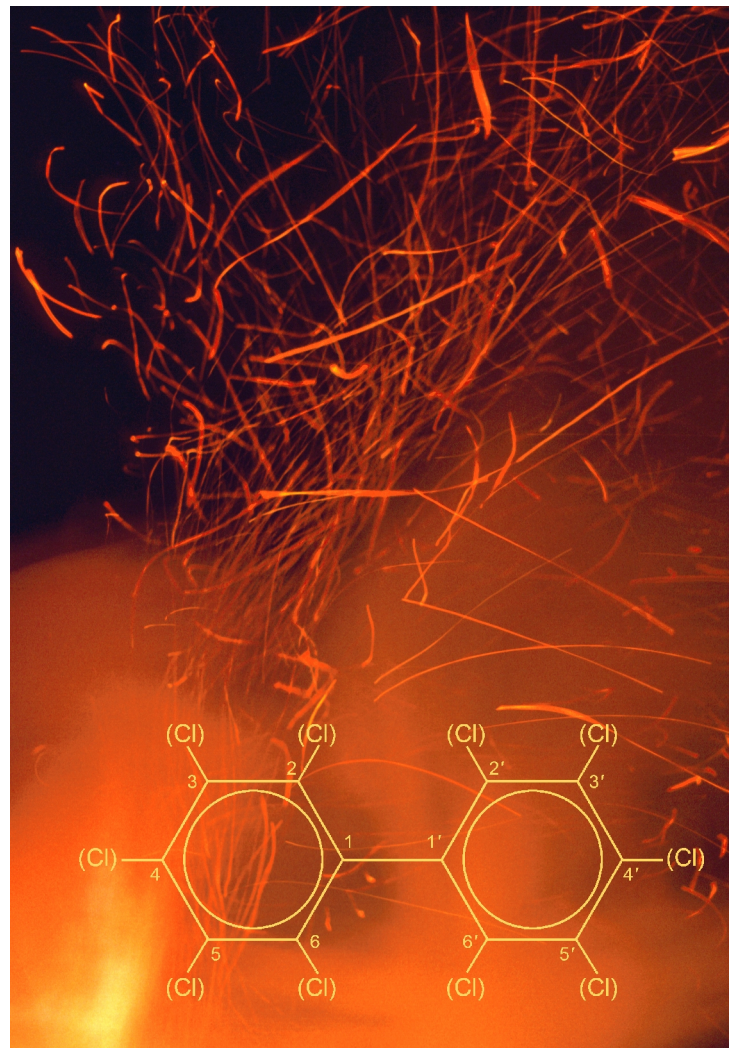


National Action Plan pursuant to Article 5 of the Stockholm Convention on POPs and Article 6 of the EU-POP Regulation





**NATIONAL ACTION PLAN PURSUANT TO
ARTICLE 5 OF THE STOCKHOLM
CONVENTION ON POPS AND ARTICLE 6
OF THE EU-POP REGULATION**



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The National Action Plan is part of the National Implementation Plan on POPs which has been published by the Federal Ministry of Agriculture, Forestry, Environment and Water Management. The National Implementation Plan contains a German summary of the National Action Plan.

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

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ISBN 3-85457-897-0

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EXECUTIVE SUMMARY

A) Introduction

The National Action Plan is part of the National Implementation Plan on POPs which has been published by the Federal Ministry of Agriculture, Forestry, Environment and Water Management. The National Implementation Plan contains a German summary of the National Action Plan.

Article 5 of the Stockholm Convention requires Parties to develop, within two years of entry into force for them, an Action Plan to identify, characterize and address the release of chemicals listed in Annex C. Currently listed are polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF), as well as hexachlorobenzene (HCB) and polychlorinated biphenyls (PCB) when produced unintentionally.

In line with the European POP-Regulation No. 850/2004 polyaromatic hydrocarbons (namely the substances benz(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene) shall be included in the Action Plan as well.

The Action Plan, which is to be part of a Party's national implementation plan to be developed pursuant to Article 7 of the Convention, will include strategies for meeting obligations to reduce or eliminate releases of chemicals listed in Annex C of the Stockholm Convention (including PAH as additional requirement from the EU-POP Regulation), and a schedule for the Action Plan. The plan will identify priorities for action, including for those source categories that provide the most cost-effective opportunities for release reduction or elimination. It will also include an inventory of releases of chemicals listed in Annex C.

The definition of the term "release" comprises emissions of POPs into air, water and soil as well as releases via residues and waste from processes and releases via products.

Relevant source categories are listed in annex C of the Stockholm Convention and include large point sources (such as waste incinerators and sinter plants) as well as small sources (such as residential combustion sources and crematoria).

Concerning emissions into air data quality is sufficient to establish an inventory for the POPs PCDD/F, PAH and HCB (in declining order with respect to data quality). However, due to a general lack of data this could not be achieved in the case of PCBs.

With respect to forecast of air emissions it should be mentioned that in order to comply with certain national and international obligations a variety of comprehensive and to some extent cross-sectoral measures and instruments are currently in development in Austria. These measures are aiming at the reduction of greenhouse gases, NO_x and (fine) particulate matter. Some of these measures – described e.g. in the Climate Strategy 2007 (Federal Ministry of Agriculture, Forestry, Environment and Water Management, 2007) – will lead to an indirect reduction of POPs releases (by e.g. reduction of energy consumption or prescription of stricter air emission limit values for dust), others (such as the increased use of biomass in small scale firing installations) will lead to an increase of POPs releases. Legally binding transposition of a variety of measures is still pending making a source specific forecast of POPs releases difficult.



Whereas data on environmental concentrations (e.g. water) is available for most of the substances of concern, few data are available concerning releases into water and waste. For the latter a plausible estimation of releases could be made for PCDD/F only.

Direct release of POPs into soil takes place from the source category „open burning of waste, including burning of landfill sites“ (this includes the burning of straw and stubble as well). However, if residues and waste from processes are brought back into the environment, releases of POPs may occur indirectly (e.g. when ashes from small scale residential combustion sources or biomass plants are used for fertilizing purposes).

Releases by accidents and releases from contaminated sites are not covered by this study. However, releases into air from accidental burning of landfill sites and intermediate storage sites for waste may be substantial.

There are some data available in the literature concerning concentrations of POPs in the products cement and pulp and paper which are presented in this report.

In general data quality is not sufficient in the case of PCBs to establish an inventory (air, water, soil, waste, products).

The National Action Plan will be reviewed and updated on a periodic basis.

B) Inventory of emissions into air

Dioxins and Furans (PCDD/F, I-TEQ)

In the year 2004 a total of 39.8 g **PCDD/F (I-TEQ)** were emitted in Austria from source categories listed in annex C of the Stockholm Convention. In the Austrian Air Emissions Inventory (OLI) PCDD/F emissions into air were calculated to be 40.7 g (I-TEQ, 2004). The difference can be explained by the fact, that the OLI is more comprehensive as far as activities are concerned. On the other hand some emission factors have been updated for the purpose of this report.

Only a few source categories contribute significantly to total emissions of dioxins and furans (PCDD/F), the most important being residential combustion sources with a share of 74% and thermal processes in the metallurgical sector with a share of 14%. Other sources are motor vehicles with 3.8%, biomass combustion (3.5%) and fossil fuel use in industry (2.6%) (see figure A and tables A and B).

In addition to that the following tables include a projection of the emissions for the year 2010. The projection is based on activity data from the Austrian energy projection (WIFO 2005). According to the projection total emissions will decrease to 36.8 g I-TEQ in the year 2010. Emission reductions will occur in sinter plants, residential combustion (due to less use of coal), mobile vehicles and fossil fuel fired boilers in industry and energy. Emissions will slightly increase in waste incineration, co-incineration in cement kilns and biomass combustion. This increase is the result of higher activity rates, it is assumed that emission concentrations remain unchanged (see specific chapters). The ranking of source categories remain unchanged.

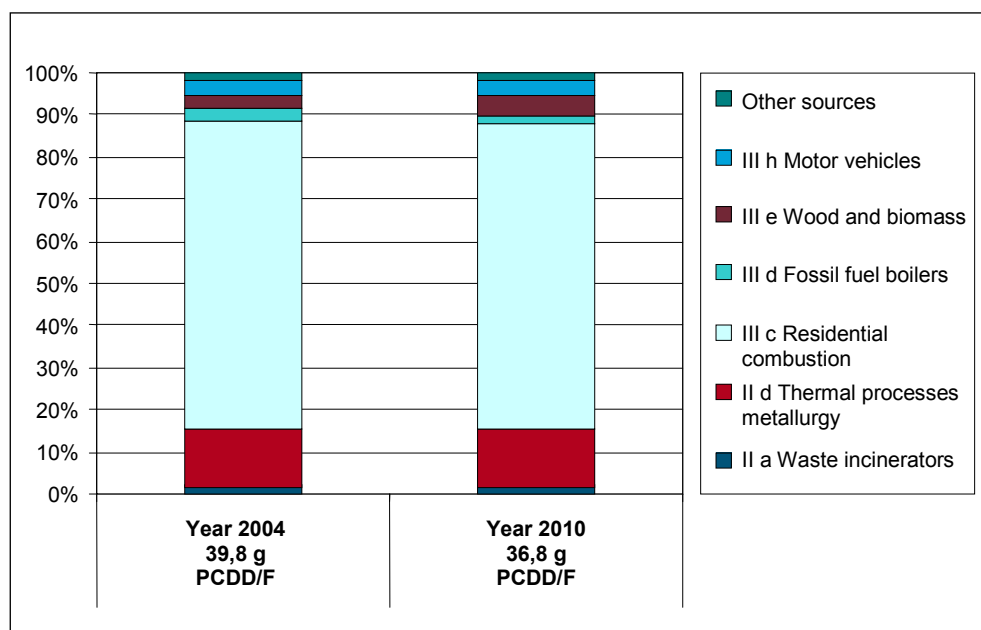


Figure A: Relevant source categories of PCDD/F (UMWELTBUNDESAMT 2006a, b; own calculation).

Table A: PCDD/F emissions from Source Categories Part II for 2004 and projection to 2010 (WIFO 2005, UMWELTBUNDESAMT 2006a, b; own calculation).

Source Category Part II	2004 [g I-TEQ]	2010 [g I-TEQ]
Waste incinerators, including co-incinerators of municipal, hazardous or medical waste or of sewage sludge	0.230	0.282
Cement kilns firing hazardous waste ¹	0.108	0.114
Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching ²	0.000	0.000
The following thermal processes in the metallurgical industry		
(i) Secondary copper production	0.512	0.512
(ii) Sinter plants in the iron and steel industry	3.040	2.300
(iii) Secondary aluminium production	1.813	1.813
(iv) Secondary zinc production	NO	NO
Total (Part II)	5.703	5.021

¹ figures represent total emissions from cement kilns

² only process emissions are covered here; PCDD/F emissions from combustion processes are included in fossil fuel fired utility and industrial boilers and in firing installations for wood and other biomass fuels.

NO: not occurring.



Table B: PCDD/F emissions from Source Categories Part III for 2004 and projection to 2010 (WIFO 2005, UMWELTBUNDESAMT 2006a, b; own calculation).

Source Category Part III	2004 [g I-TEQ]	2010 [g I-TEQ]
Open burning of waste	0.216	0.216
Thermal processes in the metallurgical industry not mentioned in Part II	0.375	0.499
Residential combustion sources	29.468	26.945
Fossil fuel-fired utility and industrial boilers	1.041	0.689
Firing installations for wood and other biomass fuels	1.374	1.917
Specific chemical production processes releasing unintentionally formed persistent organic pollutants, especially production of chlorophenols and chloranil	NA	NA
Crematoria	0.154	0.165
Motor vehicles, particularly those burning leaded gasoline	1.503	1.303
Destruction of animal carcasses	NA	NA
Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction)	NA	NA
Shredder plants for treatment of end of life vehicles	NA	NA
Smouldering of copper cables	NA	NA
Waste oil refineries	0.000	0.000
Total (Part III)	34.131	31.733

* without burning of landfill sites and accidental fires

NA: not available.

Hexachlorobenzene (HCB)

In 2004 total emissions of **HCB** came to 44.8 kg (see Table C, D and Figure B). Residential combustion sources had the lion's share of 88.7% and thermal processes in the metallurgical sector (predominantly sinter plants) had a combined 9%. The share of all other sources is below 1%.

According to the emission projection for the year 2010 total emissions will rise to 45.6 kg due to capacity increases in the metallurgical sector. Hence the share of this source category (IId in the figure below) will increase to 10.8% and the share of residential sources slightly decrease to 86.6%. Biomass combustion will become more important and will contribute 0.9% to total emissions.

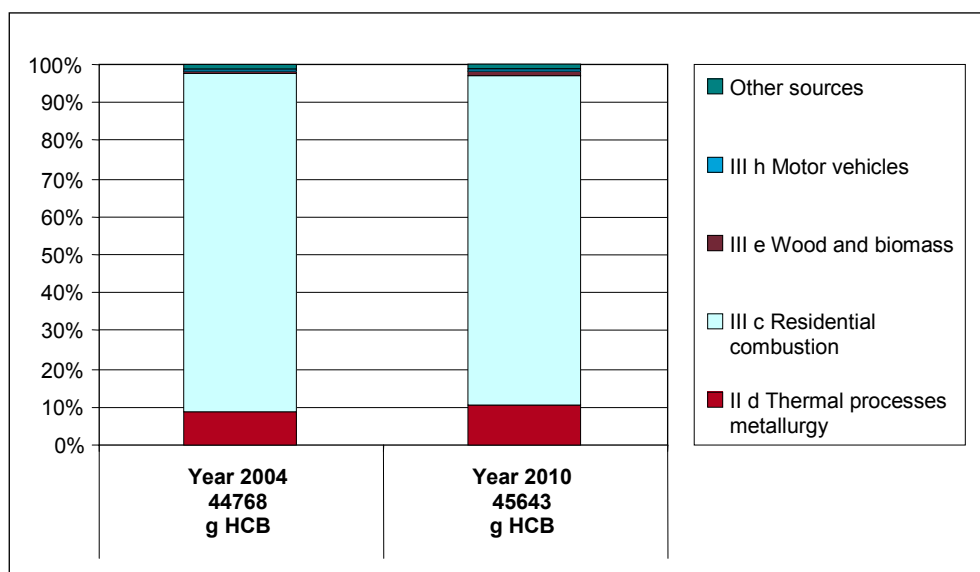


Figure B: Relevant source categories of HCB (UMWELTBUNDESAMT 2006a, b; own calculation).

Table C: HCB emissions from Source Category Part II for 2004 and projection to 2010 (UMWELTBUNDESAMT 2006a, b; own calculation).

Source Category Part II	2004 [kg HCB]	2010 [kg HCB]
Waste incinerators, including co-incinerators of municipal, hazardous or medical waste or of sewage sludge	0.196	0.282
Cement kilns firing hazardous waste ¹	0.016	0.020
Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching ²	0.000	0.000
The following thermal processes in the metallurgical industry		
(i) Secondary copper production	0.090	0.166
(ii) Sinter plants in the iron and steel industry	3.261	3.863
(iii) Secondary aluminium production	0.665	0.907
(iv) Secondary zinc production	NO	NO
Total (Part II)	4.230	5.211

¹ figures represent total emissions from cement kilns

² only process emissions are covered here; PCDD/F emissions from combustion processes are included in fossil fuel fired utility and industrial boilers and in firing installations for wood and other biomass fuels.

