air Pollutants
TAN	Total ammoniacal nitrogen
Umweltbundesamt	Umweltbundesamt (federal environment agency)
UNECE/CLRTAP	United Nations Economic Commission for Europe.Convention on Long-range Transboundary Air Pollution
UNFCCC	United Nations Framework Convention on Climate Change
VFR	Visual Flight Rules
WIFO	Wirtschaftsforschungsinstitut (Austrian Institute for Economic Research)

5 REFERENCES

BMLFUW – BUNDESMINISTERIUM FÜR LAND- UND FORSTWIRTSCHAFT, UMWELT UND WASSERWIRTSCHAFT (2006): Grüner Bericht 2006. 47. Grüner Bericht gemäß § 9 des Landwirtschaftsgesetzes BGBl. Nr. 375/1992, Wien.
http://www.gruenerbericht.at and http://www.awi.bmlf.gv.at

BUNDESABFALLWIRTSCHAFTSPLAN (BAWP) (2006): Bundesabfallbericht 2005. Bundesministerium für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft, Wien. (BMUJF–BAWP)

BUNDESANSTALT FÜR AGRARWIRTSCHAFT (2005): Federal Institute of Agricultural Economics. Download from data pool. http://www.awi.bmlfuw.gv.at/framesets/datapoolframeset.html

EMEP/CORINAIR Guidebook (1999): Atmospheric Emission Inventory Guidebook, 2nd Edition. Prepared by the EMEP Task Force on Emission Inventories. Edited by Stephen Richardson Task Force Secretary.

EMEP/CORINAIR Atmospheric Emission Inventory Guidebook, 3rd edition (2001). EEA (European Environment Agency), Copenhagen.

EMEP/CORINAIR Atmospheric Emission Inventory Guidebook, 4th edition (2007). EEA (European Environment Agency), Copenhagen.

STATISIK AUSTRIA, Wien: Statistisches Jahrbuch Österreich 1992–2007. Wien.

UMWELTBUNDESAMT (2004): Siebenter Umweltkontrollbericht. Umweltbundesamt, Wien.

UMWELTBUNDESAMT (2004): Wieser, M.; Kurzweil, A.: Emissionen als Grundlage für die Österreichische Luftschadstoffinventur Stand 2003. Bericht Bd. BE-254. Umweltbundesamt, Wien.

UMWELTBUNDESAMT (2005): Muik, B. & Wieser, M. (2004b): NISA – National Inventory System Austria - Implementation Report". REP-0004. Umweltbundesamt, Wien.

UMWELTBUNDESAMT (2006): Gager, M.: Emissionen Österreichischer Großfeuerungsanlagen 1990-2004. Report Bd. R-0006. Umweltbundesamt, Wien.

UMWELTBUNDESAMT (2006): Anderl, M.; Freudenschuss, A. et al.: Austria's National Inventory Report 2006. Submission under the United Nations Framework Convention on Climate Change. Report Bd. R-0016. Umweltbundesamt, Wien.

ANNEX

NFR for 2005

TABLE IV 1: National sector emissions: Main pollutants, particulate matter, heavy metals and persistent organic pollutants

Version 2005-1

COUNTRY:	AT	(as ISO2 code)
DATE:	12.02.2007	(as DD.MM.YYYY)
YEAR:	2005	(as YYYY, year of Emissions)

NFR sectors to be reported to LRTAP			A = Allowable Aggregation	Yearly minimum reporting																															Additional reporting							
				Main Pollutants					Particulate Matter			Priority Heavy Metals			Persistent Organic Pollutants (POPs) Annex I (1)									POPs Annex II (2)			POPs Annex III (3)							Other Heavy Metals						Other POPs (4	
																												PAH													
				NOx	CO	NMVOC	SOx	NH3	TSP	PM10	PM2.5	Pb	Cd	Hg	Aldrin	Chlordane	Chlordeco	Dieldrin	Endrin	Heptachlo	Hexabrom	Mirex	Toxaphene	HCH	DDT	PCB	DIOX	benzo(a	benzo(b	benzo(k	Indeno	Total 1	HCB	As	Cr	Cu	Ni	Se	Zn	PCP	SCCP
				Gg NO_2	Gg	Gg	Gg SO_2	Gg	Gg	Gg	Gg	Mg	Mg	Mg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	g I-Teq	Mg	Mg	Mg	Mg	Mg	kg	Mg	Mg	Mg	Mg	Mg	Mg	kg	kg
1 A 1 a	**(a)**	**1 A 1 a Public Electricity and Heat Production**		8.90	2.91	1.19	3.55	0.22	0.86	0.79	0.67	1.13	0.08	0.19	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.63	NR	NR	NR	NR	0.01	0.27	NR	NR	NR	NR	NR	NR	NR	NR
1 A 1 b	**(a)**	**1 A 1 b Petroleum refining**		3.05	0.42	IE	3.35	0.08	0.10	0.10	0.08	0.24	0.18	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.02	NR	NR	NR	NR	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR
1 A 1 c	**(a)**	**1 A 1 c Manufacture of Solid Fuels and Other Energy Industries**		0.74	0.05	0.00	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.00	NR	NR	NR	NR	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR
1 A 2	**(a)**	**1 A 2 Manufacturing Industries and Construction**	A	34.73	158.83	3.02	9.19	0.27	2.57	2.40	2.15	2.98	0.18	0.24	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	4.98	NR	NR	NR	NR	0.18	1.47	NR	NR	NR	NR	NR	NR	NR	NR
1 A 2 a	(a)	1 A 2 a Iron and Steel		5.02	138.44	0.25	4.43	0.05	0.05	0.05	0.06	0.18	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.04	NR	NR	NR	NR	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR
1 A 2 b	(a)	1 A 2 b Non-ferrous Metals		1.17	0.14	0.01	0.16	0.01	0.04	0.04	0.03	1.06	0.02	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	2.32	NR	NR	NR	NR	0.00	1.02	NR	NR	NR	NR	NR	NR	NR	NR
1 A 2 c	(a)	1 A 2 c Chemicals		1.29	1.40	0.22	0.67	0.03	0.47	0.42	0.35	0.39	0.02	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.66	NR	NR	NR	NR	0.03	0.10	NR	NR	NR	NR	NR	NR	NR	NR
1 A 2 d	(a)	1 A 2 d Pulp, Paper and Print		5.23	1.98	0.25	1.17	0.07	0.36	0.33	0.27	0.76	0.09	0.07	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.64	NR	NR	NR	NR	0.00	0.13	NR	NR	NR	NR	NR	NR	NR	NR
1 A 2 e	(a)	1 A 2 e Food Processing, Beverages and Tobacco		0.76	0.13	0.01	0.30	0.02	0.05	0.05	0.04	0.01	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.04	NR	NR	NR	NR	0.00	0.01	NR	NR	NR	NR	NR	NR	NR	NR
1 A 2 f	(a)	1 A 2 f Other (Please specify in a covering note)		21.27	16.75	2.28	2.46	0.10	1.59	1.51	1.40	0.58	0.06	0.15	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	1.28	NR	NR	NR	NR	0.14	0.21	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 a ii (i)		**1 A 3 a ii (i) Civil Aviation (Domestic, LTO)**		0.18	2.56	0.21	0.02	0.00	0.02	0.02	0.02	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NE	NR	NR	NR	NR	NE	NE	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 a ii (ii)		**1 A 3 a ii (ii) Civil Aviation (Domestic, Cruise)**		0.55	0.16	0.06	0.05	0.00	0.05	0.05	0.05	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NE	NR	NR	NR	NR	NE	NE	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 b	**(a)**	**1 A 3 b Road Transportation**	A	131.02	156.62	19.84	0.15	1.15	15.95	8.43	7.12	0.01	0.08	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	1.19	NR	NR	NR	NR	1.57	0.24	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 b i		1 A 3 b i R.T., Passenger cars		34.54	124.30	9.08	0.07	1.08	1.92	1.92	1.92	0.01	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.43	NR	NR	NR	NR	0.64	0.09	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 b ii		1 A 3 b ii R.T., Light duty vehicles		5.33	5.28	0.66	0.01	0.02	0.69	0.69	0.69	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.12	NR	NR	NR	NR	0.16	0.02	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 b iii		1 A 3 b iii R.T., Heavy duty vehicles		90.87	16.40	4.51	0.07	0.06	2.06	2.06	2.06	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.64	NR	NR	NR	NR	0.74	0.13	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 b iv		1 A 3 b iv R.T., Mopeds & Motorcycles		0.27	10.65	1.76	NA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.00	NR	NR	NR	NR	0.04	0.00	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 b v		1 A 3 b v R.T., Gasoline evaporation		NA	NA	3.83	NA	NA	NA	NA	NA	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	IE	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 b vi		1 A 3 b vi R.T., Automobile tyre and brake wear		NA	NA	NA	NA	NA	11.27	3.76	2.44	NA	0.08	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 b vii		1 A 3 b vii R.T., Automobile road abrasion		IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	IE	NR	NR	NR	NR	IE	IE	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 c	**(a)**	**1 A 3 c Railways**		1.38	0.37	0.18	0.06	0.00	1.62	0.58	0.22	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.02	NR	NR	NR	NR	0.02	0.00	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 d ii		**1 A 3 d ii National Navigation**		0.70	2.90	0.65	0.02	0.00	0.04	0.04	0.04	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.01	NR	NR	NR	NR	0.01	0.00	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 e	**(a)**	**1 A 3 e Other (Please specify in a covering note)**	A	1.47	0.10	0.00	NA	0.01	0.00	0.00	0.00	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NE	NR	NR	NR	NR	NA	0.00	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 e i		1 A 3 e i Pipeline compressors		1.47	0.10	0.00	NA	0.01	0.00	0.00	0.00	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NE	NR	NR	NR	NR	NA	0.00	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 e ii		1 A 3 e ii Other mobile sources and machinery		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NO	NR	NR	NR	NR	NO	NO	NR	NR	NR	NR	NR	NR	NR	NR

Notes are listed at the end of the table.