NO: not occurring.

Table D: HCB emissions from Source Category Part III for 2004 and projection to 2010 (UMWELTBUNDESAMT 2006a, b; own calculation).

Source Category Part III	2004 [kg HCB]	2010 [kg HCB]
Open burning of waste, including burning of landfill sites	0.043	0.043
Thermal processes in the metallurgical industry not mentioned in Part II	0.016	0.016
Residential combustion sources	39.722	39.509
Fossil fuel-fired utility and industrial boilers	0.192	0.147
Firing installations for wood and other biomass fuels	0.250	0.426
Specific chemical production processes releasing unintentionally formed persistent organic pollutants, especially production of chlorophenols and chloranil	NA	NA
Crematoria	0.015	0.032
Motor vehicles, particularly those burning leaded gasoline	0.300	0.258
Destruction of animal carcasses	NA	NA
Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction)	NA	NA
Shredder plants for treatment of end of life vehicles	NA	NA
Smouldering of copper cables	NA	NA
Waste oil refineries	NA	NA
Total (Part III)	40.538	40.432

NA: not available.

Polycyclic Aromatic Hydrocarbons (PAH)

In the year 2004 8,789 kg **PAH** were emitted in Austria. PAH emissions are mainly caused by two source categories (see Figure C, Table E and F). Residential combustion sources had the lion share of 73.9% and mobile vehicles a share of 20.1%. Other notable sources are open burning of waste (3.4%) and sinter plants (1.8%).

According to the emission projection for the year 2010 emissions from mobile vehicles will increase more strongly than those of residential sources. Hence the share of vehicles will increase to 20.8% and that of residential sources decrease to 73.3%. Overall emissions will increase to 9,130 kg. The shares of open burning of waste (3.2%) and sinter plants (1.6%) will diminish.

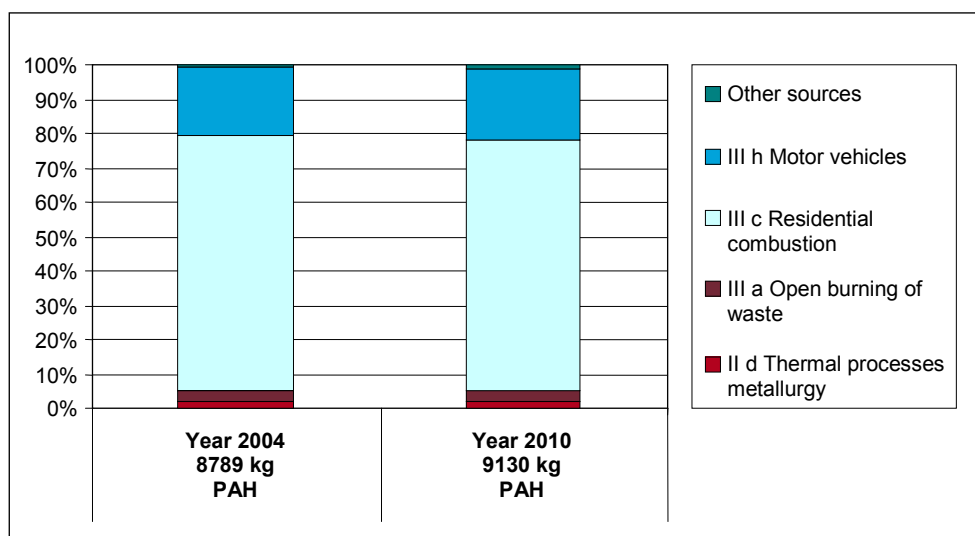


Figure C: Relevant source categories of PAH (UMWELTBUNDESAMT 2006a, b; own calculation).

Table E: PAH emissions from Source Category Part II for 2004 and projection to 2010 (UMWELTBUNDESAMT 2006a, b; own calculation).

Source Category Part II	2004 [kg PAH]	2010 [kg PAH]
Waste incinerators, including co-incinerators of municipal, hazardous or medical waste or of sewage sludge	11.7	12.1
Cement kilns firing hazardous waste ¹	2.5	2.8
Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching ²	0.0	0.0
The following thermal processes in the metallurgical industry		
(i) Secondary copper production	0.0	0.0
(ii) Sinter plants in the iron and steel industry	156.5	150.4
(iii) Secondary aluminium production	0.0	0.0
(iv) Secondary zinc production	NO	NO
Total (Part II)	170.7	165.3

¹ figures represent total emissions from cement kilns

² only process emissions are covered here; PCDD/F emissions from combustion processes are included in fossil fuel fired utility and industrial boilers and in firing installations for wood and other biomass fuels.

NO: not occurring.

Table F: PAH emissions from Source Category Part III for 2004 and projection to 2010 (UMWELTBUNDESAMT 2006a, b; own calculation).

Source Category Part III	2004 [kg PAH]	2010 [kg PAH]
Open burning of waste, including burning of landfill sites	295.6	295.6
Thermal processes in the metallurgical industry not mentioned in Part II	2.9	2.9
Residential combustion sources	6,494	6,695
Fossil fuel-fired utility and industrial boilers	22.3	11.4
Firing installations for wood and other biomass fuels	33.1	63.8
Specific chemical production processes releasing unintentionally formed persistent organic pollutants, especially production of chlorophenols and chloranil	NA	NA
Crematoria	0.0	0.0
Motor vehicles, particularly those burning leaded gasoline	1,770	1,894
Destruction of animal carcasses	NA	NA
Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction)	NA	NA
Shredder plants for treatment of end of life vehicles	NA	NA
Smouldering of copper cables	NA	NA
Waste oil refineries	NA	NA
Total (Part III)	8,618	8,964

NA: not available.

C) Inventory of emissions into water

Up to now data on POP emissions into ground and surface waters are limited which is in part due to the fact that emissions of POP into ground and surface water seem to be low in Austria.

Information on PAHs and HCB emissions into surface waters can be obtained in principle from the European Pollutant and Emission Register (EPER¹) which reports emissions from certain industrial installations. According to Austria's release data from EPER (basic year: 2004) there are no industrial facilities which exceed the release thresholds values for PAHs and HCB².

In 2004 a comprehensive assessment of pollutant emissions to ground and surface waters has been carried out within the characterisation of river basin districts according to Article 5 of the Water Framework Directive (WFD)³. HCB, Aldrin, Dieldrin, Endrin, DDT and HCH only were included in this exercise for surface waters because a previous prioritisation study has shown that emissions of other POP are of minor or no relevance⁴. In the report pursuant to Article 5 of the WFD only one water body with a potential risk with regard to HCB was identified due to a contaminated site.

¹ <http://www.eper.ec.europa.eu/eper>

² For dioxins and furans and PCBs no threshold values for water have been set in the Commission Decision 2000/479/EC of 17 July 2000 on the implementation of a European pollutant emission register (EPER).

³ EU Water Framework Directive 2000/60/EG, Österreichischer Bericht über die Ist-Bestandsaufnahme, BMLFUW 2005, p. 91ff.

⁴ Gefährliche Stoffe in Oberflächengewässern – Fachgrundlagen für österreichische Programme nach Artikel 7 der Richtlinie 76/464/EWG. Textband, BMLFUW 2002

For HCB a programme of measures for the reduction of emissions into surface waters was developed in 2002 (Implementation of Dangerous Substances Directive 76/464/EEC and daughter directives 86/280/EEC and 88/347/EEC) and updated in 2005 according to the results of the report pursuant to Article 5 of the WFD⁵.

For the purpose of the forementioned reports and programmes, except for EPER, only preliminary emission inventories have been used. A comprehensive permanent national emission inventory will become operative in the near future as part of the Water Information System Austria –WISA.

Another reason for the great uncertainties associated with water emission data is the fact, that most POPs are nearly insoluble in water. Acknowledging this, legally binding emission limit values are prescribed in certain cases only (such as for the wet treatment of flue gas from waste incineration).

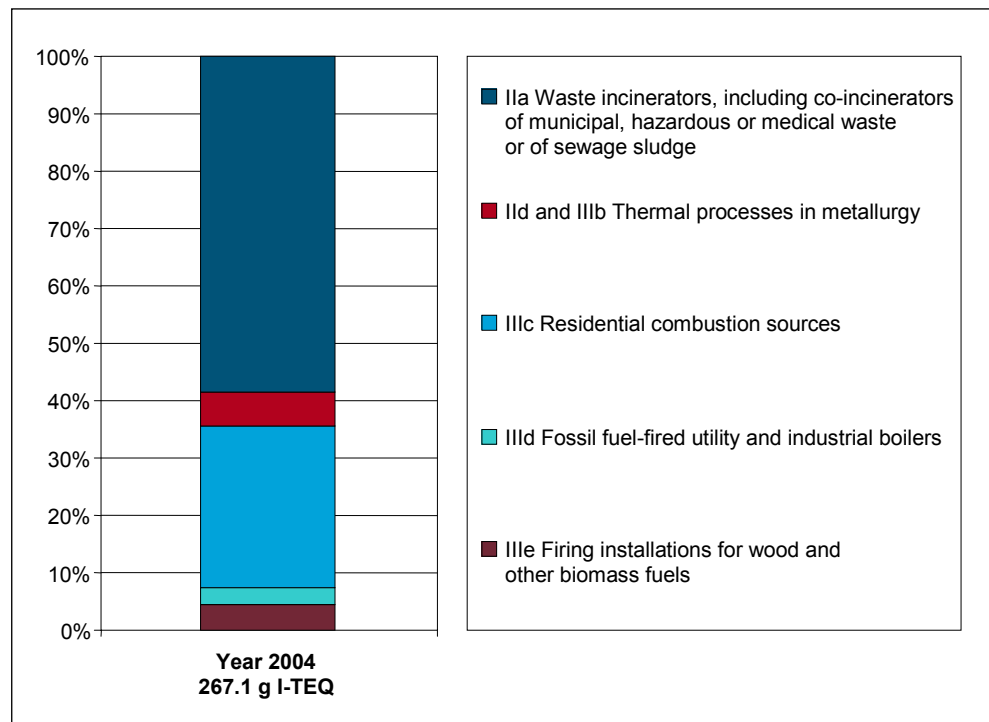
Furthermore possible emitters of POPs are equipped with a waste water treatment plant or discharge their waste water into a municipal waste water treatment plant. In both cases POPs are accumulating in the sludges and are released via them. Whenever these sludges are thermally treated (either externally or internally such as e.g. in fluidised bed boilers of the pulp and paper industry) it can be expected that POPs are oxidised and destroyed to the major extent.

Concerning contaminated sites it can be concluded that underground pollution by PAH causes in general only local impacts to soil and groundwater. Nevertheless it must be recognised that depending on the site-specific situation and interrelating to sensitive land uses risks to human health or to ecosystems need to be analysed. Regarding PCDD/F, HCB and PCB there are hardly any sites and data available on site pollution or wider environmental impacts.

D) Inventory of releases via residues and waste

An inventory of releases via residues and waste can only be established in the case of PCDD/F. In the year 2004 a total of 267.1 g PCDD/F I-TEQ were emitted, which is approximately seven times as much as the emissions to air. Solid waste from waste incineration contributes most (59%) to the overall releases. Waste from residential sources presents also a significant release (28%). Other releases come from thermal processes in the metallurgical sector and from fossil fuel and biomass combustion (see Figure D).

⁵ Dangerous Substances Directive 76/464/EEC, Austrian Report 1999–2001, BMLFUW 2002; Dangerous Substances Directive 76/464/EEC, Austrian Report 2002–2004, BMLFUW 2005



Note: Total releases may be higher since for many source categories (e.g. metallurgical sector) which have the potential of POPs releases via waste qualified emission factors are not available.

Figure D: Releases (although hardly bio-available) of PCDD/F via waste (own calculation).

However, there are **distinct differences** to other releases concerning uptake by organisms and impacts on human health: Many waste types are disposed off in landfills and thus removed from the regular material flow and are **not bio-available** anymore, provided that landfills are properly designed and operated:

Waste from waste incinerators are generally disposed off in landfills (landfills for residual waste, mass waste or underground disposal). 88% of PCDD/F releases occur via fly ash, which is often sent to underground disposal.

Very high PCDD/F concentrations could be found in the soot from small scale combustion sources. It is not known in detail how this type of waste is treated, but it is expected that the major part is disposed of via the typical municipal solid waste routes. In case of thermal treatment of municipal solid waste POPs will be either oxidised or – if they are captured in the ashes – send to landfills. In case of mechanical-biological treatment soot will accumulate in the fraction which is usually sent to landfills.

Waste from metallurgical processes – which is to some extent contaminated – are either send back to the process or to external treatment and/or disposal. There exist major data gaps with respect to concentrations of POPs and treatment of POP containing waste types.

Fly ash from thermal power plants is used in the cement and construction industry, whereas fly ash from biomass plants has to be disposed off in landfills.

Releases of POPs into the environment via waste can occur when POP containing waste types are brought back to the environment. This can be the case when ash from small scale firing installations (which can contain considerable high concentrations of POPs) is used for “fertilising” purposes or used as agent for sanding the sidewalks during winter season. Coarse ashes from biomass plants are used as additional material for preparing compost. In general there are also major data gaps concerning concentrations of POPs in ashes from residential combustion sources. Release estimations are associated with great uncertainties. Reasons for these uncertainties are (among others) the wide variety of type (including some types of waste) and quality of used fuels (e.g. water content, ash content, calorific value, chlorine content), the wide variety of firing systems with different combustion conditions and the wide variety of “local” factors (such as manual loading of the firing system, co-incineration of waste).

However, these releases are relevant because a certain part of this waste is re-transferred to the environment (e.g. when ash is used as “fertiliser” in private gardens).

E) Releases via products

Some data can be found in the literature regarding concentrations of PCDD/F in the sold products cement and pulp and paper (see Table G). Concerning the other POPs described in this report there are no proven data available.

However, for most source categories there are no relevant releases via the product.

Table G: PCDD/F-Releases via the products cement and pulp and paper – calculations were based on data from literature (KARSTENSEN 2006, UNEP 2005, GRUBER 1996).

	Release (g I-TEQ/a)
Cement	4.02
Paper	4.98
Pulp exported ¹	0.123

¹ Releases via pulp occur only via export; Releases via pulp which is not exported is included in the figure for paper

Concentrations of PCDD/F in cement are considered to be low and can be explained by the fact that filter dust from the clinker process (average PCDD/F concentration: 6.7 ng I-TEQ/kg) is added to the product and by the use of secondary raw materials (e.g. fly ash, gypsum from flue gas desulphurisation). On the other hand cement clinker itself is contaminated with low concentrations of PCDD/F (average: 0.9 ng I-TEQ/kg clinker) (KARSTENSEN 2006).

Here again, it has to be mentioned that the bio-availability of POPs in cement is greatly reduced.

In the case of the Pulp- and Paper production PCDD/F are introduced into the products mainly via the bleached (Kraft-)pulp and via the recycled papers.

Total releases via pulp came to 0.28 g in the year 2004 thereof 0.123 g I-TEQ were exported and the other part was used for paper production.

Relevant raw materials for paper production are pulp (both from national production and from import), wood pulp and recovered paper (either de-inked or not de-inked).

Whereas input from pulp and wood pulp is comparable low, input from recovered paper (more specific via the impurities in the used inks) may be more substantial:

In case de-inking is applied (about 40% of recovered paper is de-inked in Austria) PCDD/F will be reduced by a factor 3. Comparable high concentrations (up to 12 ng/kg) could be found in packaging papers and paper board in the early nineties. In general a sharp decline of the average concentrations could be observed between 1989 and 1994 whereas concentrations are slowly decreasing since then.

Based on that information and on data given in the dioxin toolkit total release via paper was estimated to be 4.98 g (reference year: 2004). The determination of POPs in packaging papers which get into contact with food merits further attention.

F) Evaluation of the efficacy of national laws and policies and strategies for meeting the obligations of the Stockholm Convention and the EU POP-Regulation

Considering the results of this report with respect to POPs release inventories, forecast of releases, availability of data, measures already in place or planned measures it can be concluded that Austria complies to a great extent with the provisions of the Stockholm Convention and the EU POP Regulation. Nevertheless, as one of the goals of the Convention is the “continuous reduction of POPs releases” further efforts are necessary.

POP emissions of major (industrial) sources have considerably declined in the past years. Still, if changes in the best available techniques allow for lower or zero emissions from relevant sources policy makers have to react and to adapt the relevant legal provisions (e.g. by laying down stricter emission limit values).

An important target area are small residential combustion plants which hold responsible for 74% of the PCDD/F emissions, 88.7% of the HCB emissions and 73.9% of the PAH emissions into air. All possible measures have to be investigated and exploited to reduce the POP emissions from these sources.

Another set of measures lies in the awareness-raising concerning (prohibited) waste incineration in household stoves or e.g. the use of ashes from these plants for fertilising purposes.

Further, it is important to gain deeper knowledge in fields where reliable data are limited or missing. Concrete studies e.g. with regard to POP concentrations in certain wastes as well as further POP related monitoring activities have been formulated below.

Proposed Measures (according to §20 (2) Chemicals Act 1996)

Releases of POPs from source categories

The following table contains an overview of the most relevant legislation with regard to the release of POPs and provides a short evaluation of the efficacy including concrete measures for meeting the obligations of the Stockholm Convention and the EU POP-Regulation. A detailed time schedule cannot be established for all measures as some responsibilities lie within the Federal Provinces.

National legislation	Contents with respect to POPs	Timetable/Concrete Steps
Emission Protection Act for Steam Boilers (Fed. Law Gaz. I No. 2004/150) and Clean Air Ordinance for Steam Boilers (Fed. Law Gaz. No. 1989/19 as amended by Fed. Law Gaz. II No. 2005/55)	ELVs for dust, CO, Corg, NO _x	Adaptation to BAT necessary (stricter ELVs for dust) Timetable: as soon as possible
<i>Industrial Code 1994 and specific ordinances</i>	ELV for various air pollutants	Continuous evaluation with regard to BAT necessary
Ordinance on combustion plants (Fed. Law Gaz. No. II 1997/331)	ELVs for dust, CO, Corg, NO _x	Adaptation to BAT necessary (stricter ELVs for dust), Timetable: amendment planned (draft sent out for comments in October 2007)
Ordinance on the production of iron and steel (Fed. Law Gaz. II No. 1997/160 amended by Fed. Law Gaz. II No. 2007/290)	ELVs for dust, CO, Corg, NO _x , heavy metals, PCDD/F	Adaptation to BAT by amendment in November 2007
Ordinance on sinter plants (Fed. Law Gaz. II No. 1997/163)	ELVs for dust, CO, Corg, NO _x , heavy metals, PCDD/F	Adaptation to BAT necessary (stricter ELVs for PCDD/F, dust) Timetable: amendment planned
Ordinance on non ferrous metals production (Fed. Law Gaz. II No. 1998/1 amended by Fed. Law Gaz. II No. 2008/86)	ELVs for dust, CO, Corg, NO _x , heavy metals, PCDD/F, benzo(a)pyrene	Adaptation to BAT by amendment in March 2008
Ordinance on foundries (Fed. Law Gaz. No. 1994/447)	ELVs for dust, CO, Corg, NO _x , VOCs	Continuous evaluation with regard to BAT necessary
Waste incineration ordinance (Fed. Law Gaz. II No. 2002/389)	ELVs for dust, CO, Corg, NO _x , heavy metals, PCDD/F	stricter ELVs for dust for co-incineration plants
<i>Austrian Water Act and specific Ordinances:</i>	ELVs for AOX and POX in the branch specific ordinances	
Ordinance on limitation of waste water emissions from flue gas treatment (Fed. Law Gaz. II No. 2003/271)	ELVs for PCDD/F	Continuous evaluation with regard to BAT
Ordinance on limitation of waste water emissions from processing of coal (Fed. Law Gaz. II No. 1997/346)	ELVs for PAHs	Continuous evaluation with regard to BAT
Ordinance on limitation of waste water emissions from the production of plant protecting agents and crop sprayings (Fed. Law Gaz. No. 1996/668)	ELVs for AOX and specific POPs	Continuous evaluation with regard to BAT
Ordinance on the determination of the target state for surface waters (Fed. Law Gaz. II No. 2006/96)	Environmental quality standard for HCB	For PAHs community environmental quality standards will be determined (presumably in 2008)



National legislation	Contents with respect to POPs	Timetable/Concrete Steps
<i>Other relevant legal provisions</i>		
Ordinance on landfills (Fed. Law Gaz. II 2008/39)	Limit values for the content of PAH in wastes	Recently amended
Compost Ordinance (Fed. Law Gaz. II No. 2001/292)	Limit values for the content of POPs in composts	Continuous evaluation of the limit values necessary
<i>Ordinances on sewage sludge and compost of the Federal Provinces</i>	Limit values for heavy metals	Continuous evaluation of the limit values necessary
<i>Ordinances of the Federal Provinces concerning the protection of soils</i>		Elaboration of target values for organic pollutants (including polybrominated diphenylethers, perfluorinated tensides and pesticides) with the aim to reduce pollution of soils
Air Quality Protection Act (IG-L)	§21 IG-L: Legal basis for an ordinance	Timetable: as soon as possible evaluation whether generally binding ELVs for crematoria in an ordinance according to § 21 IG-L are necessary
Laws of the Federal Provinces concerning residential combustion sources		Timetable: Agreement pursuant to Art. 15a Federal Constitution Law concerning the placing on the market and the inspection of combustion installations planned (draft sent out for comments in September 2006); rapid transposition of the requirements of this agreement into the law of the federal provinces (presumably in summer 2008)
Act on open burning of biogenic materials (Fed. Law Gaz. 1993/405)	Prohibition of burning of biogenic materials, many exemptions possible	Timetable: as soon as possible evaluation of the ordinance with respect to the exemptions
Permitting process	Contents with respect to POPs	Comments/Concrete Steps
<i>Landfill sites</i>	Fire protection requirements	Implementation of effective fire protection requirements for landfills and intermediate storage sites for waste

Bearing in mind that the sector **residential combustion** is responsible for 74% of the PCDD/F emissions into air the rapid implementation of the following measures is of utter importance:

- Establish compliance with the requirements of the agreement between the federal provinces pursuant to Article 15a Federal Constitution Law concerning the setting of consolidated quality standards to support the establishment and refurbishment of residential buildings for the purpose of the reduction of greenhouse gases. Timetable: as soon as possible.

- Effective financial funding of the exchange of coal fired small scale firing installations. Timetable: as soon as possible.
- Periodic review and improvement of the criteria for funding biomass plants (including biomass plants operated in the agricultural sector) with respect to operating conditions, energy efficiency (including district heating systems), quality of fuels and emission limit values for dust. Timetable: 2009
- Information campaign with respect to prevention of co-incineration of waste in small scale combustion installations).
- Information campaign with respect to final disposal of ashes/soot from small scale combustion installations (esp. in the sectors households and agriculture).
- Implementation of appropriate measures to support that the target value for Benz(a)pyrene in the ambient air ($1 \mu\text{g}/\text{m}^3$) will be kept. This target value will be transposed into an emission limit value as of 31.12.2012.

For the following sources availability of data is very limited or missing. Therefore, to assess whether releases of POPs are relevant and to improve and complete the Austria Inventories on POPs, the following **concrete steps to improve data quality** are desirable/necessary:

- Air emission measurements from secondary copper production (converter and anode furnace), secondary lead production and production of Nickel (i.a. to check compliance with BAT)
- Emission behaviour of small scale combustion installations (esp. in case of firing straw and cereals)
- Measurement of emissions of motor vehicles and update of emission factors to improve quality of forecasts
- Improvement of data quality with respect to releases of POPs from landfills and abandoned industrial sites and known contaminated sites (e.g. PAH content of landfill gases)
- Assessment of the contamination and treatment of waste and residues in non ferrous metals and secondary steel production as well as in sinter plants
- Determination of POP-concentrations in waste streams from from small scale combustion installations in the sectors residential combustion, services and agriculture which have a high probability to be released into the environment (e.g. bottom ash and fly ash)
- Determination of POP-concentrations in waste streams from fossil fuel fired utility and industrial boilers (including co-incineration of waste) which are recovered in other production processes or which have a high probability to be released into the environment (e.g. fly ash from co-incineration plants)
- Determination of POP-concentrations in waste streams from from biomass fired combustion installations which are recovered in other production processes or which have a high probability to be released into the environment (e.g. bottom ash)
- Determination of concentrations of PCDD/F and relevant precursors especially in bleached (Kraft-)pulp (imported and domestic production), papers (packaging papers, paper boards, paper made from recovered fibres), colours and inks, de-inking sludge
- Quantification of POPs in filter dusts from the clinker process (Austrian cement kilns)
- Quantification of POPs emissions (esp. PCDD/F and PCB) of the Platformer 3 of the OMV refinery in Schwechat

A time schedule for the above activities cannot be given. However, Austria seeks to close all the mentioned data gaps until the revision of the National Action Plan (subject to financial capabilities).

Data availability on POP emissions into the environment

The following table lists concrete measures to improve quality of available data regarding POPs emissions into the environment:

Concrete Steps	Timetable
Improvement of data quality with respect to releases of HCB and PCB into air (e.g. by planning and carrying out measurement programmes for sources with high priority, such as residential combustion sources, industrial processes).	2008 – review of available (literature) data, identification of (suspected) relevant sources
Establishment of monitoring programmes in the neighbourhood of POP relevant emitters	2008 – identification of relevant sites for sampling 2008/09 – sampling and measurements (winter/summer)
Continuation of monitoring programmes using Norway spruce needles close to POP sources	continued sampling and start of analysis in 2008

Data availability on POP concentrations in the environment

The following table lists concrete measures to improve quality of available data regarding POPs concentrations in the environment:

Concrete Steps	Timetable
Continuation of ambient air and deposition monitoring for POPs at Alpine summits (Sonnblick)	Continued sampling
Submission of the application of a follow-up project to MONARPOP with the following additional main targets: <ul style="list-style-type: none"> • Studying POP accumulation across alpine food chains • Completion of the regional coverage of the Alps • Inclusion of passive sampling techniques and bridge building measures to other monitoring programmes • Modelling the POP load of the Alps • Various dissemination measures, from international ones (e.g. contributing to control instruments of the Stockholm Convention) to local ones (touring exhibitions) 	intended start of project in 2008
Development of transfer factors to improve knowledge of interrelations between POP concentrations in the environment and bioavailable concentrations.	2008 – establishment of scientific panel to elaborate study design
Development and adaptation of passive sampling methods to improve comparability of available data	2008 – Method/Instrument selection and development, pilot study 2009 – evaluation of pilot study and selection of appropriate method
Implementation of a national monitoring programme to investigate distribution of deposited POPs	2008 – selection of sampling sites 2009 – implementation



ZUSAMMENFASSUNG

A) Einleitung

Artikel 5 des Stockholmer Übereinkommens verpflichtet die Vertragsparteien spätestens zwei Jahre nach Inkrafttreten dieses Übereinkommens zur Erarbeitung eines Aktionsplanes, der die Freisetzung der in Anlage C genannten Chemikalien beschreibt und näher behandelt. In dieser Anlage sind folgende unbeabsichtigt aus anthropogenen Quellen freigesetzte Chemikalien enthalten: polychlorierte Dibenzodioxine (PCDD), polychlorierte Dibenzofurane (PCDF), Hexachlorbenzol (HCB) und polychlorierte Biphenyle (PCBs).

Ferner behandelt der Nationale Aktionsplan auch die Freisetzung von polyzyklischen aromatischen Kohlenwasserstoffen (Benzo(a)pyren, Benzo(b)fluoranthren, Benzo(k)fluoranthren und Indeno(1,2,3-cd)pyren), da diese in der EU-POP-Verordnung (EG) Nr. 850/2004 genannt sind.

Der Nationale Aktionsplan ist Teil des Nationalen Durchführungsplanes gemäß Artikel 7 des Übereinkommens und hat Strategien zur Verminderung oder Eliminierung der Freisetzung der in Anlage C genannten Chemikalien (einschließlich PAHs) sowie einen Zeitplan zu enthalten. Der Nationale Aktionsplan soll den möglichen Handlungsbedarf aufzeigen sowie Quellverzeichnisse und Emissionsabschätzungen für diese Chemikalien enthalten.

Die Bezeichnung „Freisetzung“ umfasst POP-Emissionen in Luft, Wasser und Boden sowie Freisetzungen über Abfälle, Rückstände und Produkte.

Die relevanten Quellkategorien sind in Anlage C des Stockholmer Übereinkommens angeführt und betreffen sowohl große Punktquellen (wie Abfallverbrennungsanlagen und Sinteranlagen) als auch kleine Verursacher (wie Kleinf Feuerungsanlagen und Krematorien).

Ein Quellverzeichnis für Emissionen von PCDD/F, PAHs und HCB in die Luft existiert, für PCBs ist dies aufgrund mangelnder Daten jedoch nicht möglich.

Zu einer Emissionsprognose ist anzumerken, dass derzeit in Österreich eine Vielzahl an umfassenden und zum Teil sektorübergreifenden Maßnahmen entwickelt wird, um nationale und internationalen Verpflichtungen im Bereich Klimaschutz sowie die Reduktion von Stickoxiden und Feinstaub betreffend erfüllen zu können. Einige dieser Maßnahmen werden zur Verminderung von POP-Freisetzungen führen (z. B. aufgrund von vermindertem Energieverbrauch oder strengerer Emissionsgrenzwerte für Staub), andere wiederum können auch eine Erhöhung der POP-Emissionen verursachen (z. B. vermehrter Einsatz von Biomasse in Kleinf Feuerungsanlagen). Eine rechtlich verbindliche Umsetzung einiger dieser Maßnahmen steht noch aus und erschwert deshalb eine quellspezifische Emissionsprognose.

Zur Freisetzung von POPs in das Wasser und in Abfälle existieren wenig Daten. In Bezug auf Abfälle kann lediglich für PCDD/F eine Abschätzung getroffen werden. Eine direkte Freisetzung von POPs in den Boden erfolgt durch die Quellkategorie „offene Verbrennung von Abfällen, einschließlich Verbrennung auf Deponien“ (dies beinhaltet auch die offene Verbrennung biogener Materialien wie etwa Stroh). Jedoch können auch POPs in den Boden freigesetzt werden, wenn Prozessrückstände wieder in die Umwelt gelangen (Beispiel: Verwendung von Asche aus Kleinf Feuerungsanlagen für Düngezwecke).