NFR sectors to be reported to LRTAP			A = Allowable Aggregation	NOx	CO	NMVOC	SOx	NH3	TSP	PM10	PM2.5	Pb	Cd	Hg	Aldrin	Chlordane	Chlordeco	Dieldrin	Endrin	Heptachlo	Hexabrom	Mirex	Toxaphene	HCH	DDT	PCB	DIOX	benzo(a	benzo(b	benzo(k	Indeno	Total 1	HCB	As	Cr	Cu	Ni	Se	Zn	PCP	SCCP
				Yearly minimum reporting																														***Additional reporting***							
				Main Pollutants					Particulate Matter			Priority Heavy Metals			Persistent Organic Pollutants (POPs) Annex I (1)									POPs Annex II (2)			POPs Annex III (3)	PAH						Other Heavy Metals						Other POPs (4	
				Gg NO_2	Gg	Gg	Gg SO_2	Gg	Gg	Gg	Gg	Mg	Mg	Mg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	g I-Teq	Mg	Mg	Mg	Mg	Mg	kg	Mg	Mg	Mg	Mg	Mg	Mg	kg	kg
1 A 4 a	**(a)**	**1 A 4 a Commercial / Institutional**		3.41	13.61	1.46	1.43	0.12	0.36	0.33	0.29	0.31	0.04	0.02	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	1.93	NR	NR	NR	NR	0.14	1.20	NR	NR	NR	NR	NR	NR	NR	NR
1 A 4 b	**(a)**	**1 A 4 b Residential**	A	13.89	307.63	34.15	6.80	0.58	7.67	6.92	6.17	2.18	0.24	0.18	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	27.73	NR	NR	NR	NR	5.92	35.03	NR	NR	NR	NR	NR	NR	NR	NR
1 A 4 b i		1 A 4 b i Residential plants		13.09	289.67	31.29	6.79	0.58	7.52	6.76	6.01	2.18	0.24	0.18	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	27.68	NR	NR	NR	NR	5.89	35.02	NR	NR	NR	NR	NR	NR	NR	NR
1 A 4 b ii		1 A 4 b ii Household and gardening (mobile)		0.80	17.96	2.86	0.00	0.00	0.15	0.15	0.15	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.05	NR	NR	NR	NR	0.03	0.01	NR	NR	NR	NR	NR	NR	NR	NR
1 A 4 c	**(a)**	**1 A 4 c Agriculture / Forestry / Fishing**	A	18.28	42.11	8.12	0.34	0.05	2.67	2.62	2.56	0.16	0.05	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	2.24	NR	NR	NR	NR	0.60	3.44	NR	NR	NR	NR	NR	NR	NR	NR
1 A 4 c i		1 A 4 c i Stationary		0.96	20.73	2.34	0.29	0.04	0.56	0.51	0.45	0.16	0.05	0.01	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	2.11	NR	NR	NR	NR	0.47	3.41	NR	NR	NR	NR	NR	NR	NR	NR
1 A 4 c ii		1 A 4 c ii Off-road Vehicles and Other Machinery		17.32	21.38	5.78	0.05	0.01	2.11	2.11	2.11	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.13	NR	NR	NR	NR	0.13	0.03	NR	NR	NR	NR	NR	NR	NR	NR
1A 4 c iii		1A 4 c iii National Fishing		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NO	NR	NR	NR	NR	NO	NO	NR	NR	NR	NR	NR	NR	NR	NR
1 A 5 a	**(a)**	**1 A 5 a Other, Stationary (including Military)**		IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	IE	NR	NR	NR	NR	IE	IE	NR	NR	NR	NR	NR	NR	NR	NR
1 A 5 b	**(a)**	**1 A 5 b Other, Mobile (Including military)**		0.20	0.72	0.04	0.04	0.00	0.04	0.04	0.04	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0.00	NR	NR	NR	NR	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR
1B1	**(a)**	**1B1 Fugitive Emissions from Solid Fuels**	A	NA	NA	NA	NA	NA	0.61	0.29	0.09	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
1 B 1 a	(a)	1 B 1 a Coal Mining and Handling		NA	NA	NA	NA	NA	0.61	0.29	0.09	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
1 B 1 b	(a)	1 B 1 b Solid fuel transformation		IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	IE	NR	NR	NR	NR	IE	IE	NR	NR	NR	NR	NR	NR	NR	NR
1 B 1 c	(a)	1 B 1 c Other (Please specify in a covering note)		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NO	NR	NR	NR	NR	NO	NO	NR	NR	NR	NR	NR	NR	NR	NR
1 B 2	**(a)**	**1 B 2 Oil and natural gas**	A	IE	IE	3.09	0.13	IE	IE	IE	IE	IE	IE	IE	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	IE	NR	NR	NR	NR	IE	IE	NR	NR	NR	NR	NR	NR	NR	NR
1 B 2 a	**(a)**	**1 B 2 a Oil**		NA	NA	2.84	NA	NA	NA	NA	NA	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
1 B 2 a i	(a)	1 B 2 a i Exploration Production, Transport		NA	NA	0.91	NA	NA	NA	NA	NA	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
1 B 2 a iv	(a)	1 B 2 a iv Refining / Storage		NA	NA	0.94	NA	NA	NA	NA	NA	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
1 B 2 a v	(a)	1 B 2 a v Distribution of oil products		NA	NA	0.98	NA	NA	NA	NA	NA	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
1 B 2 a vi	(a)	1 B 2 a vi Other		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NE	NR	NR	NR	NR	NE	NE	NR	NR	NR	NR	NR	NR	NR	NR
1 B 2 b	(a)	1 B 2 b Natural gas		NA	NA	0.25	0.13	NA	NA	NA	NA	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
1 B 2 c	(a)	1 B 2 c Venting and flaring		IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	IE	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	IE	NR	NR	NR	NR	IE	IE	NR	NR	NR	NR	NR	NR	NR	NR
2 A	**(a)**	**2 A MINERAL PRODUCTS (b)**	A	NA	9.78	IE	NA	NA	23.99	11.58	3.61	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
2 A 1	(a)	2 A 1 Cement Production		NA	NA	NA	NA	NA	0.33	0.15	0.05	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
2 A 2	(a)	2 A 2 Lime Production		NA	NA	NA	NA	NA	0.02	0.01	0.00	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
2 A 3	(a)	2 A 3 Limestone and Dolomite Use		NA	NA	NA	NA	NA	0.58	0.27	0.09	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
2 A 4	(a)	2 A 4 Soda Ash Production and use		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
2 A 5	(a)	2 A 5 Asphalt Roofing		NA	9.78	IE	NA	NA	NA	NA	NA	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
2 A 6	(a)	2 A 6 Road Paving with Asphalt		NA	NA	IE	NA	NA	NA	NA	NA	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
2 A 7	(a)	2 A 7 Other including Non Fuel Mining & Construction (Please specify in a covering note)		NA	NA	NA	NA	NA	23.06	11.14	3.47	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
2 B	**(a)**	**2 B CHEMICAL INDUSTRY**	A	0.57	11.12	1.32	0.77	0.07	0.46	0.27	0.14	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
2 B 1	(a)	2 B 1 Ammonia Production		0.24	0.05	IE	NA	0.01	NA	NA	NA	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
2 B 2	(a)	2 B 2 Nitric Acid Production		0.24	NA	NA	NA	0.00	NA	NA	NA	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
2 B 3	(a)	2 B 3 Adipic Acid Production		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NO	NR	NR	NR	NR	NO	NO	NR	NR	NR	NR	NR	NR	NR	NR
2 B 4	(a)	2 B 4 Carbide Production		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
2 B 5	(a)	2 B 5 Other (Please specify in a covering note)		0.09	11.07	1.32	0.77	0.06	0.46	0.27	0.14	0.00	0.00	0.00	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR

Notes are listed at the end of the table.

Yearly minimum reporting

		NFR sectors to be reported to LRTAP	A = Allowable Aggregation	Main Pollutants					Particulate Matter			Priority Heavy Metals		
				NOx	CO	NMVOC	SOx	NH3	TSP	PM10	PM2.5	Pb	Cd	Hg
				Gg NO_2	Gg	Gg	Gg SO_2	Gg	Gg	Gg	Gg	Mg	Mg	Mg
2 C	**(a)**	**2 C METAL PRODUCTION**		0.10	2.54	0.45	0.45	IE	2.29	1.61	0.70	6.49	0.22	0.30
2 D	**(a)**	**2 D OTHER PRODUCTION (b)**	**A**	0.61	0.45	2.62	NA	NA	0.00	0.00	0.00	**NA**	**NA**	**NA**
2 D 1	(a)	2 D 1 Pulp and Paper		0.61	0.45	0.45	NA	NA	NA	NA	NA	**NA**	**NA**	**NA**
2 D 2	(a)	2 D 2 Food and Drink		**NA**	**NA**	2.17	**NA**	**NA**	**0.00**	**0.00**	**0.00**	**NA**	**NA**	**NA**
2 G	**(a)**	**2 G OTHER (Please specify in a covering note)**		NA	NA	NA	NA	0.00	NA	NA	NA	NA	NA	NA
3 A	**(a)**	**3 A PAINT APPLICATION**		**NA**	**NA**	20.81	**NA**	**NA**	**NA**	**NA**	**NA**	NA	NA	NA
3 B	**(a)**	**3 B DEGREASING AND DRY CLEANING**		**NA**	**NA**	9.17	**NA**	**NA**	**NA**	**NA**	**NA**	NA	NA	NA
3 C	**(a)**	**3 C CHEMICAL PRODUCTS, MANUFACTURE AND PROCESSING**		**NA**	**NA**	11.31	**NA**	**NA**	**NA**	**NA**	**NA**	**0.03**	**0.00**	NA
3 D	**(a)**	**3 D OTHER including products containing HMs and POPs (Please specify in a covering note)**		NA	NA	34.48	NA	NA	NA	NA	NA	NA	NA	NA
4 B	(a)	**4 B MANURE MANAGEMENT (c)**	**A**	**NA**	**NA**	**NA**	**NA**	53.03	NA	NA	NA	**NA**	**NA**	**NA**
4 B 1	**(a)**	**4 B 1 Cattle**		**NA**	**NA**	**NA**	**NA**	36.65	NA	NA	NA	**NA**	**NA**	**NA**
4 B 1 a	(a)	4 B 1 a Dairy		**NA**	**NA**	**NA**	**NA**	14.06	NA	NA	NA	**NA**	**NA**	**NA**
4 B 1 b	(a)	4 B 1 b Non-Dairy		**NA**	**NA**	**NA**	**NA**	22.60	NA	NA	NA	**NA**	**NA**	**NA**
4 B 2	(a)	4 B 2 Buffalo		**NO**	**NO**	**NO**	**NO**	NO	NO	NO	NO	**NO**	**NO**	**NO**
4 B 3	(a)	4 B 3 Sheep		**NA**	**NA**	**NA**	**NA**	0.83	NA	NA	NA	**NA**	**NA**	**NA**
4 B 4	(a)	4 B 4 Goats		**NA**	**NA**	**NA**	**NA**	0.14	NA	NA	NA	**NA**	**NA**	**NA**
4 B 5	(a)	4 B 5 Camels and Llamas		**NO**	**NO**	**NO**	**NO**	NO	NO	NO	NO	**NO**	**NO**	**NO**
4 B 6	(a)	4 B 6 Horses		**NA**	**NA**	**NA**	**NA**	0.73	NA	NA	NA	**NA**	**NA**	**NA**
4 B 7	(a)	4 B 7 Mules and Asses		**IE**	**IE**	**IE**	**IE**	IE	IE	IE	IE	**IE**	**IE**	**IE**
4 B 8	(a)	4 B 8 Swine		**NA**	**NA**	**NA**	**NA**	9.38	NA	NA	NA	**NA**	**NA**	**NA**
4 B 9	(a)	4 B 9 Poultry		**NA**	**NA**	**NA**	**NA**	5.18	NA	NA	NA	**NA**	**NA**	**NA**
4 B 13	(a)	4 B 13 Other		**NA**	**NA**	**NA**	**NA**	0.11	NA	NA	NA	**NA**	**NA**	**NA**
4 C	**(a)**	**4 C RICE CULTIVATION**		**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
4 D 1	**(a)**	**4 D 1 Direct Soil Emission**		5.19	**NA**	**1.76**	**NA**	7.32	27.51	5.77	1.35	**NA**	**NA**	**NA**
4 F	**(a)**	**4 F FIELD BURNING OF AGRICULTURAL WASTES**		0.03	1.12	0.11	0.00	0.04	NE	NE	NE	0.01	0.00	0.00
4 G	**(a)**	**4 G OTHER (d)**		NA	NA	NA	NA	NA	4.33	3.61	0.79	NA	NA	NA
5 B	**(a)**	**5 B FOREST AND GRASSLAND CONVERSION**		NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE

	Persistent Organic Pollutants (POPs) Annex I (1)									POPs Annex II (2)			POPs Annex III (3)							*Additional reporting* Other Heavy Metals						Other POPs (4	
														PAH													
	Aldrin	Chlordane	Chlordeco	Dieldrin	Endrin	Heptachlo	Hexabrom	Mirex	Toxaphene	HCH	DDT	PCB	DIOX	benzo(a	benzo(b	benzo(k	Indeno	Total 1	HCB	As	Cr	Cu	Ni	Se	Zn	PCP	SCCP
	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	g I-Teq	Mg	Mg	Mg	Mg	Mg	kg	Mg	Mg	Mg	Mg	Mg	Mg	kg	kg
2 C	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**3.41**	NR	NR	NR	NR	0.18	3.67	NR	NR	NR	NR	NR	NR	**NR**	**NR**
2 D	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**0.13**	**NR**	NR	NR	NR	0.04	0.03	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
2 D 1	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NA**	**NR**	NR	NR	NR	NA	NA	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
2 D 2	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**0.13**	**NR**	**NR**	**NR**	**NR**	**0.04**	**0.03**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
2 G	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	NR	**NR**	**NR**	**NR**	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	**NR**	NR
3 A	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	NR
3 B	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
3 C	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	NR	**NR**	**NR**	**NR**	**NR**	NR	NA	NR	NR	NR	NR	NA	NA	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	NR
3 D	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
4 B	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
4 B 1	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
4 B 1 a	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
4 B 1 b	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
4 B 2	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NO**	**NR**	**NR**	**NR**	**NR**	**NO**	**NO**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
4 B 3	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
4 B 4	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
4 B 5	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NO**	**NR**	**NR**	**NR**	**NR**	**NO**	**NO**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
4 B 6	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
4 B 7	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**IE**	**NR**	**NR**	**NR**	**NR**	**IE**	**IE**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
4 B 8	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
4 B 9	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
4 B 13	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
4 C	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	**NR**	**NO**	**NR**	**NR**	**NR**	**NR**	**NO**	**NO**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	NR	**NR**
4 D 1	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	NR	**NR**
4 F	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	NR	**NR**	**NR**	**NR**	**NR**	**NR**	0.15	NR	NR	NR	NR	0.20	**0.03**	NR	NR	NR	NR	NR	NR	**NR**	**NR**
4 G	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	NR	NR	NR	NR	NR	NR	NR	**NR**
5 B	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	NE	NR	NR	NR	NR	NE	NE	NR	NR	NR	NR	NR	NR	**NR**	**NR**

Notes are listed at the end of the table.

NFR code		NFR sectors to be reported to LRTAP	A = Allowable Aggregation	NOx	CO	NMVOC	SOx	NH3	TSP	PM10	PM2.5	Pb	Cd	Hg	Aldrin	Chlordane	Chlordeco	Dieldrin	Endrin	Heptachlo	Hexabrom	Mirex	Toxaphen	HCH	DDT	PCB	DIOX	benzo(a	benzo(b	benzo(k	Indeno	Total 1	HCB	As	Cr	Cu	Ni	Se	Zn	PCP	SCCP
				Yearly minimum reporting																														***Additional reporting***							
				Main Pollutants					Particulate Matter			Priority Heavy Metals			Persistent Organic Pollutants (POPs) Annex I (1)									POPs Annex II (2)			POPs Annex III (3)							Other Heavy Metals						Other POPs (4)	
																												PAH													
				Gg NO_2	Gg	Gg	Gg SO_2	Gg	Gg	Gg	Gg	Mg	Mg	Mg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	kg	g I-Teq	Mg	Mg	Mg	Mg	Mg	kg	Mg	Mg	Mg	Mg	Mg	Mg	kg	kg
6 A	(a)	6 A SOLID WASTE DISPOSAL ON LAND		**NA**	**6.30**	0.08	**NA**	0.00	0.18	0.09	0.03	**0.00**	**0.00**	0.00	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
6 B	(a)	6 B WASTE-WATER HANDLING		**NA**	**NA**	NA	**NA**	NA	NA	NA	NA	NA	NA	NA	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NA**	**NR**	**NR**	**NR**	**NR**	**NA**	**NA**	NR	NR	NR	NR	NR	NR	**NR**	**NR**
6 C	(a)	6 C WASTE INCINERATION (e)		0.05	0.01	0.00	0.06	0.00	NE	NE	NE	0.01	0.00	0.02	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	NR	0.17	NR	NR	NR	NR	0.00	0.03	NR	NR	NR	NR	NR	NR	**NR**	**NR**
6 D	(a)	6 D OTHER WASTE (f)		**NA**	**NA**	NA	NA	**0.99**	NA	NA	NA	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
7	(a)	7 OTHER		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NO	NR	NR	NR	NR	NO	NO	NR	NR	NR	NR	NR	NR	NR	NR
NATIONAL TOTAL	(g)	National Total for the entire territory (2002 Guidelines)		225.06	720.31	154.14	26.41	63.94	91.34	45.53	26.12	13.57	1.08	0.98	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	42.62	NR	NR	NR	NR	8.87	45.41	NR	NR	NR	NR	NR	NR	NR	NR
Memo Items. NOT TO BE INCLUDED IN NATIONAL TOTALS IF NOT OTHERWISE STATED																																									
SNAP NATIONAL	(g)	National Total for the entire territory (1997 Guidelines)		225.06	720.31	154.14	26.41	63.94	91.34	45.53	26.12	13.57	1.08	0.98	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	42.62	NR	NR	NR	NR	8.87	45.41	NR	NR	NR	NR	NR	NR	NR	NR
GRID TOTAL	(h)	National Total for the EMEP grid domain		225.06	720.31	154.14	26.41	63.94	91.34	45.53	26.12	13.57	1.08	0.98	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	42.62	NR	NR	NR	NR	8.87	45.41	NR	NR	NR	NR	NR	NR	NR	NR
1 A 3 a i (	(a)	International Aviation (LTO)		0.84	0.79	0.31	0.06	0.00	0.07	0.07	0.07	0.00	0.00	0.00	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	NE	NR	NR	NR	NR	NE	**NE**	NR	NR	NR	NR	NR	NR	**NR**	**NR**
1 A 3 a i (	(a)	International Aviation (Cruise)		4.69	0.92	0.41	0.49	0.00	0.53	0.53	0.53	0.00	0.00	0.00	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	NE	NR	NR	NR	NR	NE	**NE**	NR	NR	NR	NR	NR	NR	**NR**	**NR**
1 A 3 d i (	(a)	International maritime Navigation		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	NO	NR	NR	NR	NR	NO	**NO**	NR	NR	NR	NR	NR	NR	**NR**	**NR**
1 A 3 d i (	(a)	International inland waterways (Included in NEC totals only)		**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NO**	**NR**	**NR**	**NR**	**NR**	**NO**	**NO**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**	**NR**
5 E	(a)	5 E Other		0.97	NA	124.62	NA	NA	NA	NA	NA	NA	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NA	NR	NR	NR	NR	NA	NA	NR	NR	NR	NR	NR	NR	NR	NR
X		X (11 08 Volcanoes)		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NO	NR	NR	NR	NR	NO	NO	NR	NR	NR	NR	NR	NR	NR	NR