Freisetzungen aufgrund von Unfällen und aus kontaminierten Flächen werden im Nationalen Aktionsplan nicht behandelt. Sie können jedoch im Fall von Bränden in Deponien oder Abfallzwischenlagern beträchtlich sein.

Der Nationale Aktionsplan enthält weiters einige Literaturdaten zu Gehalten von POPs in den Produkten Zement, Zellstoff und Papier.

Für PCBs können aufgrund mangelnder verfügbarer Daten keine Quellverzeichnisse für Luft, Wasser, Boden, Abfall und Produkte erstellt werden.

B) Emissionsverzeichnis Luft

Dioxine und Furane (PCDD/F; I-TEQ)

Im Jahr 2004 wurden 39,8 g **PCDD/F (I-TEQ)** aus den in Anlage C des Stockholmer Übereinkommens angeführten Quellkategorien emittiert. Gemäß der Österreichischen Luftschadstoffinventur (OLI) betrug die PCDD/F-Emissionen in die Luft im Jahr 2004 40,7 g (I-TEQ). Diese Differenz ergibt sich einerseits durch den weiteren Anwendungsbereich der OLI, andererseits durch teilweise adaptierte Emissionsfaktoren, die für diesen Bericht verwendet wurden.

Einen wesentlichen Beitrag zur Emission von Dioxinen und Furanen liefern nur einige wenige Quellkategorien, am größten ist hierbei der Anteil der Kleinfeuerungsanlagen (häusliche Quellen) mit 74 % und jener der thermischen Prozesse in der metallurgischen Industrie mit 14 %. Andere Verursacher sind Kraftfahrzeuge (3,8 %), Verbrennung von Biomasse (3,5 %) und Einsatz von fossilen Brennstoffen in der Industrie (2,6 %) (siehe Abbildung A und Tabelle A und B).

Die folgenden Abbildungen enthalten weiters eine Emissionsprognose für das Jahr 2010, die auf der WIFO-Energieprognose (WIFO 2005) basiert. Die Gesamtemissionen werden sich dieser Prognose zufolge auf 36,8 g I-TEQ im Jahr 2010 vermindern. Emissionsreduktionen werden bei Sinteranlagen, Kleinfeuerungsanlagen (geringerer Einsatz von Kohle), Kraftfahrzeugen und Kesselanlagen für fossile Brennstoffe zu verzeichnen sein. In den Bereichen Abfallverbrennung, Mitverbrennungsanlagen in der Zementindustrie und Biomasseverbrennung wird es (aufgrund höherer Aktivitäten) zu einem geringen Anstieg der Emissionen kommen; die Reihung der Quellkategorien bleibt jedoch unverändert.

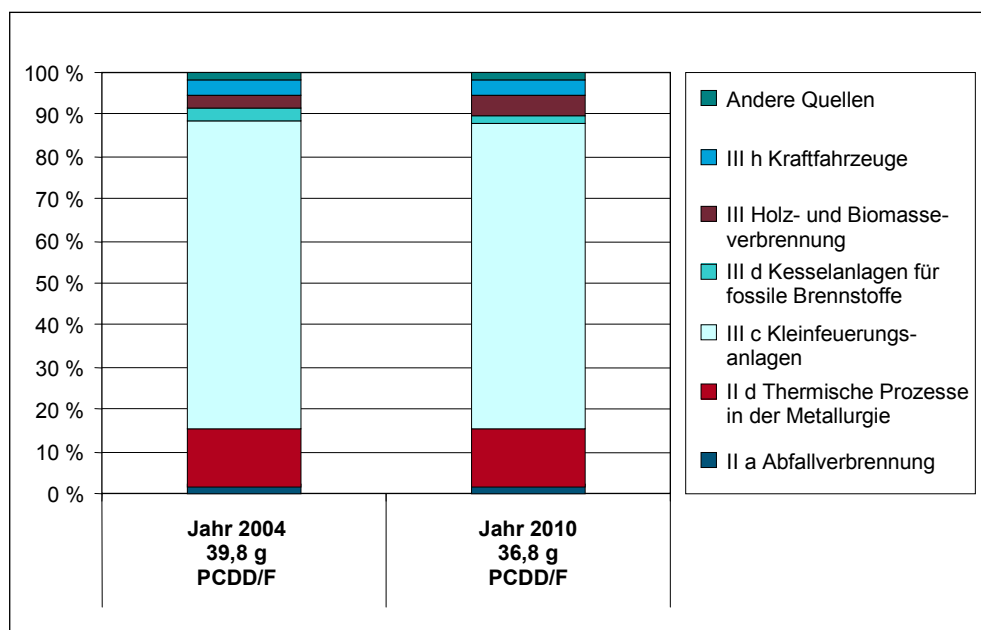


Abbildung A: Relevante Quellkategorien für PCDD/F (WIFO 2005, UMWELTBUNDESAMT 2006a, b; eigene Berechnung).

Tabelle A: PCDD/F-Emissionen aus Quellkategorien Teil II für 2004 und Prognose für 2010 (WIFO 2005, UMWELTBUNDESAMT 2006a, b; eigene Berechnung).

Quellkategorien Teil II	2004 [g I-TEQ]	2010 [g I-TEQ]
Abfallverbrennungsanlagen, einschließlich Anlagen zur Mitverbrennung von Siedlungsabfällen, gefährlichen Abfällen, Abfällen aus dem medizinischen Bereich oder Klärschlamm	0,230	0,282
mit gefährlichen Abfällen befeuerte Zementöfen*	0,108	0,114
Zellstoffproduktion unter Verwendung von elementarem Chlor oder von Chemikalien, bei denen elementares Chlor erzeugt wird, für Bleichzwecke **	0,000	0,000
folgende thermische Prozesse in der metallurgischen Industrie:		
(i) Sekundärkupferproduktion	0,512	0,512
(ii) Sinteranlagen in der Eisen- und Stahlindustrie	3,040	2,300
(iii) Sekundäraluminiumproduktion	1,813	1,813
(iv) Sekundärzinkproduktion	NR	NR
Gesamt (Teil II)	5,703	5,021

* Gesamt PCDD/F-Emissionen der österreichischen Zementöfen

** nur Prozessemissionen; PCDD/F-Emissionen aus Verbrennungsprozessen werden bei den relevanten Quellkategorien des Teil III betrachtet.

NR: nicht relevant (in Österreich nicht vorhanden).

Tabelle B: PCDD/F-Emissionen aus Quellkategorien Teil III für 2004 und Prognose für 2010
(WIFO 2005, UMWELTBUNDESAMT 2006a, b; eigene Berechnung).

Quellkategorien Teil III	2004 [g I-TEQ]	2010 [g I-TEQ]
offene Verbrennung von Abfall, einschließlich Verbrennung auf Deponien*	0,216	0,216
in Teil II nicht genannte thermische Prozesse in der metallurgischen Industrie	0,375	0,499
häusliche Verbrennungsquellen	29,468	26,945
mit fossilen Brennstoffen befeuerte Kesselanlagen von Versorgungs- und Industrieunternehmen	1,041	0,689
Feuerungsanlagen für Holz und sonstige Biomassebrennstoffe	1,374	1,917
spezifische chemische Produktionsprozesse, bei denen unbeabsichtigt gebildete persistente organische Schadstoffe freigesetzt werden, insbesondere bei der Produktion von Chlorphenolen und Chloranil	NV	NV
Krematorien	0,154	0,165
Kraftfahrzeuge, insbesondere bei Verbrennung von verbleitem Ottokraftstoff	1,503	1,303
Tierkörperbeseitigung	NV	NV
Färben (mit Chloranil) und Endbehandlung (durch alkalische Extraktion) von Textilien und Leder	NV	NV
Shredderanlagen zur Behandlung von Altfahrzeugen	NV	NV
Kupferkabelverschmelzung	NV	NV
Altölaufbereitungsanlagen	0,000	0,000
Gesamt (Teil III)	34,131	31,733

* ohne Brände (einschließlich Deponiebrände)

NV: nicht verfügbar.

Hexachlorbenzol (HCB)

Im Jahr 2004 wurden 44,8 kg HCB emittiert (siehe Tabelle C, D und Abbildung B). Hauptverantwortliche Quellkategorie sind die Kleinf Feuerungsanlagen mit 88,7 %, danach thermische Prozesse in der metallurgischen Industrie (v. a. Sinteranlagen) mit 9 %. Der Anteil aller anderen Quellkategorien beträgt unter 1 %.

Gemäß der Emissionsprognose für das Jahr 2010 werden die Gesamtemissionen an HCB auf 45,6 kg steigen. Dies beruht auf Kapazitätserweiterungen in der metallurgischen Industrie, der Anteil dieser Quellkategorie an den Gesamtemissionen wird auf 10,8 % steigen, der Anteil der Kleinf Feuerungsanlagen wird geringfügig sinken (auf 86,8 %).

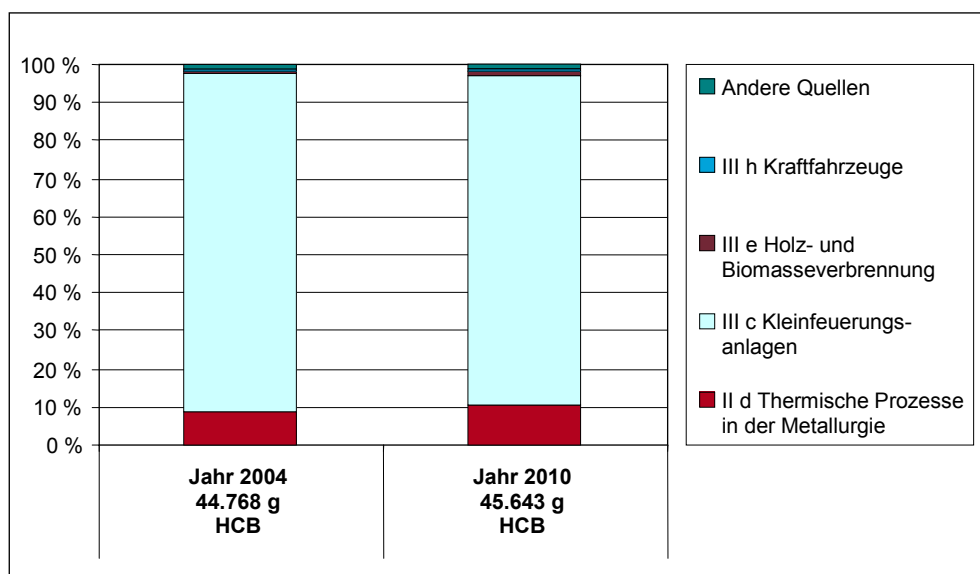


Abbildung B: Relevante Quellkategorien für HCB (WIFO 2005, UMWELTBUNDESAMT 2006a, b; eigene Berechnung).

Tabelle C: HCB-Emissionen aus Quellkategorien Teil II für 2004 und Prognose für 2010 (WIFO 2005, UMWELTBUNDESAMT 2006a, b; eigene Berechnung).

Quellkategorien Teil II	2004 [kg HCB]	2010 [kg HCB]
Abfallverbrennungsanlagen, einschließlich Anlagen zur Mitverbrennung von Siedlungsabfällen, gefährlichen Abfällen, Abfällen aus dem medizinischen Bereich oder Klärschlamm	0,196	0,282
mit gefährlichen Abfällen befeuerte Zementöfen*	0,016	0,020
Zellstoffproduktion unter Verwendung von elementarem Chlor oder von Chemikalien, bei denen elementares Chlor erzeugt wird, für Bleichzwecke **	0,000	0,000
folgende thermische Prozesse in der metallurgischen Industrie:		
(i) Sekundärkupferproduktion	0,090	0,166
(ii) Sinteranlagen in der Eisen- und Stahlindustrie	3,261	3,863
(iii) Sekundäraluminiumproduktion	0,665	0,907
(iv) Sekundärzinkproduktion	NR	NR
Gesamt (Teil II)	4,230	5,211

* Gesamt HCB-Emissionen der österreichischen Zementöfen

** nur Prozessemissionen; HCB-Emissionen aus Verbrennungsprozessen werden bei den relevanten Quellkategorien des Teil III betrachtet.

NR: nicht relevant (in Österreich nicht vorhanden).

Tabelle D: HCB-Emissionen aus Quellkategorien Teil III für 2004 und Prognose für 2010
(WIFO 2005, UMWELTBUNDESAMT 2006a, b; eigene Berechnung).

Quellkategorien Teil III	2004 [kg HCB]	2010 [kg HCB]
offene Verbrennung von Abfall, einschließlich Verbrennung auf Deponien*	0,043	0,043
in Teil II nicht genannte thermische Prozesse in der metallurgischen Industrie	0,016	0,016
häusliche Verbrennungsquellen	39,722	39,509
mit fossilen Brennstoffen befeuerte Kesselanlagen von Versorgungs- und Industrieunternehmen	0,192	0,147
Feuerungsanlagen für Holz und sonstige Biomassebrennstoffe	0,250	0,426
spezifische chemische Produktionsprozesse, bei denen unbeabsichtigt gebildete persistente organische Schadstoffe freigesetzt werden, insbesondere bei der Produktion von Chlorphenolen und Chloranil	NV	NV
Krematorien	0,015	0,032
Kraftfahrzeuge, insbesondere bei Verbrennung von verbleitem Ottokraftstoff	0,300	0,258
Tierkörperbeseitigung	NV	NV
Färben (mit Chloranil) und Endbehandlung (durch alkalische Extraktion) von Textilien und Leder	NV	NV
Shredderanlagen zur Behandlung von Altfahrzeugen	NV	NV
Kupferkabelverschmelzung	NV	NV
Altölaufbereitungsanlagen	NV	NV
Gesamt (Teil III)	40,538	40,432

* ohne Brände (einschließlich Deponiebrände)

NV: nicht verfügbar.

Polyzyklische aromatische Kohlenwasserstoffe (PAHs)

Im Jahr 2004 wurden 8.789 kg PAHs emittiert. Hauptverantwortlich für die PAH-Emissionen sind v. a. die Kleinf Feuerungsanlagen mit 73,9 % Anteil sowie Kraftfahrzeuge mit einem Beitrag von 20,1 % an den Gesamtemissionen (siehe Abbildung C, Tabelle E and F). Andere nennenswerte Verursacher sind die offene Verbrennung von Abfällen (3,4 % sowie Sinteranlagen (1,8 %).

Gemäß der Emissionsprognose für das Jahr 2010 werden die Gesamtemissionen auf 9.130 kg steigen. Der Anteil der mobilen Quellen an den Gesamtemissionen wird auf 20,8 % steigen, der Anteil der Kleinf Feuerungsanlagen wird geringfügig sinken (auf 73,3 %). Auch die Anteile der offenen Verbrennung von Abfällen sowie der Sinteranlagen reduzieren sich.