(a) Sectors already reported to UNFCCC for NOx, CO, NMVOC, SO2.

(b) Including Product handling.

(c) Including NH3 from Enteric Fermentation.

(d) Including PM sources.

(e) Excludes waste incineration for energy (this is included in 1 A 1).

(f) Includes accidental fires.

(g) National Total refers to the territory declared upon ratification of the relevant Protocol of the Convention.

(h) EMEP grid domain is defined in the Emission Reporting Guidelines (ECE/EB.AIR/80/Annex V)

Note 1: Main Pollutants should cover the time span from 1980 to latest year.
HM should cover the time span from 1990 to latest year.
POPs should cover the time span from 1990 to the latest year.
PM should cover the time span from 2000 to latest year.

Note 2: The A=Allowable Aggregation illustrates the level of aggregation that can be used if more detailed information is not available.
Grey cells show which sectors can be aggregated into the sector marked A. Black cells occur when two possible levels of aggregation are possible.

Note 3: (1) The POPs listed in annex I to the Protocol on POPs are substances scheduled for elimination; DDT and PCBs are also listed in annex I;
(2) The POPs listed in annex II to the Protocol on POPs are substances scheduled for restrictions on use;
(3) The POPs listed in annex III to the Protocol on POPs are substances referred to in article 3, para. 5 (a), of the Protocol. Polycyclic aromatic hydrocarbons (PAHs): For the purpose of the emission inventories, the following four indicator compounds should be used: benzo(b)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene. HCB is also included in annex I to the Protocol as a substance for elimination.
(4) See article 8 of the Protocol (Research, development and monitoring; reporting voluntary).

Footnotes to NFR

FOOTNOTES IV 1: National sector emissions: Main pollutants, particulate matter (PM), heavy metals (HM) and persistent organic pollutants (POP).

Table IV 1 F1: Definition of Notation Keys

See: Chapter 1

Table 1 F2: Explanation to the Notation key NE

NFR code	Substance(s)	Reason for reporting NE
1.A.3.a i	DIOX, PAH, HCB	No measurements or emission factors available.
1.A.3.a ii	DIOX, PAH, HCB	No measurements or emission factors available.
1.A.3.e i	DIOX	No measurements or emission factors available. However, DIOX emissions from this category seem to be negligible (NA could be reported alternatively)
1.B.2.a.vi	all	no other emission sources from 1.B.2.a are known
4.F	TSP, PM10, PM2.5	No sufficient information.
6.C	TSP, PM10, PM2.5	No sufficient information.

Table IV 1 F3: Explanation to the Notation key IE

NFR code	Substance(s)	Included in NFR code
1.A.1.b	NMVOC	1 B 2 a iv
1.B.1.b	all	1 A 2 a
1 B 2 c	all	1 B 2 a i
2 A 5	NMVOC	3
2 A 6	NMVOC	3
2 B 1	NMVOC	2 B 5
2 C	NH3	1 A 2 a
4 B 7 Mules and Asses	NH3	4 B 6 Horses
4 D 1 ii Animal waste applied to soil	NH3	4 B 1 to 4 B13
4 D 2 pasture range and paddock	NOx, NH3, TSP, PM10, PM2.5	4 D 1

Table IV 1 F4: Sub-sources accounted for in reporting codes "other"

NFR code	Sub-source description	Substance(s) reported
1A2f		NOx, SO2, CO, NMVOC, NH3, TSP, PM10, PM2.5, PAH, HCB, DIOX, Cd, Hg, Pb
1A3 e	1 A 3 e i Pipeline compressors	NOx, CO, NMVOC, NH3, TSP, PM10, PM2.5, PAH, HCB
1A5a		
1A5b		
1B1 c		none
1B2 a vi		none
2 A 7	diffuse emissions from construction, mining and food production	TSP, PM10, PM2.5
2 B 5	emissions from other organic and inorganic chemical industries	NOx, CO, NMVOC, Sox, NH3, TSP, PM10, PM2.5, Pb, Cd, Hg
2 G	emissions from use of NH3 as refrigerant	NH3
3 D		
4 B 13	wild animals, mainly deer (pasture)	NH3
4 G	particle emissions from animal husbandry	TSP, PM10, PM2.5
6 D		
7		
5E		

Table IV 1 F5: Basis for estimating emissions from mobile sources. Please tick off with X.

NFR code	Description	Fuel sold	Fuel used	Comment
1 A 3 a i (i)	International Aviation (LTO)	x		
1 A 3 a i (ii)	International Aviation (Cruise)	x		
1 A 3 a ii (i)	1 A 3 a ii Civil Aviation (Domestic, LTO)	x		
1 A 3 a ii (ii)	1 A 3 a ii Civil Aviation (Domestic, Cruise)	x		
1A3b	Road transport	x		
1A3c	Railways	x		
1A3di (i)	International maritime Navigation			
1A3di (ii)	International inland waterways (Included in NEC totals only)			
1A3dii	National Navigation	x		
1A4ci	Agriculture	x		
1A4cii	Off-road Vehicles and Other Machinery	x		
1A4ciii	National Fishing	x		
1 A 5 b	Other, Mobile (Including military)	x		

Austria's emissions for SO_2, NO_x, NMVOC and NH_3 according to the submission under NEC directive

The following table presents Austria's emissions based on fuel used – thus excluding 'fuel tourism'[61] – as submitted under Directive 2001/81/EC.

Table A-1: Austria's emissions 1990–2005 without 'fuel tourism' according to Directive 2001/81/EC, Article 8 (1)

	SO_2 [Gg]	NO_x [Gg]	NMVOC [Gg]	NH_3 [Gg]
1990	74.77	220.84	285.02	68.81
1991	71.38	217.23	269.00	70.08
1992	54.96	208.13	242.06	67.85
1993	53.20	199.70	238.42	68.04
1994	47.60	195.86	220.52	69.14
1995	46.64	189.72	218.60	70.73
1996	44.17	186.71	211.15	69.05
1997	40.16	189.06	197.97	69.23
1998	35.06	182.43	181.41	69.21
1999	33.41	178.98	170.02	67.98
2000	30.96	172.70	168.45	66.27
2001	32.43	172.16	170.35	66.03
2002	31.25	168.52	163.36	64.73
2003	31.87	168.11	158.60	64.61
2004	27.20	162.04	153.18	63.86
2005	26.35	159.17	149.85	63.65
Ceilings 2010	39.00	103.00	159.00	66.00

[61] For information regarding fuel tourism please refer to Chapter 1.7 Completeness