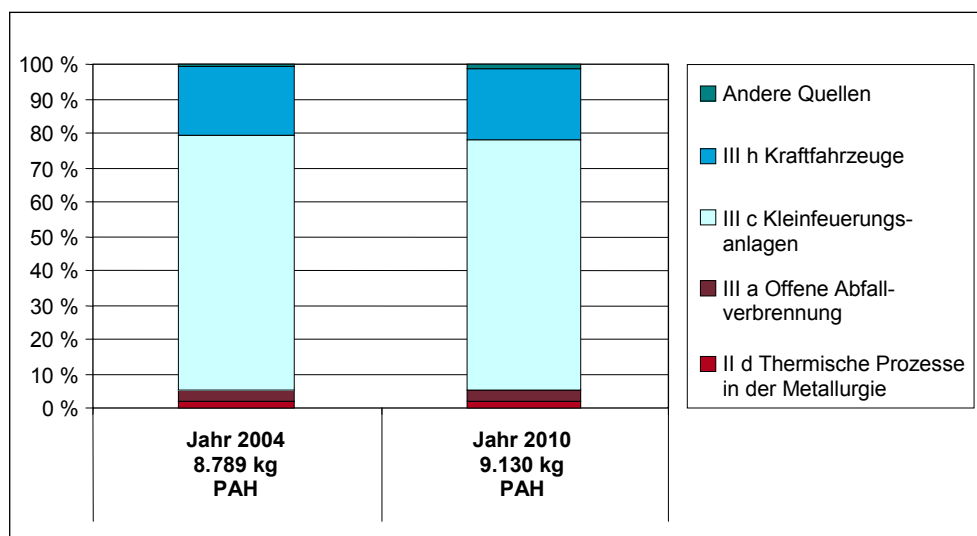


Abbildung C: Relevante Quellkategorien für PAHs (WIFO 2005, UMWELTBUNDESAMT 2006a, b; eigene Berechnung)

Tabelle E: PAH-Emissionen aus Quellkategorien Teil II für 2004 und Prognose für 2010 (WIFO 2005, UMWELTBUNDESAMT 2006a, b; eigene Berechnung).

Quellkategorien Teil II	2004 [kg PAH]	2010 [kg PAH]
Abfallverbrennungsanlagen, einschließlich Anlagen zur Mitverbrennung von Siedlungsabfällen, gefährlichen Abfällen, Abfällen aus dem medizinischen Bereich oder Klärschlamm	11,7	12,1
mit gefährlichen Abfällen befeuerte Zementöfen*	2,5	2,8
Zellstoffproduktion unter Verwendung von elementarem Chlor oder von Chemikalien, bei denen elementares Chlor erzeugt wird, für Bleichzwecke **	0,0	0,0
folgende thermische Prozesse in der metallurgischen Industrie:		
(i) Sekundärkupferproduktion	0,0	0,0
(ii) Sinteranlagen in der Eisen- und Stahlindustrie	156,5	150,4
(iii) Sekundäraluminiumproduktion	0,0	0,0
(iv) Sekundärzinkproduktion	NR	NR
Gesamt (Teil II)	170,7	165,3

* Gesamt PAH-Emissionen der österreichischen Zementöfen

** nur Prozessemissionen; PAH-Emissionen aus Verbrennungsprozessen werden bei den relevanten Quellkategorien des Teil III betrachtet.

NR: nicht relevant (in Österreich nicht vorhanden).

Tabelle F: PAH-Emissionen aus Quellkategorien Teil III für 2004 und Prognose für 2010
(WIFO 2005, UMWELTBUNDESAMT 2006a, b; eigene Berechnung).

Quellkategorien Teil III	2004 [kg PAH]	2010 [kg PAH]
offene Verbrennung von Abfall, einschließlich Verbrennung auf Deponien*	295,6	295,6
in Teil II nicht genannte thermische Prozesse in der metallurgischen Industrie	2,9	2,9
häusliche Verbrennungsquellen	6.494	6.695
mit fossilen Brennstoffen befeuerte Kesselanlagen von Versorgungs- und Industrieunternehmen	22,3	11,4
Feuerungsanlagen für Holz und sonstige Biomassebrennstoffe	33,1	63,8
spezifische chemische Produktionsprozesse, bei denen unbeabsichtigt gebildete persistente organische Schadstoffe freigesetzt werden, insbesondere bei der Produktion von Chlorphenolen und Chloranil	NV	NV
Krematorien	0,0	0,0
Kraftfahrzeuge, insbesondere bei Verbrennung von verbleitem Ottokraftstoff	NV	NV
Tierkörperbeseitigung	NV	NV
Färben (mit Chloranil) und Endbehandlung (durch alkalische Extraktion) von Textilien und Leder	NV	NV
Shredderanlagen zur Behandlung von Altfahrzeugen	NV	NV
Kupferkabelverschmelzung	NV	NV
Altölaufbereitungsanlagen	NV	NV
Gesamt (Teil III)	8.618	8.964

* ohne Brände (einschließlich Deponiebrände)

NV: nicht verfügbar

C) Emissionsverzeichnis Wasser

Bislang existieren nur begrenzt Daten zu POP-Emissionen in Grund- und Oberflächenwässern. Aus den derzeit verfügbaren Daten ist jedoch zu schließen, dass die Emissionen grundsätzlich gering sind. Informationen zu PAH- und HCB-Emissionen in Oberflächengewässern enthält das Europäische Schadstoffemissionsregister (EPER), das Emissionen aus bestimmten Industrieanlagen berichtet. Gemäß den EPER-Daten für Österreich (Referenzjahr: 2004) gibt es jedoch keine Industrieanlagen, die die Schadstoffschwellenwerte für PAHs und HCB überschreiten.

Im Jahr 2004 wurde eine umfassende Bewertung der Emissionen von HCB, Aldrin, Endrin, Dieldrin, DDT und HCH in Grund- und Oberflächenwässern durchgeführt. Der Bericht Österreichs gemäß Artikel 5 der Wasserrahmenrichtlinie identifiziert lediglich einen Wasserkörper mit einem potenziellen Risiko bezüglich HCB (aufgrund einer kontaminierten Fläche). Für HCB wurde im Jahr 2002 ein Maßnahmenprogramm zur Emissionsreduktion entwickelt und 2005 aktualisiert.

Ein umfassendes nationales Emissionsverzeichnis wird demnächst eingerichtet (als Teil des Wasserinformationssystems WISA gemäß §§ 59, 59a Wasserrechtsgesetz 1959 i.d.g.F.).

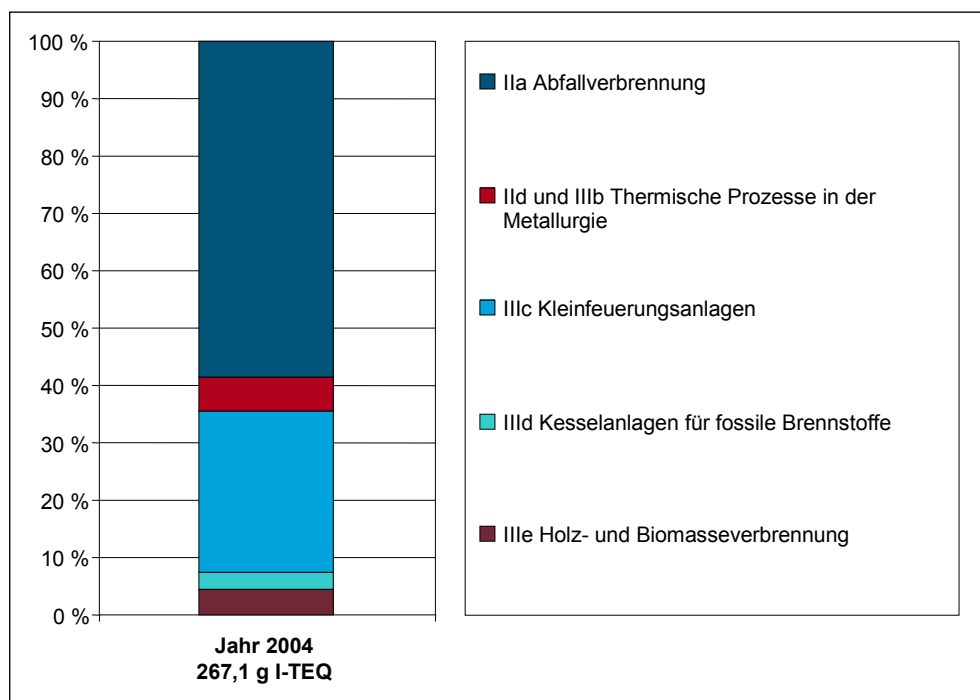
Ein Grund für die Unsicherheiten betreffend Emissionen in Gewässer ist auch die Tatsache, dass die meisten POPs nahezu wasserunlöslich sind. Daher sind nur in wenigen Fällen rechtlich verbindliche Emissionsgrenzwerte festgelegt (etwa für Abwässer aus der nassen Rauchgasreinigung in der Abfallverbrennung). Ein weiterer Grund besteht darin, dass mögliche POP-Emittenten über eine Abwasserreinigungsanlage verfügen oder ihre Abwässer indirekt über eine Kläranlage einleiten. In beiden Fällen erfolgt eine Anreicherung der POPs im Klärschlamm. Eine nachfolgende thermische Behandlung dieser Klärschlämme führt zu einer weitgehenden Zerstörung der POPs.

Mögliche Freisetzungen von PAHs auf kontaminierten Flächen können zu lokalen Beeinträchtigungen des Bodens und des Grundwassers führen. Nichtsdestotrotz müssen jedoch Gefährdungen des Menschen oder von Ökosystemen durch entsprechende Analysen verifiziert und sodann hintangehalten werden.

Daten zu möglichen Beeinträchtigungen durch PCDD/F, HCB und PCBs aus kontaminierten Böden existieren kaum.

D) Emissionen über Abfälle und Rückstände

Ein Emissionsverzeichnis kann nur für PCDD/F erstellt werden. Im Jahr 2004 wurden insgesamt 267,1 g PCDD/F I-TEQ über Abfälle und Rückstände emittiert, der Anteil fester Abfälle aus der Abfallverbrennung ist hierbei mit 59 % am größten, erheblich ist auch der Anteil von Abfällen aus Kleinfeuerungsanlagen (28 %). Andere Quellen sind Abfälle aus thermischen Prozessen der metallurgischen Industrie sowie aus dem Einsatz fossiler Brennstoffe und Biomasse (siehe Abbildung D).



Anmerkung: Emissionsfaktoren für Abfälle sind nicht verfügbar, die Gesamtfreisetzung könnte daher möglicherweise höher sein.

Abbildung D: Freisetzungen (jedoch überwiegend nicht bioverfügbar) von PCDD/F über Abfälle (eigene Berechnung).



Es muss jedoch hervorgehoben werden, dass POP-Freisetzungen über Abfälle grundsätzlich anders zu betrachten sind als Freisetzungen über die Medien Luft und Wasser: Die überwiegende Mehrheit der Abfälle wird auf Deponien abgelagert. Eine Bioverfügbarkeit der möglicherweise enthaltenen POPs ist dadurch nicht mehr gegeben, vorausgesetzt die Deponien wurden und werden ordnungsgemäß errichtet und betrieben.

Rückstände aus der Abfallverbrennung werden im Allgemeinen auf Deponien entsorgt. Die Flugasche, in der 88 % der PCDD/F enthalten sind, wird oft einer Untertagedeponie zugeführt.

Sehr hohe PCDD/F-Konzentrationen finden sich in der Asche aus Kleinf Feuerungsanlagen. Vermutlich wird ein Großteil dieser Asche über den Hausmüll entsorgt. Bei der thermischen Behandlung dieses Hausmülls werden die POPs entweder oxidiert oder mit der Asche auf Deponien entsorgt. Auch im Fall einer mechanisch-biologischen Behandlung des Hausmülls gelangen die POPs letztendlich in jene Fraktion, die auf der Deponie endgelagert wird.

Abfälle aus der metallurgischen Industrie werden entweder wieder in den Prozess zurückgeführt oder einer externen Behandlung/Entsorgung zugeführt. Diesbezüglich bestehen jedoch noch einige Unklarheiten über die Höhe der POP-Konzentrationen und die in Österreich praktizierte Behandlung der Abfälle.

Die Flugasche aus Kraftwerken wird in der Zement- und Baustoffindustrie weiterverwendet, Flugasche aus der Verbrennung von Biomasse muss jedoch über Deponien entsorgt werden.

Abfälle die in die Umwelt gelangen, können zur Freisetzung von POPs führen. Ein Beispiel wäre die Verwendung von Aschen aus Kleinf Feuerungsanlagen für Düngezwecke oder für Streuzwecke im Winter. Weiters werden etwa grobe Aschen aus Biomasseverbrennungsanlagen als Zusatzstoffe für Kompost genutzt. Da große Datenlücken hinsichtlich der Höhe der POP-Konzentrationen in Aschen existieren, sind Freisetzungsabschätzungen generell mit hohen Unsicherheiten behaftet. Ausschlaggebend für die Höhe der POP-Konzentrationen in Aschen sind insbesondere die Qualität des Brennstoffes, das verwendete Feuerungssystem sowie die Menge mitverbrannter Abfälle.

E) Freisetzungen über Produkte

In der Literatur finden sich einige Daten zu Gehalten von PCDD/F in den Produkten Zement, Zellstoff und Papier (siehe Tabelle G). Zu anderen POPs existieren keine Daten. Freisetzungen über Produkte sind jedoch bei den meisten Quellkategorien nicht relevant.

Tabelle G: PCDD/F-Gehalte in den Produkten Zement, Zellstoff und Papier. Berechnungen basieren auf Literaturdaten (KARSTENSEN 2006, UNEP 2005, GRUBER 1996).

Produkt	Freisetzung (g I-TEQ/a)
Zement	4,02
Papier	4,98
exportierter Zellstoff	0,123

¹ Freisetzungen über exportieren Zellstoff; Freisetzungen über den heimischen Zellstoff sind in den Angaben zu Papier enthalten.

PCDD/F-Gehalte im Zement sind gering und lassen sich durch die Tatsache erklären, dass die Filterstäube aus der Klinkerproduktion (durchschnittliche PCDD/F-Konzentration: 6,7 ng I-TEQ/kg) dem Produkt beigemischt werden und weiters auch sekundäre Rohstoffe eingesetzt werden (z. B. Flugasche, Gips aus der Rauchgasentschwefelung). Auch der Zementklinker selbst kann mit PCDD/F verunreinigt sein (durchschnittlich: 0,9 ng I-TEQ/kg Klinker) (KARSTENSEN 2006). Die Bioverfügbarkeit von im Zement gebundenen POPs ist jedoch sehr gering.

Im Fall von Zellstoff und Papier können PCDD/F über die Zellstoffbleiche oder über Altpapier eingetragen werden. Die Freisetzung von PCDD/F über Zellstoff betrug 0,28 g im Jahr 2004, davon wurden 0,123 g I-TEQ exportiert, der Rest wurde in der Papierindustrie eingesetzt.