Emission Trends per Sector

Table A-2: Emission trends for SO_2 [Gg] 1980–2005

	NFR-Sectors										
year	1	1 A	1 B	2	3	4	5	6	7		
	ENERGY	FUEL COMBUSTION ACTIVITIES	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	SOLVENT AND OTHER PRODUCT USE	AGRICULTURE	LAND USE CHANGE AND FORESTRY	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1980	330.27	327.71	2.56	13.14	NA	0.04	NE	0.41	NO	343.86	0.12
1981	287.92	286.02	1.89	13.02	NA	0.04	NE	0.41	NO	301.38	0.13
1982	273.70	271.96	1.75	12.89	NA	0.04	NE	0.41	NO	287.05	0.12
1983	198.96	197.37	1.59	12.77	NA	0.04	NE	0.41	NO	212.19	0.15
1984	181.82	180.15	1.67	12.65	NA	0.04	NE	0.41	NO	194.93	0.20
1985	166.33	164.80	1.53	12.07	NA	0.05	NE	0.41	NO	178.86	0.21
1986	147.78	146.32	1.46	11.28	NA	0.04	NE	0.41	NO	159.52	0.19
1987	126.88	125.36	1.52	10.28	NA	0.04	NE	0.41	NO	137.61	0.21
1988	98.44	96.80	1.65	3.92	NA	0.05	NE	0.22	NO	102.64	0.23
1989	88.68	86.95	1.73	3.31	NA	0.05	NE	0.14	NO	92.18	0.28
1990	71.92	69.92	2.00	2.22	NA	0.00	NE	0.07	NO	74.22	0.28
1991	69.39	68.09	1.30	1.90	NA	0.00	NE	0.06	NO	71.35	0.32
1992	53.20	51.20	2.00	1.67	NA	0.00	NE	0.04	NO	54.91	0.34
1993	51.85	49.75	2.10	1.42	NA	0.00	NE	0.04	NO	53.32	0.36
1994	46.09	44.81	1.28	1.42	NA	0.00	NE	0.05	NO	47.56	0.38
1995	45.39	43.86	1.53	1.37	NA	0.00	NE	0.05	NO	46.81	0.42
1996	43.31	42.11	1.20	1.29	NA	0.00	NE	0.05	NO	44.66	0.47
1997	39.03	38.97	0.07	1.27	NA	0.00	NE	0.05	NO	40.35	0.48
1998	34.33	34.29	0.04	1.18	NA	0.00	NE	0.05	NO	35.56	0.50
1999	32.56	32.42	0.14	1.12	NA	0.00	NE	0.06	NO	33.74	0.49
2000	30.27	30.12	0.15	1.09	NA	0.00	NE	0.06	NO	31.41	0.53
2001	31.75	31.59	0.16	1.21	NA	0.00	NE	0.06	NO	33.02	0.52
2002	30.65	30.51	0.14	1.21	NA	0.00	NE	0.06	NO	31.92	0.48
2003	31.36	31.21	0.15	1.21	NA	0.00	NE	0.06	NO	32.63	0.41
2004	25.98	25.84	0.14	1.22	NA	0.00	NE	0.06	NO	27.26	0.49
2005	25.13	25.00	0.13	1.22	NA	0.00	NE	0.06	NO	26.41	0.55

Table A-3:Emission trends for NO_X [Gg] 1980–2005

	NFR-Sectors										
year	1	1 A	1 B	2	3	4	5	6	7		
	ENERGY	FUEL COMBUSTION ACTIVITIES	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	SOLVENT AND OTHER PRODUCT USE	AGRICULTURE	LAND USE CHANGE AND FORESTRY	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1980	226.91	226.91	IE	13.98	NA	6.66	NE	0.25	NO	**247.81**	1.15
1981	213.37	213.37	IE	12.71	NA	6.63	NE	0.25	NO	**232.96**	1.25
1982	210.19	210.19	IE	11.45	NA	6.80	NE	0.25	NO	**228.70**	1.15
1983	213.55	213.55	IE	10.27	NA	6.91	NE	0.25	NO	**230.99**	1.44
1984	214.52	214.52	IE	9.07	NA	7.04	NE	0.25	NO	**230.88**	1.94
1985	219.95	219.95	IE	7.88	NA	7.06	NE	0.25	NO	**235.15**	2.11
1986	214.81	214.81	IE	6.68	NA	6.95	NE	0.25	NO	**228.70**	1.87
1987	212.94	212.94	IE	5.49	NA	7.19	NE	0.25	NO	**225.88**	2.07
1988	208.75	208.75	IE	5.27	NA	7.14	NE	0.17	NO	**221.33**	2.28
1989	203.65	203.65	IE	4.99	NA	6.92	NE	0.13	NO	**215.70**	2.79
1990	200.09	200.09	IE	4.80	NA	6.09	NE	0.10	NO	**211.07**	2.77
1991	211.45	211.45	IE	4.48	NA	6.32	NE	0.09	NO	**222.34**	3.12
1992	198.87	198.87	IE	4.55	NA	5.96	NE	0.06	NO	**209.44**	3.40
1993	194.58	194.58	IE	1.98	NA	5.72	NE	0.05	NO	**202.33**	3.61
1994	186.26	186.26	IE	1.92	NA	6.13	NE	0.04	NO	**194.36**	3.77
1995	184.38	184.38	IE	1.46	NA	6.19	NE	0.05	NO	**192.07**	4.23
1996	204.77	204.77	IE	1.42	NA	5.86	NE	0.05	NO	**212.10**	4.66
1997	191.86	191.86	IE	1.50	NA	5.92	NE	0.05	NO	**199.32**	4.85
1998	204.55	204.55	IE	1.46	NA	5.92	NE	0.05	NO	**211.98**	5.01
1999	192.58	192.58	IE	1.44	NA	5.76	NE	0.05	NO	**199.83**	4.92
2000	197.62	197.62	IE	1.54	NA	5.61	NE	0.05	NO	**204.82**	5.36
2001	206.59	206.59	IE	1.57	NA	5.57	NE	0.05	NO	**213.78**	5.21
2002	212.71	212.71	IE	1.63	NA	5.51	NE	0.05	NO	**219.90**	4.88
2003	222.48	222.48	IE	1.34	NA	5.41	NE	0.05	NO	**229.28**	4.17
2004	218.04	218.04	IE	1.28	NA	5.26	NE	0.05	NO	**224.63**	4.90
2005	218.50	218.50	IE	1.29	NA	5.22	NE	0.05	NO	**225.06**	5.53

Table A-4:Emission trends for NMVOC [Gg] 1980–2005

	NFR-Sectors										
year	1	1 A	1 B	2	3	4	5	6	7		
	ENERGY	FUEL COMBUSTION ACTIVITIES	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	SOLVENT AND OTHER PRODUCT USE	AGRICULTURE	LAND USE CHANGE AND FORESTRY	WASTE	OTHER	**NATIONAL TOTAL**	International Bunkers
1980	198.71	185.97	12.74	17.73	210.53	4.55	NE	0.16	NO	**431.68**	0.13
1981	198.88	186.64	12.24	17.12	187.39	4.48	NE	0.16	NO	**408.03**	0.14
1982	197.85	186.31	11.53	16.76	184.22	4.60	NE	0.16	NO	**403.60**	0.13
1983	200.06	188.71	11.35	16.24	181.11	4.51	NE	0.16	NO	**402.09**	0.16
1984	203.60	192.10	11.50	15.73	178.05	4.57	NE	0.16	NO	**402.12**	0.22
1985	203.00	191.48	11.52	15.21	172.82	4.61	NE	0.16	NO	**395.80**	0.24
1986	198.27	186.67	11.60	14.83	171.65	4.52	NE	0.16	NO	**389.42**	0.21
1987	196.85	185.09	11.76	14.36	170.50	4.54	NE	0.16	NO	**386.41**	0.23
1988	182.93	171.27	11.67	14.57	169.36	4.66	NE	0.16	NO	**371.67**	0.26
1989	171.89	159.98	11.91	14.54	148.42	4.61	NE	0.16	NO	**339.63**	0.32
1990	154.68	142.47	12.22	11.10	116.95	1.85	NE	0.16	NO	**284.74**	0.31
1991	157.33	144.16	13.16	12.58	100.08	1.84	NE	0.16	NO	**271.99**	0.35
1992	145.16	132.04	13.12	13.78	82.33	1.78	NE	0.15	NO	**243.21**	0.38
1993	139.41	126.55	12.86	15.05	82.43	1.75	NE	0.15	NO	**238.79**	0.41
1994	127.44	117.19	10.26	13.57	77.06	1.81	NE	0.14	NO	**220.02**	0.44
1995	122.55	113.73	8.83	11.95	81.75	1.82	NE	0.13	NO	**218.19**	0.48
1996	121.14	113.24	7.90	10.37	78.07	1.80	NE	0.12	NO	**211.50**	0.57
1997	103.37	96.01	7.37	9.06	82.93	1.88	NE	0.12	NO	**197.37**	0.63
1998	97.50	91.65	5.85	7.71	75.54	1.84	NE	0.11	NO	**182.71**	0.69
1999	92.48	87.35	5.13	6.04	69.96	1.88	NE	0.11	NO	**170.47**	0.67
2000	85.00	79.83	5.16	4.96	77.74	1.78	NE	0.10	NO	**169.58**	0.70
2001	83.44	80.13	3.31	4.38	82.63	1.86	NE	0.10	NO	**172.40**	0.68
2002	79.20	75.73	3.47	4.57	80.95	1.85	NE	0.10	NO	**166.68**	0.64
2003	77.35	73.91	3.44	4.26	79.27	1.73	NE	0.10	NO	**162.71**	0.54
2004	73.29	70.02	3.27	4.40	77.59	1.97	NE	0.09	NO	**157.34**	0.64
2005	72.01	68.92	3.09	4.40	75.77	1.87	NE	0.09	NO	**154.14**	0.72

Table A-5:Emission trends for NH_3 [Gg] 1980–2005

	NFR-Sectors										
year	**1**	**1 A**	**1 B**	**2**	**3**	**4**	**5**	**6**	**7**		
	ENERGY	**FUEL COMBUSTION ACTIVITIES**	**FUGITIVE EMISSIONS FROM FUELS**	**INDUSTRIAL PROCESSES**	**SOLVENT AND OTHER PRODUCT USE**	**AGRICULTURE**	**LAND USE CHANGE AND FORESTRY**	**WASTE**	**OTHER**	**NATIONAL TOTAL**	**International Bunkers**
1980	1.41	1.41	IE	0.31	NA	62.09	NE	0.01	NO	**63.81**	< 0.01
1981	1.32	1.32	IE	0.30	NA	62.88	NE	0.01	NO	**64.50**	< 0.01
1982	1.31	1.31	IE	0.29	NA	63.42	NE	0.01	NO	**65.02**	< 0.01
1983	1.28	1.28	IE	0.28	NA	64.86	NE	0.01	NO	**66.42**	< 0.01
1984	1.31	1.31	IE	0.29	NA	65.51	NE	0.01	NO	**67.11**	< 0.01
1985	1.35	1.35	IE	0.28	NA	65.14	NE	0.01	NO	**66.77**	< 0.01
1986	1.37	1.37	IE	0.26	NA	64.47	NE	0.01	NO	**66.10**	< 0.01
1987	1.37	1.37	IE	0.26	NA	64.76	NE	0.01	NO	**66.39**	< 0.01
1988	1.34	1.34	IE	0.28	NA	63.39	NE	0.01	NO	**65.02**	< 0.01
1989	1.36	1.36	IE	0.27	NA	63.54	NE	0.01	NO	**65.17**	< 0.01
1990	2.04	2.04	IE	0.27	NA	66.12	NE	0.38	NO	**68.81**	< 0.01
1991	2.50	2.50	IE	0.51	NA	66.78	NE	0.39	NO	**70.19**	< 0.01
1992	2.69	2.69	IE	0.37	NA	64.40	NE	0.45	NO	**67.91**	< 0.01
1993	2.96	2.96	IE	0.22	NA	64.34	NE	0.54	NO	**68.06**	< 0.01
1994	3.04	3.04	IE	0.17	NA	65.27	NE	0.62	NO	**69.10**	< 0.01
1995	3.08	3.08	IE	0.10	NA	66.86	NE	0.64	NO	**70.68**	< 0.01
1996	3.10	3.10	IE	0.10	NA	65.08	NE	0.67	NO	**68.94**	< 0.01
1997	2.99	2.99	IE	0.10	NA	65.35	NE	0.65	NO	**69.10**	< 0.01
1998	3.03	3.03	IE	0.10	NA	65.40	NE	0.67	NO	**69.20**	< 0.01
1999	2.93	2.93	IE	0.12	NA	64.15	NE	0.71	NO	**67.90**	< 0.01
2000	2.73	2.73	IE	0.10	NA	62.68	NE	0.73	NO	**66.24**	< 0.01
2001	2.79	2.79	IE	0.08	NA	62.47	NE	0.74	NO	**66.09**	< 0.01
2002	2.74	2.74	IE	0.06	NA	61.38	NE	0.76	NO	**64.95**	< 0.01
2003	2.76	2.76	IE	0.08	NA	61.19	NE	0.87	NO	**64.90**	< 0.01
2004	2.58	2.58	IE	0.06	NA	60.72	NE	0.80	NO	**64.16**	< 0.01
2005	2.49	2.49	IE	0.07	NA	60.39	NE	0.99	NO	**63.94**	< 0.01

Table A-6:Emission trends for CO [Gg] 1980–2005

	NFR-Sectors										
year	1	1 A	1 B	2	3	4	5	6	7		
	ENERGY	FUEL COMBUSTION ACTIVITIES	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	SOLVENT AND OTHER PRODUCT USE	AGRICULTURE	LAND USE CHANGE AND FORESTRY	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1980	1 688.5	1 688.5	IE	52.8	NA	31.1	NA	10.7	NO	1 783.2	0.35
1981	1 647.6	1 647.6	IE	50.7	NA	28.6	NA	10.8	NO	1 737.6	0.38
1982	1 623.7	1 623.7	IE	48.3	NA	32.9	NA	10.8	NO	1 715.7	0.35
1983	1 602.8	1 602.8	IE	47.9	NA	32.8	NA	10.8	NO	1 694.2	0.44
1984	1 649.1	1 649.1	IE	48.1	NA	35.1	NA	10.8	NO	1 743.0	0.59
1985	1 618.4	1 618.4	IE	46.7	NA	36.3	NA	10.7	NO	1 712.1	0.64
1986	1 556.7	1 556.7	IE	44.7	NA	33.2	NA	10.6	NO	1 645.2	0.57
1987	1 487.9	1 487.9	IE	44.9	NA	34.2	NA	10.6	NO	1 577.7	0.63
1988	1 380.6	1 380.6	IE	45.9	NA	38.2	NA	10.9	NO	1 475.6	0.69
1989	1 327.2	1 327.2	IE	46.3	NA	36.4	NA	11.3	NO	1 421.2	0.85
1990	1 161.8	1 161.8	IE	46.4	NA	1.2	NA	11.4	NO	1 220.8	0.85
1991	1 186.9	1 186.9	IE	41.7	NA	1.2	NA	11.3	NO	1 241.1	0.93
1992	1 139.9	1 139.9	IE	45.0	NA	1.1	NA	11.0	NO	1 197.0	1.01
1993	1 095.0	1 095.0	IE	47.2	NA	1.1	NA	10.9	NO	1 154.1	1.08
1994	1 041.6	1 041.6	IE	48.6	NA	1.2	NA	10.3	NO	1 101.7	1.14
1995	954.1	954.1	IE	45.1	NA	1.2	NA	9.7	NO	1 010.1	1.26
1996	971.3	971.3	IE	39.4	NA	1.2	NA	9.2	NO	1 021.1	1.41
1997	906.3	906.3	IE	38.3	NA	1.2	NA	8.7	NO	954.6	1.52
1998	870.4	870.4	IE	34.9	NA	1.2	NA	8.4	NO	914.9	1.62
1999	826.0	826.0	IE	30.6	NA	1.2	NA	8.1	NO	865.9	1.59
2000	766.0	766.0	IE	27.4	NA	1.1	NA	7.7	NO	802.3	1.65
2001	756.5	756.5	IE	24.2	NA	1.2	NA	7.4	NO	789.3	1.61
2002	723.5	723.5	IE	23.9	NA	1.2	NA	7.3	NO	755.8	1.51
2003	728.8	728.8	IE	23.6	NA	1.1	NA	7.4	NO	760.8	1.29
2004	705.0	705.0	IE	23.9	NA	1.7	NA	6.8	NO	737.4	1.51
2005	689.0	689.0	IE	23.9	NA	1.1	NA	6.3	NO	720.3	1.71

Table A-7:Emission trends for Cd [Mg] 1985–2005

	NFR-Sectors										
year	**1**	**1 A**	**1 B**	**2**	**3**	**4**	**5**	**6**	**7**		
	ENERGY	**FUEL COMBUSTION ACTIVITIES**	**FUGITIVE EMISSIONS FROM FUELS**	**INDUSTRIAL PROCESSES**	**SOLVENT AND OTHER PRODUCT USE**	**AGRICULTURE**	**LAND USE CHANGE AND FORESTRY**	**WASTE**	**OTHER**	**NATIONAL TOTAL**	**International Bunkers**
1985	2.08	2.08	NE	0.84	0.00	0.04	NE	0.14	NO	**3.10**	0.00
1986	1.82	1.82	NE	0.71	0.00	0.04	NE	0.12	NO	**2.70**	0.00
1987	1.41	1.41	NE	0.65	0.00	0.04	NE	0.10	NO	**2.21**	0.00
1988	1.19	1.19	NE	0.62	0.00	0.05	NE	0.08	NO	**1.94**	0.00
1989	1.06	1.06	NE	0.58	0.00	0.04	NE	0.06	NO	**1.74**	0.00
1990	1.06	1.06	NE	0.46	0.00	0.00	NE	0.06	NO	**1.57**	0.00
1991	1.09	1.09	NE	0.38	0.00	0.00	NE	0.05	NO	**1.52**	0.00
1992	0.97	0.97	NE	0.26	0.00	0.00	NE	0.01	NO	**1.24**	0.00
1993	0.93	0.93	NE	0.22	0.00	0.00	NE	0.00	NO	**1.16**	0.00
1994	0.87	0.87	NE	0.18	0.00	0.00	NE	0.00	NO	**1.06**	0.00
1995	0.80	0.80	NE	0.16	0.00	0.00	NE	0.00	NO	**0.97**	0.00
1996	0.84	0.84	NE	0.15	0.00	0.00	NE	0.00	NO	**0.99**	0.00
1997	0.81	0.81	NE	0.16	0.00	0.00	NE	0.00	NO	**0.97**	0.00
1998	0.73	0.73	NE	0.16	0.00	0.00	NE	0.00	NO	**0.89**	0.00
1999	0.81	0.81	NE	0.17	0.00	0.00	NE	0.00	NO	**0.98**	0.00
2000	0.75	0.75	NE	0.18	0.00	0.00	NE	0.00	NO	**0.93**	0.00
2001	0.80	0.80	NE	0.18	0.00	0.00	NE	0.00	NO	**0.99**	0.00
2002	0.81	0.81	NE	0.19	0.00	0.00	NE	0.00	NO	**1.00**	0.00
2003	0.83	0.83	NE	0.19	0.00	0.00	NE	0.00	NO	**1.03**	0.00
2004	0.83	0.83	NE	0.20	0.00	0.00	NE	0.00	NO	**1.03**	0.00
2005	0.86	0.86	NE	0.22	0.00	0.00	NE	0.00	NO	**1.08**	0.00