Als Rohstoffe in der Papierzeugung werden Zellstoff (heimisch oder importiert), Holzstoff und Altpapier (de-inkt oder nicht de-inkt) verwendet. Hierbei ist der Eintrag von POPs über das Altpapier (insbesondere über Verunreinigungen in den verwendeten Druckfarben) relevant, der Eintrag über Zellstoff und Holzstoff ist vergleichsweise gering. Ein De-inking reduziert die PCDD/F-Konzentrationen um den Faktor 3. Höhere Konzentrationen wurden in den frühen Neunzigerjahren in Verpackungspapieren und Karton gefunden. Im Allgemeinen konnte ein drastischer Rückgang zwischen 1989 und 1994 verzeichnet werden, seither sinken die Konzentrationen nur mehr geringfügig. Auf Basis dieser Studien sowie der im UNEP Dioxin Toolkit angegebenen Emissionsfaktoren wurde die Gesamtfreisetzung über Papier auf 4,98 g I-TEQ geschätzt (Referenzjahr: 2004).

F) Bewertung der Wirksamkeit der Rechtsvorschriften und Politiken in Bezug auf die Verpflichtungen des Stockholmer Übereinkommens und der EU-POP-Verordnung

Auf Basis der im Nationalen Aktionsplan dokumentierten Ergebnisse hinsichtlich von Emissionsverzeichnissen, Emissionsprognosen, Datenverfügbarkeit und der bereits getätigten sowie geplanten Maßnahmen ist zu schließen, dass Österreich die Vorschriften des Stockholmer Übereinkommens bereits größtenteils erfüllt hat. Nichtsdestotrotz sind weitere Anstrengungen notwendig, da das Stockholmer Übereinkommen „die kontinuierliche Verringerung von POP-Freisetzungen“ zum Ziel hat.

POP-Emissionen großer stationärer (industrieller) Quellen wurden in den letzten Jahren stark reduziert. Sollten jedoch Weiterentwicklungen im Stand der Technik geringere Emissionen oder sogar eine vollständige Vermeidung derselben bewirken, muss die Politik darauf reagieren und die relevanten Rechtsvorschriften entsprechend anpassen (z. B. durch Einführung strengerer Emissionsgrenzwerte).

Eine sehr wichtige Emissionsquelle sind (häusliche) Kleinfeuerungsanlagen, die derzeit für 74 % der PCDD/F-Emissionen, 88,7 % der HCB-Emissionen und 73,9 % der PAH-Emissionen verantwortlich zeichnen. Alle möglichen Maßnahmen müssen identifiziert und ausgeschöpft werden, um eine Reduktion dieser POP-Emissionen zu bewirken.

Weitere notwendige Maßnahmen betreffen die Bewußtseinsbildung in Hinblick auf die Verbrennung von Abfällen in Haushalten oder etwa die Verwendung von Aschen und Ruß aus Kleinfeuerungsanlagen z. B. für die Düngung.

Außerdem erscheint es wichtig, bessere Kenntnis in Bereichen zu erlangen, in denen bisher nur sehr begrenzt zuverlässige Daten zur Verfügung stehen. Deshalb wurden im Folgenden konkrete Aufträge für Studien z. B. betreffend POP-Konzentrationen in bestimmten Abfällen oder weitere Monitoringaktivitäten formuliert.

Handlungsbedarf (Vorschläge für Maßnahmen, die gemäß § 20 Abs. 2 Chemikaliengesetz 1996 zu treffen sind)

Freisetzungen von POPs aus den Quellkategorien

Die folgende Tabelle enthält eine Übersicht der in Österreich geltenden POP-relevanten Gesetze und Verordnungen einschließlich einer kurzen Evaluation ihrer Wirksamkeit hinsichtlich der Verminderung der Freisetzung von POPs. Sie zeigt den Handlungsbedarf zur Einhaltung der Bestimmungen des Stockholmer Übereinkommens und der EU-POP-Verordnung auf. Ein konkreter Zeitplan kann nicht immer angegeben werden, da mehrere Maßnahmen in der Kompetenz der Bundesländer liegen.

Nationale Gesetze und Verordnungen	POP-relevante Inhalte	Kommentar/konkrete Schritte
Emissionsgesetz für Kesselanlagen (BGBl. Nr. I 150/2004) und Luftreinhalteverordnung für Kesselanlagen (BGBl. Nr. 19/1989 i.d.F. BGBl. II Nr. 55/2005)	EGW für Staub, CO, Corg, NO _x	Anpassung an BAT notwendig (strengere EGW für Staub) Zeitplan: ehestmöglich
<i>Gewerbeordnung 1994 und Verordnungen gemäß § 82 Abs. 1 GewO 1994</i>	EGW für unterschiedliche Schadstoffe	Regelmäßige Überprüfung der Konformität mit BAT
Feuerungsanlagen-Verordnung BGBl. II Nr. 331/1997	EGW für Staub, CO, Corg, NO _x	Anpassung an BAT notwendig (strengere EGW für Staub) Zeitplan: Novellierung geplant (Begutachtungsverfahren im Oktober 2007 erfolgt)
Eisen/Stahl-Verordnung (BGBl. II Nr. 160/1997 i.d.F. BGBl. II Nr. 290/2007)	EGW für Staub, CO, Corg, NO _x , Schwermetalle, PCDD/F	Anpassung an BAT mittels der Novelle BGBl. II Nr. 290/2007 im November 2007 erfolgt
Sinteranlagen-Verordnung (BGBl. II Nr. 163/1997)	EGW für Staub, CO, Corg, NO _x , Schwermetalle, PCDD/F	Anpassung an BAT notwendig (strengere EGW für PCDD/F, Staub) Zeitplan: Novellierung geplant

Nationale Gesetze und Verordnungen	POP-relevante Inhalte	Kommentar/konkrete Schritte
Nichteisenmetall- und Refraktärmetall-Verordnung (BGBl. II Nr. 86/2008)	EGW für Staub, CO, Corg, NO _x , Schwermetalle	Anpassung an BAT mittels der Novelle BGBl. II Nr. 86/2008 im März 2008 erfolgt
Gießerei-Verordnung (BGBl. Nr. 447/1994)	EGW für Staub, CO, Corg, NO _x , VOCs	Regelmäßige Überprüfung der Konformität mit BAT notwendig
Abfallverbrennungsverordnung (BGBl. II Nr. 389/2002)	EGW für Staub, CO, Corg, NO _x , Schwermetalle, PCDD/F	Strengere EGWs für Staub bei Mitverbrennungsanlagen wünschenswert
<i>Wasserrechtsgesetz und Verordnungen</i>	EGW für AOX and POX sowie spezifische POPs in den branchenspezifischen Abwasseremissionsverordnungen, Qualitätsziele	
Abwasseremissionsverordnung Verbrennungsgas (BGBl. II Nr. 271/2003)	EGW für PCDD/F	Regelmäßige Überprüfung der Konformität mit BAT notwendig
Abwasseremissionsverordnung Kohleverarbeitung (BGBl. II Nr. 346/1997)	EGW für PAHs	Regelmäßige Überprüfung der Konformität mit BAT notwendig
Abwasseremissionsverordnung Pflanzenschutzmittel (BGBl. Nr. 668/1996)	EGW für AOX und spezifische POPs	Regelmäßige Überprüfung der Konformität mit BAT notwendig
Qualitätszielverordnung Oberflächengewässer (BGBl. II Nr. 96/2006)	Umweltqualitätsziel für HCB	Für PAHs werden voraussichtlich noch 2008 gemeinschaftsweite Qualitätsziele festgelegt.
<i>Andere relevante Rechtsvorschriften</i>		
Deponieverordnung (BGBl. Nr. 39/2008)	Grenzwerte für PAH-Konzentrationen in Abfällen	kürzlich novelliert
Kompostverordnung (BGBl. II Nr. 292/2001)	Grenzwerte für POP-Konzentrationen in Komposten	Regelmäßige Evaluierung der Grenzwerte notwendig
<i>Klärschlamm- und Kompostverordnungen bzw. -gesetze der Bundesländer</i>	Grenzwerte für Schwermetalle	Regelmäßige Evaluierung der Grenzwerte notwendig
<i>Bodenschutzverordnungen der Bundesländer</i>		Festlegung von Zielwerten für organische Schadstoffe (einschließlich polybromierte Diphenylether, perfluorierte Tenside und Pestizide) zur Verminderung von Bodenkontaminationen zweckmäßig
Immissionsschutzgesetz – Luft (IG-L)	§ 21 IG-L: Verordnungsermächtigung	Überprüfung, ob allgemein verbindliche EGW für Kretorien in einer Verordnung gemäß § 21 IG-L notwendig sind Zeitplan: ehestmöglich



Nationale Gesetze und Verordnungen	POP-relevante Inhalte	Kommentar/konkrete Schritte
Rechtsakte der Bundesländer betreffend häusliche Verbrennungsanlagen (Kleinfeuerungsanlagen)		Entwurf einer Vereinbarung gemäß Art. 15a B-VG über das Inverkehrbringen und die Überprüfung von Feuerungsanlagen Zeitplan: Begutachtungsverfahren im September 2006 erfolgt; ehestmögliche Umsetzung dieser Vereinbarung in das Länderrecht (voraussichtlich im Sommer 2008)
Gesetz über das Verbot des Verbrennens biogener Materialien (BGBl. Nr. 405/1993)	Verbot des Verbrennens biogener Materialien	Überprüfung der Ausnahmestimmungen Zeitplan: ehestmöglich
Genehmigungsverfahren	POP-relevante Inhalte	Kommentare/Konkrete Schritte
<i>Deponien</i>	Anforderungen an die Brandverhütung	Implementierung wirksamer Brandverhütungsmaßnahmen für Deponien und Abfallzwischenlager

EGW: EmissionsgrenzwertBAT: Best Available Technology

Aufgrund der Tatsache, dass **häusliche Verbrennungsanlagen** 74 % der PCDD/F-Emissionen in die Luft verursachen, ist die **zügige Implementierung der folgenden Maßnahmen von besonderer Wichtigkeit:**

- Umsetzung der Anforderungen der Vereinbarung gemäß Art. 15a B-VG zwischen dem Bund und den Ländern über gemeinsame Qualitätsstandards für die Förderung der Errichtung und Sanierung von Wohngebäuden zum Zweck der Reduktion des Ausstoßes an Treibhausgasen; Zeitplan: ehestmöglich
- Effiziente Förderung des Austausches von kohlebefeuelten Öfen; Zeitplan: ehestmöglich
- Regelmäßige Überprüfung und Verbesserung der Förderkriterien für Biomasseverbrennungsanlagen (einschließlich derartiger landwirtschaftlicher Anlagen) in Hinblick auf Betriebsbedingungen, Energieeffizienz (einschließlich Fernwärmesysteme), Brennstoffqualität und EGW für Staub; Zeitplan: 2009
- Informationskampagnen zur Verhinderung der Verbrennung von Abfällen in Kleinfeuerungsanlagen;
- Informationskampagnen zur Entsorgung von Ruß und Asche aus Kleinfeuerungsanlagen (insbes. im Haushalt und in der Landwirtschaft);
- Implementierung geeigneter Maßnahmen, die eine Einhaltung des Zielwertes für Benzo(a)pyren in der Umgebungsluft (1 ng/m^3) sicherstellen (Zielwert wird mit 31.12.2012 in einen Grenzwert umgewandelt).



Für die im Folgenden genannten Quellen existieren bisher nur **unzureichend Daten**. Um die Relevanz dieser Quellen abschätzen zu können sowie um die österreichischen Quellverzeichnisse zu vervollständigen, erscheinen die unten angeführten Maßnahmen notwendig:

- Emissionsmessungen in der Sekundärkupferproduktion (Konverter und Anodenofen), Sekundärbleiproduktion und Nickelproduktion (Überprüfung der Konformität mit BAT).
- Untersuchung des Emissionsverhaltens von Kleinf Feuerungsanlagen (insb. Stroh- und Getreideverbrennung).
- Emissionsmessungen bei Kraftfahrzeugen und Überprüfung der Emissionsfaktoren, um genauere Trendprognosen zu ermöglichen.
- Quantifizierung der POP-Freisetzungen aus Deponien und aufgelassenen Industriestandorten sowie kontaminierten Flächen (z. B. PAH-Anteile im Deponiegas).
- Bewertung der POP-Konzentrationen in Abfällen und Rückständen aus der Nicht-eisenmetallerzeugung, Elektrostahlerzeugung und aus Sinteranlagen.
- Bestimmung der POP-Konzentrationen in Abfällen aus Kleinf Feuerungsanlagen (Haushalt, Versorgungsunternehmen, Landwirtschaft), die mit hoher Wahrscheinlichkeit in die Umwelt gelangen (z. B. Bodenasche und Flugasche).
- Bestimmung der POP-Konzentrationen in Abfällen aus mit fossilen Brennstoffen befeuerten Kesselanlagen (einschließlich Mitverbrennung von Abfällen), die in andere Produktionsprozesse Eingang finden oder mit hoher Wahrscheinlichkeit in die Umwelt gelangen (insb. Flugasche aus Mitverbrennungsanlagen).
- Bestimmung der POP-Konzentrationen in Abfällen aus Biomasseverbrennungsanlagen, die in andere Produktionsprozesse Eingang finden oder mit hoher Wahrscheinlichkeit in die Umwelt gelangen (z. B. Bodenasche).
- Bestimmung der Konzentrationen von PCDD/F und relevanten Vorläufersubstanzen in gebleichtem Kraft-Zellstoff (importiert und heimisch erzeugt), in Papier (Verpackungspapier, Karton, Papier mit Altpapieranteil), in Farben und Druckfarben und in De-inking-Schlämmen.
- Quantifizierung der POP-Gehalte im Filterstaub aus der Zementklinkerherstellung.
- Quantifizierung der POP-Emissionen (insb. PCDD/F und PCBs) des Platformer 3 der OMV Raffinerie in Schwechat.

Ein Zeitplan kann für diese Aktivitäten nicht angegeben werden, jedoch ist Österreich bestrebt – vorbehaltlich der Finanzierbarkeit dieser Maßnahmen – möglichst alle diese Datenlücken bis zur Revision des Nationalen Aktionsplans zu schließen.



Daten zu POP-Emissionen in die Umwelt

Die folgende Tabelle enthält konkrete, seitens des Umweltbundesamt geplante Maßnahmen zur Verbesserung der verfügbaren Daten über POP-Emissionen in die Umwelt:

Konkrete Schritte	Zeitplan
Verbesserung der Datenqualität in Hinblick auf HCB- und PCB-Freisetzen in die Luft (z. B. durch Planung und Durchführung von Messprogrammen bei prioritären Quellen wie z. B. häuslichen und industriellen Quellen)	2008 – Prüfung der verfügbaren Daten, Identifizierung relevanter Quellen
Einrichtung von Monitoringprogrammen in der Nähe POP-relevanter Quellen	2008 – Identifizierung relevanter Standorte 2008/09 – Probenahme und Messung (Winter/Sommer)
Weiterführung des Monitorings mit Fichtennadeln in der Nähe von POP-Quellen	2008 – Kontinuierliche Probenahme und Beginn der Analysen

Daten zu POP-Konzentrationen in der Umwelt

Die folgende Tabelle enthält konkrete, seitens des Umweltbundesamt geplante Maßnahmen zur Verbesserung der verfügbaren Daten über POP-Konzentrationen in der Umwelt:

Konkrete Schritte	Zeitplan
Weiterführung des Monitorings der Umgebungsluft und der Deposition auf Alpengipfeln (Sonnblick) Einreichung eines MONARPOP-Folgeprojektes mit folgenden Zielen: <ul style="list-style-type: none">• Untersuchung der Akkumulation von POPs in alpinen Nahrungsketten• Ausdehnung auf weitere alpine Gebiete• Einbeziehung passiver Probenahmemethoden und Überleitung zu anderen Monitoringprogrammen• Modellierung der POP-Belastung in den Alpen• Verbreitung der Ergebnisse (international, national)	kontinuierlich geplant: 2008
Entwicklung von Transferfaktoren zur Verbesserung der Kenntnis über Wechselbeziehungen zwischen POP-Konzentrationen in der Umwelt und bioverfügbaren Konzentrationen	2008 – Einrichtung eines wissenschaftlichen Panels
Entwicklung bzw. Anpassung von passiven Probenahmemethoden zur Verbesserung der Vergleichbarkeit von Daten	2008 – Auswahl und Entwicklung der Methoden/Instrumente, Pilotstudie 2009 – Evaluierung der Pilotstudie und Auswahl geeigneter Methoden
Implementierung eines nationalen Monitoringprogrammes zur Untersuchung der Verteilung der Deposition von POPs	2008 – Auswahl relevanter Standorte 2009 – Implementierung

1 INTRODUCTION

Article 5 of the Stockholm Convention requires Parties to develop, within two years of entry into force for them, an Action Plan to identify, characterize and address the release of chemicals listed in Annex C. Currently listed are polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF), as well as hexachlorobenzene (HCB) and polychlorinated biphenyls (PCB) when produced unintentionally.