Table A-8:Emission trends for Hg [Mg] 1985–2005

	NFR-Sectors										
year	**1**	**1 A**	**1 B**	**2**	**3**	**4**	**5**	**6**	**7**		
	ENERGY	**FUEL COMBUSTION ACTIVITIES**	**FUGITIVE EMISSIONS FROM FUELS**	**INDUSTRIAL PROCESSES**	**SOLVENT AND OTHER PRODUCT USE**	**AGRICULTURE**	**LAND USE CHANGE AND FORESTRY**	**WASTE**	**OTHER**	**NATIONAL TOTAL**	**International Bunkers**
1985	2.98	2.98	NE	0.67	NA	0.01	NE	0.09	NO	**3.74**	0.00
1986	2.60	2.60	NE	0.63	NA	0.01	NE	0.08	NO	**3.32**	0.00
1987	2.16	2.16	NE	0.61	NA	0.01	NE	0.07	NO	**2.84**	0.00
1988	1.78	1.78	NE	0.59	NA	0.01	NE	0.06	NO	**2.45**	0.00
1989	1.59	1.59	NE	0.58	NA	0.01	NE	0.06	NO	**2.24**	0.00
1990	1.56	1.56	NE	0.53	NA	0.00	NE	0.05	NO	**2.14**	0.00
1991	1.50	1.50	NE	0.49	NA	0.00	NE	0.05	NO	**2.04**	0.00
1992	1.18	1.18	NE	0.44	NA	0.00	NE	0.02	NO	**1.64**	0.00
1993	0.95	0.95	NE	0.41	NA	0.00	NE	0.02	NO	**1.39**	0.00
1994	0.76	0.76	NE	0.40	NA	0.00	NE	0.02	NO	**1.18**	0.00
1995	0.71	0.71	NE	0.47	NA	0.00	NE	0.02	NO	**1.20**	0.00
1996	0.71	0.71	NE	0.43	NA	0.00	NE	0.02	NO	**1.16**	0.00
1997	0.69	0.69	NE	0.43	NA	0.00	NE	0.02	NO	**1.14**	0.00
1998	0.60	0.60	NE	0.33	NA	0.00	NE	0.01	NO	**0.95**	0.00
1999	0.65	0.65	NE	0.28	NA	0.00	NE	0.01	NO	**0.94**	0.00
2000	0.64	0.64	NE	0.24	NA	0.00	NE	0.01	NO	**0.90**	0.00
2001	0.71	0.71	NE	0.24	NA	0.00	NE	0.01	NO	**0.96**	0.00
2002	0.67	0.67	NE	0.26	NA	0.00	NE	0.01	NO	**0.94**	0.00
2003	0.69	0.69	NE	0.26	NA	0.00	NE	0.01	NO	**0.96**	0.00
2004	0.66	0.66	NE	0.27	NA	0.00	NE	0.02	NO	**0.95**	0.00
2005	0.65	0.65	NE	0.30	NA	0.00	NE	0.02	NO	**0.98**	0.00

Table A-9:Emission trends for Pb [Mg] 1985–2005

	NFR-Sectors										
year	**1**	**1 A**	**1 B**	**2**	**3**	**4**	**5**	**6**	**7**		
	ENERGY	**FUEL COMBUSTION ACTIVITIES**	**FUGITIVE EMISSIONS FROM FUELS**	**INDUSTRIAL PROCESSES**	**SOLVENT AND OTHER PRODUCT USE**	**AGRICULTURE**	**LAND USE CHANGE AND FORESTRY**	**WASTE**	**OTHER**	**NATIONAL TOTAL**	**International Bunkers**
1985	258.11	258.11	NE	62.45	0.06	0.23	NE	5.85	NO	**326.70**	0.00
1986	255.02	255.02	NE	52.38	0.06	0.21	NE	5.27	NO	**312.94**	0.00
1987	249.21	249.21	NE	47.85	0.06	0.22	NE	4.69	NO	**302.04**	0.00
1988	224.18	224.18	NE	45.16	0.07	0.24	NE	2.59	NO	**272.23**	0.00
1989	195.69	195.69	NE	41.74	0.07	0.23	NE	1.64	NO	**239.36**	0.00
1990	173.66	173.66	NE	32.09	0.07	0.01	NE	1.02	NO	**206.85**	0.00
1991	143.23	143.23	NE	27.09	0.06	0.01	NE	0.78	NO	**171.17**	0.00
1992	100.14	100.14	NE	18.61	0.06	0.01	NE	0.49	NO	**119.30**	0.00
1993	70.19	70.19	NE	15.15	0.05	0.01	NE	0.38	NO	**85.78**	0.00
1994	47.05	47.05	NE	12.03	0.05	0.01	NE	0.27	NO	**59.40**	0.00
1995	11.33	11.33	NE	4.68	0.04	0.01	NE	0.01	NO	**16.08**	0.00
1996	11.18	11.18	NE	4.26	0.04	0.01	NE	0.01	NO	**15.50**	0.00
1997	9.69	9.69	NE	4.79	0.04	0.01	NE	0.01	NO	**14.55**	0.00
1998	8.23	8.23	NE	4.70	0.04	0.01	NE	0.01	NO	**12.99**	0.00
1999	7.67	7.67	NE	4.91	0.04	0.01	NE	0.01	NO	**12.64**	0.00
2000	6.38	6.38	NE	5.48	0.04	0.01	NE	0.01	NO	**11.91**	0.00
2001	6.92	6.92	NE	5.35	0.04	0.01	NE	0.01	NO	**12.34**	0.00
2002	6.84	6.84	NE	5.65	0.04	0.01	NE	0.01	NO	**12.55**	0.00
2003	7.05	7.05	NE	5.68	0.04	0.01	NE	0.01	NO	**12.79**	0.00
2004	7.18	7.18	NE	5.90	0.04	0.01	NE	0.01	NO	**13.14**	0.00
2005	7.02	7.02	NE	6.49	0.03	0.01	NE	0.01	NO	**13.57**	0.00

Table A-10: Emission trends for PAH [Mg] 1985–2005

	NFR-Sectors										
year	**1**	**1 A**	**1 B**	**2**	**3**	**4**	**5**	**6**	**7**		
	ENERGY	**FUEL COMBUSTION ACTIVITIES**	**FUGITIVE EMISSIONS FROM FUELS**	**INDUSTRIAL PROCESSES**	**SOLVENT AND OTHER PRODUCT USE**	**AGRICULTURE**	**LAND USE CHANGE AND FORESTRY**	**WASTE**	**OTHER**	**NATIONAL TOTAL**	**International Bunkers**
1985	11.94	11.94	NE	7.88	0.15	7.07	NE	0.00	NO	**27.04**	NE
1986	11.27	11.27	NE	7.82	0.15	7.06	NE	0.00	NO	**26.31**	NE
1987	11.08	11.08	NE	7.91	0.15	7.06	NE	0.00	NO	**26.21**	NE
1988	9.94	9.94	NE	7.46	0.15	7.06	NE	0.00	NO	**24.61**	NE
1989	9.45	9.45	NE	7.57	0.15	7.06	NE	0.00	NO	**24.23**	NE
1990	9.44	9.44	NE	7.44	0.15	0.24	NE	0.00	NO	**17.27**	NE
1991	10.29	10.29	NE	7.18	0.15	0.24	NE	0.00	NO	**17.86**	NE
1992	9.36	9.36	NE	3.59	0.11	0.24	NE	0.00	NO	**13.30**	NE
1993	9.26	9.26	NE	0.52	0.07	0.24	NE	0.00	NO	**10.10**	NE
1994	8.37	8.37	NE	0.59	0.06	0.24	NE	0.00	NO	**9.26**	NE
1995	8.83	8.83	NE	0.49	0.04	0.24	NE	0.00	NO	**9.60**	NE
1996	9.56	9.56	NE	0.90	0.02	0.24	NE	0.00	NO	**10.71**	NE
1997	8.58	8.58	NE	0.47	0.01	0.23	NE	0.00	NO	**9.29**	NE
1998	8.28	8.28	NE	0.41	NA	0.23	NE	0.00	NO	**8.93**	NE
1999	8.32	8.32	NE	0.25	NA	0.23	NE	0.00	NO	**8.80**	NE
2000	7.73	7.73	NE	0.19	NA	0.23	NE	0.00	NO	**8.16**	NE
2001	8.51	8.51	NE	0.18	NA	0.23	NE	0.00	NO	**8.93**	NE
2002	8.17	8.17	NE	0.19	NA	0.23	NE	0.00	NO	**8.60**	NE
2003	8.33	8.33	NE	0.19	NA	0.23	NE	0.00	NO	**8.75**	NE
2004	8.16	8.16	NE	0.20	NA	0.29	NE	0.00	NO	**8.65**	NE
2005	8.45	8.45	NE	0.22	NA	0.20	NE	0.00	NO	**8.87**	NE

Table A-11: Emission trends for Dioxin [g] 1985–2005

	NFR-Sectors										
year	1	1 A	1 B	2	3	4	5	6	7		
	ENERGY	FUEL COMBUSTION ACTIVITIES	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	SOLVENT AND OTHER PRODUCT USE	AGRICULTURE	LAND USE CHANGE AND FORESTRY	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1985	109.55	109.55	NE	51.30	5.19	5.05	NE	15.90	NO	**186.98**	NE
1986	107.67	107.67	NE	51.02	6.20	5.05	NE	15.89	NO	**185.84**	NE
1987	115.67	115.67	NE	50.81	0.24	5.05	NE	15.89	NO	**187.67**	NE
1988	109.66	109.66	NE	41.60	1.06	5.05	NE	15.48	NO	**172.85**	NE
1989	101.49	101.49	NE	41.13	1.06	5.05	NE	15.29	NO	**164.02**	NE
1990	101.56	101.56	NE	39.00	1.06	0.18	NE	18.19	NO	**159.99**	NE
1991	80.65	80.65	NE	35.15	1.04	0.18	NE	17.75	NO	**134.77**	NE
1992	53.54	53.54	NE	21.89	0.02	0.18	NE	0.53	NO	**76.15**	NE
1993	49.15	49.15	NE	17.01	0.02	0.18	NE	0.22	NO	**66.58**	NE
1994	44.38	44.38	NE	11.26	NA	0.18	NE	0.08	NO	**55.90**	NE
1995	45.68	45.68	NE	12.23	NA	0.18	NE	0.08	NO	**58.17**	NE
1996	48.19	48.19	NE	11.17	NA	0.18	NE	0.08	NO	**59.62**	NE
1997	47.15	47.15	NE	12.15	NA	0.17	NE	0.08	NO	**59.55**	NE
1998	44.42	44.42	NE	11.45	NA	0.17	NE	0.08	NO	**56.12**	NE
1999	41.01	41.01	NE	12.60	NA	0.17	NE	0.08	NO	**53.86**	NE
2000	37.29	37.29	NE	14.05	NA	0.17	NE	0.08	NO	**51.60**	NE
2001	41.04	41.04	NE	13.55	NA	0.17	NE	0.08	NO	**54.84**	NE
2002	38.83	38.83	NE	3.24	NA	0.17	NE	0.08	NO	**42.32**	NE
2003	38.98	38.98	NE	2.98	NA	0.17	NE	0.12	NO	**42.25**	NE
2004	37.67	37.67	NE	3.30	NA	0.21	NE	0.16	NO	**41.34**	NE
2005	38.76	38.76	NE	3.54	NA	0.15	NE	0.17	NO	**42.62**	NE

Table A-12: Emission trends for HCB [kg] 1985–2005

	NFR-Sectors										
year	**1**	**1 A**	**1 B**	**2**	**3**	**4**	**5**	**6**	**7**		
	ENERGY	**FUEL COMBUSTION ACTIVITIES**	**FUGITIVE EMISSIONS FROM FUELS**	**INDUSTRIAL PROCESSES**	**SOLVENT AND OTHER PRODUCT USE**	**AGRICULTURE**	**LAND USE CHANGE AND FORESTRY**	**WASTE**	**OTHER**	**NATIONAL TOTAL**	**International Bunkers**
1985	83.08	83.08	NE	13.27	7.71	1.01	NE	1.11	NO	**106.18**	NE
1986	80.12	80.12	NE	13.21	8.12	1.01	NE	1.11	NO	**103.57**	NE
1987	82.88	82.88	NE	13.18	8.11	1.01	NE	1.11	NO	**106.29**	NE
1988	76.51	76.51	NE	11.16	8.22	1.01	NE	0.70	NO	**97.61**	NE
1989	72.54	72.54	NE	11.06	9.34	1.01	NE	0.52	NO	**94.48**	NE
1990	72.31	72.31	NE	9.71	9.05	0.04	NE	0.39	NO	**91.51**	NE
1991	69.52	69.52	NE	8.03	6.39	0.04	NE	0.28	NO	**84.25**	NE
1992	56.65	56.65	NE	4.94	7.49	0.04	NE	0.11	NO	**69.22**	NE
1993	53.42	53.42	NE	3.70	6.47	0.04	NE	0.04	NO	**63.68**	NE
1994	47.90	47.90	NE	2.45	1.25	0.04	NE	0.02	NO	**51.65**	NE
1995	50.12	50.12	NE	2.67	0.00	0.04	NE	0.02	NO	**52.84**	NE
1996	53.14	53.14	NE	2.44	0.00	0.04	NE	0.02	NO	**55.64**	NE
1997	49.12	49.12	NE	2.65	0.00	0.03	NE	0.02	NO	**51.83**	NE
1998	46.43	46.43	NE	2.50	0.00	0.03	NE	0.02	NO	**48.98**	NE
1999	44.89	44.89	NE	2.76	0.00	0.03	NE	0.02	NO	**47.70**	NE
2000	40.76	40.76	NE	3.07	0.00	0.03	NE	0.02	NO	**43.89**	NE
2001	44.96	44.96	NE	2.98	0.00	0.03	NE	0.02	NO	**47.99**	NE
2002	41.99	41.99	NE	3.17	NA	0.03	NE	0.02	NO	**45.21**	NE
2003	42.03	42.03	NE	3.18	NA	0.03	NE	0.02	NO	**45.27**	NE
2004	40.22	40.22	NE	3.30	NA	0.04	NE	0.03	NO	**43.59**	NE
2005	41.65	41.65	NE	3.69	NA	0.03	NE	0.03	NO	**45.41**	NE

Table A-13: Emission trends for TSP [Mg] 1990–2005

	NFR-Sectors										
year	1	1 A	1 B	2	3	4	5	6	7		
	ENERGY	FUEL COMBUSTION ACTIVITIES	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	SOLVENT AND OTHER PRODUCT USE	AGRICULTURE	LAND USE CHANGE AND FORESTRY	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1990	32 631	31 984	647	25 170	NA	33 603	NE	168	NO	91 572	307
1995	32 548	32 003	545	26 579	NA	29 325	NE	184	NO	88 636	456
2000	32 609	32 110	500	29 667	NA	31 903	NE	75	NO	94 255	530
2001	31 616	31 060	556	28 743	NA	29 145	NE	112	NO	89 616	576
2002	32 845	32 258	587	28 307	NA	31 137	NE	109	NO	92 398	560
2003	32 677	32 079	598	28 172	NA	30 635	NE	127	NO	91 611	524
2004	33 078	32 423	655	27 705	NA	28 365	NE	154	NO	89 303	448
2005	32 699	32 090	609	27 733	NA	33 995	NE	192	NO	94 619	526

Table A-14: Emission trends for PM 10 [Mg] 1990–2005

	NFR-Sectors										
year	1	1 A	1 B	2	3	4	5	6	7		
	ENERGY	FUEL COMBUSTION ACTIVITIES	FUGITIVE EMISSIONS FROM FUELS	INDUSTRIAL PROCESSES	SOLVENT AND OTHER PRODUCT USE	AGRICULTURE	LAND USE CHANGE AND FORESTRY	WASTE	OTHER	NATIONAL TOTAL	International Bunkers
1990	24 225	23 920	305	13 846	NA	9 440	NE	80	NO	47 592	307
1995	23 575	23 318	257	13 902	NA	8 728	NE	87	NO	46 292	456
2000	23 204	22 969	236	15 246	NA	9 678	NE	36	NO	48 164	530
2001	22 196	21 934	263	14 814	NA	8 457	NE	53	NO	45 520	576
2002	23 231	22 954	277	14 615	NA	8 971	NE	52	NO	46 868	560
2003	22 955	22 673	282	14 217	NA	8 832	NE	60	NO	46 064	524
2004	23 224	22 915	309	13 989	NA	8 639	NE	73	NO	45 925	448
2005	22 761	22 473	287	13 969	NA	9 761	NE	91	NO	46 581	526

Table A-15: Emission trends for PM 2.5 [Mg] 1990–2005

	NFR-Sectors										
year	**1**	**1 A**	**1 B**	**2**	**3**	**4**	**5**	**6**	**7**		
	ENERGY	**FUEL COMBUSTION ACTIVITIES**	**FUGITIVE EMISSIONS FROM FUELS**	**INDUSTRIAL PROCESSES**	**SOLVENT AND OTHER PRODUCT USE**	**AGRICULTURE**	**LAND USE CHANGE AND FORESTRY**	**WASTE**	**OTHER**	**NATIONAL TOTAL**	**International Bunkers**
1990	21 136	21 041	95	5 189	NA	2 256	NE	26	NO	28 606	307
1995	20 608	20 528	80	4 898	NA	2 033	NE	27	NO	27 566	456
2000	20 183	20 110	74	5 150	NA	2 188	NE	11	NO	27 532	530
2001	19 254	19 172	82	5 018	NA	1 989	NE	17	NO	26 277	576
2002	20 151	20 064	87	4 957	NA	2 094	NE	16	NO	27 218	560
2003	19 898	19 810	88	4 710	NA	2 057	NE	19	NO	26 685	524
2004	20 106	20 009	97	4 640	NA	1 964	NE	23	NO	26 733	448
2005	19 663	19 572	90	4 622	NA	2 249	NE	29	NO	26 562	526