In line with the European POP-Regulation (850/2004) polyaromatic hydrocarbons (namely the substances benz(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene and indeno(1,2,3-cd)pyrene) shall be included in the action plan as well.

The Action Plan, which is to be part of a Party's National Implementation Plan to be developed pursuant to Article 7 of the Convention, will include strategies for meeting obligations to reduce or eliminate releases of chemicals listed in Annex C of the Stockholm Convention (including PAH as additional requirement from the EU-POP Regulation), and a schedule for the Action Plan. The plan will identify priorities for action, including for those source categories that provide the most cost-effective opportunities for release reduction or elimination. It will also include an inventory of releases of chemicals listed in Annex C.

The definition of the term "release" includes emissions of POPs into air, water and soil as well as releases via residues and waste from processes and releases via products.

Within this report an inventory (year 2004) of POPs releases based on a critical review of available data is presented. In addition to that a forecast of POPs releases will be given for the year 2010. Based on this inventory instruments and measures aiming at the reduction of POPs releases are going to be described. In particular, the efficacy of national legal regulations will be assessed and it is investigated, if Best Available Techniques (BAT) in combination with Best Environment Practice (BEP) is already applied in the source categories defined by the Stockholm Convention. If applicable recommendations how BAT and BEP can be implemented are given. In addition data gaps are identified and proposals for the improvement of data quality are elaborated.

In the assessment of existing measures both direct effects (e.g. as a consequence of a legally binding emission limit value for PCDD/F) as well as indirect effects (e.g. as a consequence of a legally binding emission limit value for particulate matter which as a side benefit will lead to reduction of particle bound POPs emissions) are included.

The Action Plan will be reviewed and updated on a periodic basis.

1.1 Methodology

Both the inventory and the forecast are based on activity data which are multiplied with activity specific emission factors. Activity data for the year 2004 – units are preferably given in GJ in case of combustion processes or in Mg in case of production processes – are taken from the Austrian Energy Balance (UMWELTBUNDESAMT, 2006a), whereas for the year 2010 activity data are taken from the most actual energy forecast available (WIFO 2005).

Both activity data are given in specific formats which are called SNAP⁶- and NFR⁷-Codes. Both formats show relevant differences to the Stockholm Convention with respect to classification of source categories. To overcome this obstacle activity data for individual processes had to be identified and re-classified to obtain source specific activity data in line with the requirements of the Stockholm Convention.

In addition to that data from literature and further information from recent studies have been used when available (see description of releases from individual source categories).

Emission factors for air emissions have been taken from the Austrian Air Emissions Inventory (“Österreichische Luftschadstoffinventur – OLI”) which gives a yearly update of emissions of air pollutants, among them PCDD/F (I-TEQ), HCB and PAH (4 congeners). Where necessary emission factors have been re-calculated to reflect recent developments in data quality (see description of releases from individual source categories).

With respect to forecast of air emissions it should be mentioned that in order to comply with certain national and international obligations a variety of comprehensive and to some extent cross-sectoral measures and instruments are currently in development in Austria. These measures are aiming at the reduction of greenhouse gases, NO_x and (fine) particulate matter. Some of these measures (described e.g. in the Climate Strategy 2007 (FEDERAL MINISTRY OF AGRICULTURE, FORESTRY, ENVIRONMENT AND WATER MANAGEMENT 2007) or in the Programme of the Federal Government (FEDERAL GOVERNMENT 2007)) will lead to an indirect reduction of POPs releases (by e.g. reduction of energy consumption or prescription of stricter air emission limit values for dust), others (such as the increased use of biomass in small scale firing installations) will lead to an increase of POPs releases. Legally binding transposition of a variety of measures is still pending making a source specific forecast of POPs releases difficult.

1.2 Pollutants of concern

1.2.1 Polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF)

Polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF) are unintentionally formed in industrial-chemical processes, such as chemical manufacture, and thermal processes, such as waste incineration. PCDD/PCDF are the only POPs whose mechanism of formation has been studied extensively in combustion-related processes and to a lesser extent in non-combustion-related chemical processes; even so, the mechanisms and exact formation conditions are not fully resolved.

Carbon, oxygen, hydrogen and chlorine, whether in elemental, organic or inorganic form, are needed. At some point in the synthesis process, whether present in a precursor or generated by a chemical reaction, the carbon must assume an aromatic structure.

⁶ SNAP: Standard Nomenclature of Air Pollutants

⁷ NFR: Nomenclature for Reporting

There are two main pathways by which these compounds can be synthesized: from precursors such as chlorinated phenols or de novo from carbonaceous structures in fly ash, activated carbon, soot or smaller molecule products of incomplete combustion. Under conditions of poor combustion, PCDD/PCDF can be formed in the burning process itself.

The mechanism associated with this synthesis can be homogeneous (molecules react all in the gas phase or all in the solid phase) or heterogeneous (involving reactions between gas phase molecules and surfaces).

PCDD/PCDF can also be destroyed when incinerated at sufficient temperature with adequate residence time and mixing of combustion gases and waste or fuel feed. Good combustion practice includes management of the “3 Ts” – time of residence, temperature and turbulence. Use of a fast temperature quench and other known processes are necessary to prevent reformation.

In addition to primary measures there exists a variety of well proven and effective secondary measures to reduce emissions of once formed PCDD/F, including different techniques of adsorption on activated coke or oxidation with the help of a catalyst.

1.2.2 Hexachlorobenzene (HCB)

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 release of hexachlorobenzene is as unintentionally produced pollutant. HCB can still be found as an impurity in certain active ingredients of some plant protection products and biocides, however, in much smaller amounts than in former times. Further, it is emitted from the same chemical and thermal processes as dioxins and furans and formed via a similar mechanism.

There is far less information on the formation of PCB and HCB, especially in combustion processes. Since there are similarities in the structure and occurrence of PCDD/PCDF, PCB and HCB, it is usually assumed that, with the exception of oxygen-containing species, those parameters and factors that favour formation of PCDD/PCDF also generate PCB and HCB.

1.2.3 Polychlorinated Biphenyls (PCB)

Polychlorinated Biphenyls (PCB) have been widely used as additives in transformer oils, in capacitors, as hydraulic fluids and as softener in lacquers and plastics.

As there is no more PCB production in the EU, the only man-made release of PCB is as unintentionally produced pollutant; it is emitted from the same chemical and thermal processes as dioxins and furans and formed via a similar mechanism.

There is far less information on the formation of PCB and HCB, especially in combustion processes. Since there are similarities in the structure and occurrence of PCDD/PCDF, PCB and HCB, it is usually assumed that, with the exception of oxygen-containing species, those parameters and factors that favour formation of PCDD/PCDF also generate PCB and HCB.



1.2.4 Polycyclic Aromatic Hydrocarbons (PAH)

The polycyclic aromatic hydrocarbons (PAH) are molecules built up of benzene rings. PAHs are a group of approximately 100 compounds. Most PAHs in the environment arise from incomplete combustion of carbon-containing materials like oil, wood, garbage or coal. Fires are able to produce fine PAH particles, which bind to ash particles and are considered long range air pollutants. Thus PAHs have been ubiquitously distributed in the environment since thousands of years.

The four compounds Benz(a)pyrene, Benzo(b)fluoranthene, Benzo(k)fluoranthene and Indeno(1,2,3-cd)pyrene are used as indicators for the purposes of emission inventories.

2 SOURCE INVENTORY OF POPS RELEASES INTO AIR

In this section two inventories are described: the Austrian air emissions inventory (“Österreichische Luftschadstoff-Inventur OLI”) according to UNECE/LRTAP and the inventory developed according to the source categories of Annex C of the Stockholm Convention (including PAH as required by the EU-POP Regulation).

There are distinct methodological differences between these two inventories: The OLI includes a variety of air pollutants, among them PCDD/F (I-TEQ), HCB and PAH (4 congeners). Source categories are combined in SNAP codes (SNAP: Standard Nomenclature for Air Pollutants) and in NFR codes (NFR: Nomenclature For Reporting).

On the other hand the inventory required by the Stockholm Convention should help to identify major sources of POPs emissions and therefore follows a more source-based approach: Emissions to air (but also emissions to water, soil and releases via residues and waste) should be given for individual processes which have been identified by the relevant Technical Working Group as having the potential for substantial POPs releases (refer to 6.1.1).

The National Action Plan according to Article 5 of the Stockholm Convention should also present an inventory of PCB releases. However, due to a general lack of data, this requirement could not be fulfilled.

Concerning emissions into air there are specific differences in the results of the two inventories. These can be explained by the different formats used for activity data and by incorporation of updated emission factors for the Action Plan’s inventory. Relevant discrepancies will be described in detail in the source specific sections.

2.1 Austrian Air emissions Inventory according to UNECE/LRTAP

The Umweltbundesamt, as the Federal Environment Agency, has been designated as single national entity responsible for the preparation of the annual air pollutant inventory by law. The Environmental Control Act (Fed. Law Gaz. 1998/152) 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)
- “NEC gases” (SO_x, NO_x, NH₃, NMVOC) and CO
- POPs (PAHs, HCB, PCDD/F)
- heavy metals (Pb, Cd, Hg)
- particulate matter (TSP, PM10 and PM2.5)

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.

2.1.1 Trends for POPs Emissions into Air

Emissions of the three POP categories PAH, PCDD/F and HCB decreased significantly from the year 1985 to the year 1994 as a result of legal regulations concerning emission reduction from industry and waste incineration. Emissions increased in the years 1995 and 1996, but steadily declined afterwards until the year 2001. Between 2002 and 2004 a slight increase of the emissions of all three categories can be observed. As can be seen in Figure 1 and Table 1 emissions are well below their 1985 level, which is the obligation for Austria as a Party to the POPs Protocol (see 6.1.4.1).

Emissions of PAH and HCB are slightly increasing from the year 2000, whereas emissions of PCDD/F remarkably dropped down between 2001 and 2002 (due to a reduction measure in one sinter plant). Since 2002 emissions of PCDD/F undergo a slight increase.

Table 1: Emissions and emission trends for POPs 1985–2005 (UMWELTBUNDESAMT 2006b)

	Emission		
	PAH [Mg]	PCDD/F [I-TEQ, g]	HCB [kg]
1985	27.04	186.98	106.18
1990	17.27	159.99	91.51
1995	9.60	58.17	52.84
2000	8.16	51.60	43.89
2004	8.84	40.74	44.16
Trend 1985–2004	–68%	–78%	–58%

Remark: Please note different units used for different groups of pollutants!

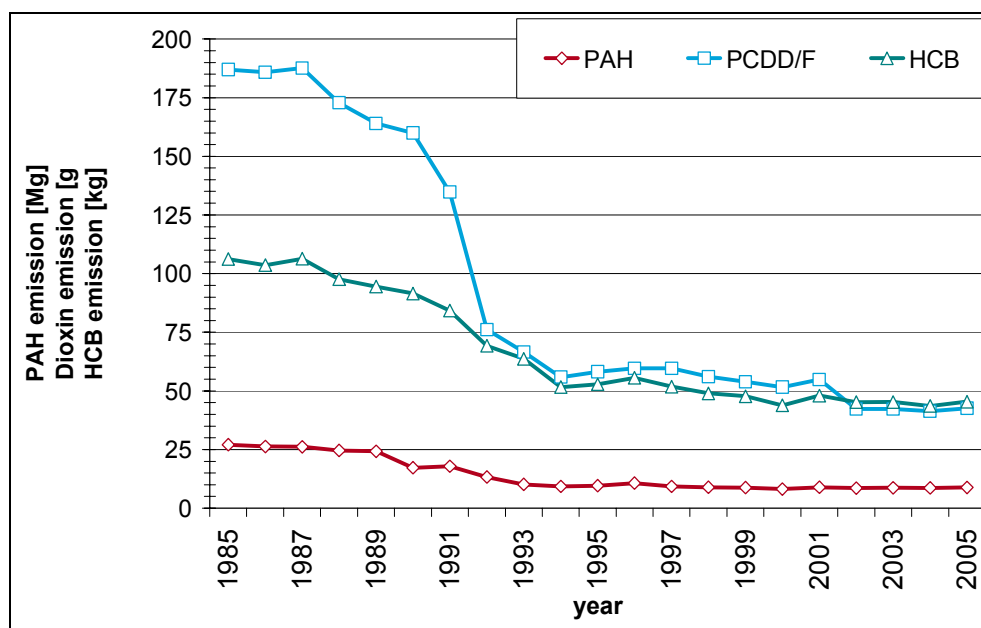


Figure 1: Emission of Persistent Organic Pollutants 1985–2005 in Mg (PAH), g (PCDD/F) and kg (HCB); (UMWELTBUNDESAMT 2007d).

2.2 Releases of polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF) – Source categories of the Stockholm Convention

2.2.1 Waste incinerators, including co-incinerators of municipal, hazardous or medical waste or of sewage sludge

The following description of this source category is given in the Stockholm Convention's Technical Guidebook (UNEP 2006):

“This section deals only with the dedicated incineration of wastes and not with other situations where waste is thermally treated, for example co-incineration processes such as cement kilns and large combustion plants, which are dealt with in the sections relating to those processes.”

2.2.1.1 Emission Factors and Emissions

To calculate emissions results of a recent study (UMWELTBUNDESAMT 2007a) were used. This study includes a description of the technical characteristics of all large waste incineration plants operated in Austria in conjunction with relevant input and output data, the latter comprises also emissions into air, water and solid waste.

Table 2 gives a list of waste incineration plants currently operated in Austria together with input data:

Table 2: Waste Incineration Plants in Austria (UMWELTBUNDESAMT 2007a).

	Waste Input [t/a]	
	2004	2005
Spittelau (Vienna)	268,957	258,256
Flötzersteig (Vienna)	209,627	208,797
Dürnrohr (AVN)	323,060	322,963
Wels I (WAV)	103,661	77,730
Wels II (WAV)	–	about 150,000
Arnoldstein (KRV)	40,644	81,663
Lenzing (RVL)	No data	about 300,000
Niklasdorf (ENAGES)	68,737	77,584
Simmering WSO1-3	160,027	178,097
Simmering WSO4	82,727	101,842
Arnoldstein WS (ABRG)	29,151	29,020
Arnoldstein DR (ABRG)	–	3,926
Simmering DR 1-2	95,956	91,418

PCDD/F emissions into air are in the range of 0.0013 to 0.05 ng/Nm³ (I-TEQ; at 11% oxygen), which is within (or in some cases even below) the ranges associated with Best Available Techniques (0.01–0.1 ng/Nm³; EUROPEAN COMMISSION 2006). Most of the measurements are done on a discontinuous basis. However, in some cases PCDD/F-emissions were measured on a semi-continuous basis (i.e. continuous sampling of flue-gas followed by an analyses of the filter cartridge every two weeks).

Currently, there are three large plants firing hazardous waste in operation. However, emission data are only available for the largest of these plants (rotary kilns of the plant Simmeringer Haide; Simmering DR 1-2 in the table above).

As a result of the Austrian Landfill Ordinance (see 6.2.4) and the European Emission Trading Scheme waste is pre-treated – with incineration being the preferred pre-treatment technique – prior to final disposal on a landfill. This in turn has led to the erection of some large waste incineration plants in Austria, some other projects are currently in the planning or permitting phase. Therefore the emissions of PCDD/F are projected to increase by 22% until the year 2010 (see Table 3).

Table 3: PCDD/F-Emissions into air of the source category Waste Incineration (UMWELTBUNDESAMT 2007a; own calculation).

	Emission 2004 (g I-TEQ)	Emission 2010 (g I-TEQ)
Municipal Solid Waste	0.214	0.265
Hazardous Waste	0.013	0.015
Sludge	0.002	0.002
Sum	0.230	0.282

2.2.2 Cement kilns firing hazardous waste

The following description of this source category is given in the Stockholm Convention's Technical Guidebook (UNEP 2006):

“The following draft guidelines shall provide guidance on best available techniques and guidance on best environmental practices for cement kilns relevant to Article 5 and Annex C, Part II of the Convention. This section also considers requirements of Article 6 of the Convention addressing destruction of POPs containing waste.

In the scope of this document co-incineration of alternative fuels and hazardous wastes in cement kilns is dealt with as well. It should be kept in mind in reading these guidelines that stringent definitions of both terms currently do not exist.

2.2.2.1 Emission Factors and Emissions

In all Austrian cement plants waste is co-incinerated with an upward trend. Emission factors used in the OLI were assessed using reported emissions from Austrian cement kilns (ENVIRONMENTAL IMPACT STATEMENT WIETERSDORF (2003), ENVIRONMENTAL IMPACT STATEMENT RETZNEI (2004), ENVIRONMENTAL IMPACT STATEMENT LEUBE (2005), KARSTENSEN (2006)).

3.22 Mio t of clinker were produced in nine plants in the year 2004. In total about 274,000 t of waste were co-incinerated. Data from single measurements (done between 1999 and 2003) show emission concentrations between 0.0011–0.00725 ng/Nm³ (I-TEQ), which is considerable below the BAT ranges of <0.1 ng/Nm³ (10% O₂; UNEP 2006). Results from literature show, that PCDD/F emissions are not primarily depending on the type of fuel or waste but on the operating conditions and on the prevention of conditions which favour the de-novo synthesis.

The next table presents calculated emissions loads from Austrian cement kilns:

Table 4: PCDD/F-emissions of Austrian cement plants (UMWELTBUNDESAMT 2006a, WIFO 2005; own calculation).

	Emission 2004 (g I-TEQ)	Emission 2010 (g I-TEQ)
Cement kilns (total emissions)	0.108	0.114

2.2.3 Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching

The production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching is described in the Stockholm Convention's Technical Guidebook (UNEP 2006) as follows:

“The main processes involved in making pulp and paper products are raw material handling and preparation, storage (and preservation for non-woods), wood debarking, chipping and agricultural residue cleaning, deknottling, pulping, pulp processing and bleaching if required and, finally, paper or paperboard manufacturing. Most of the formation of the 2,3,7,8-TCDD and 2,3,7,8-TCDF is generated in the C-stage of bleaching via the reaction of chlorine with precursors of TCDD and TCDF. HCB and PCB are not formed during pulp bleaching”.



2.2.3.1 Emission Factors and Emissions

Emissions into air are released by recovery boilers (incineration of black liquor and fuel oil), fluidised bed reactors (incineration of bark, sludge, coal, fuel oil, biomass and waste), lime kilns (incineration of gas and fuel oil) and other fossil fuel fired incineration plants (UMWELTBUNDESAMT 2007b). Although PCDD/F-emissions are not measured in most of the above mentioned incineration plants (emissions are routinely measured at fluidised bed reactors when waste is co-incinerated) emissions are generally considered to be low (UNEP 2005). Emissions of these incineration plants are reported in section 2.2.8 (fossil fuel-fired utility and industrial boilers).

2.2.4 Thermal processes in the metallurgical industry (Secondary copper production; Sinter plants in the iron and steel industry; Secondary aluminium production; Secondary zinc production)

This source category is described in the Stockholm Convention's Technical Guidebook (UNEP 2006) as follows:

“Secondary copper smelting involves pyrometallurgical processes dependent on the copper content of the feed material, size distribution and other constituents. Feed sources are copper scrap, sludge, computer scrap, drosses from refineries and semi-finished products. These materials may contain organic materials like coatings or oil, and installations take this into account by using de-oiling and decoating methods or by correct design of the furnace and abatement system.”

“Iron sintering plants may be used in the manufacture of iron and steel, often in integrated steel mills. The sintering process is a pretreatment step in the production of iron whereby fine particles of iron ores and, in some plants, secondary iron oxide wastes (collected dusts, mill scale) are agglomerated by combustion.”

“Processes used in secondary aluminium smelting are dependent on feed material. Pretreatment, furnace type and fluxes used will vary with each installation. Production processes involve scrap pretreatment and smelting/refining. Pretreatment methods include mechanical, pyrometallurgical and hydrometallurgical cleaning. Smelting is conducted using reverberatory or rotary furnaces. Induction furnaces may also be used to smelt the cleaner aluminium feed materials.”

“Secondary zinc smelting involves the processing of zinc scrap from various sources. Feed material includes dusts from copper alloy production and electric arc steel making (both of which have the potential to be contaminated with chemicals listed in Annex C of the Stockholm Convention), residues from steel scrap shredding, and scrap from galvanizing processes. The process method is dependent on zinc purity, form and degree of contamination. Scrap is processed as zinc dust, oxides or slabs. The three general stages of production are pretreatment, melting and refining.”

The latter process is not applied in Austria.

2.2.4.1 Emission Factors and Emissions

Secondary copper plant

In Austria only one secondary copper plant is in operation with a production capacity of 74.000 t/a copper cathodes and 100.000 t/a bolts (UMWELTBUNDESAMT 2004). Emissions are reduced via fabric filter and regenerative afterburner after the shaft

furnace. Emissions of PCDD/F after the shaft furnace are below the emission limit value of the permit of 0.9 ng/Nm³. (UMWELTBUNDESAMT 2004; no oxygen content has been reported).

There are no dioxin emission reduction measures installed after the converter and the anode furnace.

Sinter Plants

In Austria two sinter plants are in operation with a production capacity of 1.5 mio t/a (VA Donawitz) and 2.75 mio t/a (VA Linz), respectively. The larger plant uses a wet system (the so-called Airfine process) for cleaning of the flue gases, thus emitting less than 0.4 ng/Nm³ PCDD/F (emission limit value; as I-TEQ; EIA 2004). With the end of October 2007 the Airfine process will be replaced by a bag filter. It is expected that emissions will be reduced to below 0.1 ng/Nm³ PCDD/F (as I-TEQ) (ENVIRONMENTAL IMPACT STATEMENT 2006, ENVIRONMENTAL IMPACT ASSESSMENT 2004).

The other sinter plant is equipped with a fabric filter since 2002. However, due to the fact that actually there are no limit values and monitoring requirements for existing sinter plants the emission behaviour of this sinter plant is not known. Internal measurements of the company are reported to the Umweltbundesamt as basis for the Austrian Air Emissions Inventory.

Secondary aluminium smelting plants

In Austria the following companies are producing secondary aluminium (UMWELTBUNDESAMT 2004):

- AMAG casting GmbH
- AMAG rolling GmbH (the capacity of both AMAG companies has been >200.000 t/a in 2001)
- Aluminium Lend GmbH & Co KG (SAG): capacity: 40.000 t/a (2001).
- Hütte Klein-Reichenbach: capacity: 10.000 t/a.

Different furnaces are used in the secondary aluminium production in Austria like reverberatory furnace, rotary furnace, tilting rotary furnace, induction furnace. Emissions of PCDD/F are reduced via afterburning, dry sorption technique (NAHCO₃, coke) or injection of sorbalite (lime and coke). Measured PCDD/F emissions are in a range of <0.01–0.4 ng/Nm³, (UMWELTBUNDESAMT 2004) which is below the emission value associated with Best Available Techniques (<0.1–0.5 ng/Nm³, EUROPEAN COMMISSION 2001).

Actual limit values of PCDD/F from the different secondary aluminium plants in Austria are in a range of 0.1–0.4 ng/Nm³.

Benzo(a)pyrene is limited in the non ferrous metals ordinance with an emission limit value of 0.05 mg/Nm³, measured values (as far as they are available) are far below this limit value.

Emissions

Table 5 gives an overview of calculated emissions from processes described above:

*Table 5: PCDD/F-emissions of thermal processes in the metallurgical industry
– Part II (UMWELTBUNDESAMT 2006a, WIFO 2005; own calculation).*

Source Category	2004 [g I-TEQ]	2010 [g I-TEQ]
Secondary copper production	0.512	0.512
Sinter plants in the iron and steel industry	3.04	2.30
Secondary aluminium production	1.813	1.813

2.2.5 Open burning of waste, including burning of landfill sites

This source category is described in the Stockholm Convention's Technical Guidebook (UNEP 2006) as follows:

“Open burning covers a wide range of different uncontrolled waste combustion practices, including dump fires, pit burning, fires on plain soil and barrel burning.”

2.2.5.1 Emission Factors and Emissions

This source category includes on-field burning of stubble, straw, etc and open burning of agricultural waste. Releases are taken from the Austrian National Inventory (see Table 6).

Intentional fires like bonfires bare the risk for abuse for domestic waste disposal. This issue has been addressed in a single case study showing the effectiveness of current regulation for this field of activity. The situation for unintentional fires is more unclear. Emission factors reported in literature show high uncertainty due to limited sets of data.

In addition releases by accidental burning of landfill sites (esp. landfills for the intermediate storage of waste) should be added here as well as releases by accidental fires of houses and other facilities. In the recent years burning of intermediate storage facilities of waste occurred comparable often. However, due to missing data in terms of the mass of burnt waste and the great uncertainties associated with the relevant emission factors no quantification of emissions was done for these types of unwanted emissions.

Nevertheless, it can be assumed that these incidents contribute substantially to the overall emissions of PCDD/F into air: The Dioxin Toolkit (UNEP 2005) gives an default emission factor of 1 mg per ton of burnt material.

*Table 6: PCDD/F-emissions of the source category open burning of waste
(UMWELTBUNDESAMT 2006a, WIFO 2005; own calculation).*

Source Category Part III	2004 [g I-TEQ]	2010 [g I-TEQ]
Open burning of waste*	0.216	0.216

* without burning of landfill sites and accidental fires

2.2.6 Thermal processes in the metallurgical industry not mentioned in Part II

This source category is described in the Stockholm Convention's Technical Guidebook (UNEP 2006) as follows:

“Secondary lead smelting involves the production of lead and lead alloys, primarily from scrap automobile batteries, and also from other used lead sources (pipe, solder, drosses, lead sheathing). Production processes include scrap pretreatment, smelting and refining.”

“Primary aluminium is produced directly from the mined ore, bauxite. The bauxite is refined into alumina through the Bayer process. The alumina is reduced into metallic aluminium by electrolysis through the Hall-Héroult process (either using self-baking anodes – Söderberg anodes – or using prebaked anodes).”

“Magnesium is produced either from raw magnesium chloride with molten salt electrolysis, or magnesium oxide reduction with ferrosilicon or aluminium at high temperatures, as well as through secondary magnesium recovery (for example, from asbestos tailings).”

“Secondary steel is produced through direct smelting of ferrous scrap using electric arc furnaces. The furnace melts and refines a metallic charge of scrap steel to produce carbon, alloy and stainless steels at non-integrated steel mills. Ferrous feed materials may include scrap, such as shredded vehicles and metal turnings, or direct reduced iron. In addition scrap may be added to other melting furnaces in the foundry and primary iron and steel sectors.”

“Primary base metals smelting involves the extraction and refining of nickel, lead, copper, zinc and cobalt. Generally, primary base metals smelting facilities process ore concentrates. Most primary smelters have the technical capability to supplement primary concentrate feed with secondary materials (e.g. recyclables).”

2.2.6.1 Emission factors and emissions

Secondary lead production

Only one plant in Austria (BMG Metall & Recycling GmbH in Arnoldstein/Kärnten) produces secondary lead from old batteries with a production capacity of about 23,000 t/a. (UMWELTBUNDESAMT 2004). An afterburner has been installed after the furnaces. No data have been given with regard to PCDD/F-emissions of the secondary lead plant; no emission limit value with regards to PCDD/F exists in the current permit. Benzo(a)pyrene is limited by permit with an emission limit value of 0.1 mg/Nm³, a measured value of 0.0016 mg/Nm³ is far below the limit value. (UMWELTBUNDESAMT 2004).

Primary aluminium production

Primary aluminium is not produced in Austria anymore (1992 – change to secondary aluminium production).

Secondary steel production

Secondary steel (Electric Arc Furnace) is produced in three plants (Böhler Uddeholm, Marienhütte, Breifenfeld). Total production was 622,000 t in the year 2005.

Primary base metals

Nickel oxide is produced from old nickel containing catalysts and other nickel containing wastes and by-products (Treibach TIAG in Althofen). Measured PCDD/F-emissions are well below $<0.1 \text{ ng/Nm}^3$. (UMWELTBUNDESAMT 2004). The Austrian non ferrous metals ordinance does not apply to the production of nickel oxide.

Emissions

Releases are taken from the Austrian National Inventory (see Table 7).

Table 7: PCDD/F-emissions of the source category thermal processes in the metallurgical industry – Part III (UMWELTBUNDESAMT 2006a, WIFO 2005; own calculation).

Source Category Part III	2004 [g I-TEQ]	2010 [g I-TEQ]
Thermal processes in the metallurgical industry not mentioned in Part II	0.131	0.131

2.2.7 Residential combustion sources

Residential combustion plants are defined in the Stockholm Convention's Technical Guidebook (UNEP 2006) as follows:

“This section considers the combustion of wood, coal and gas, mainly for residential heating and cooking. Combustion takes place in hand-fired stoves or fireplaces or, in the case of larger central heating systems, in automatically fired installations.”

2.2.7.1 Emission Factors and Emissions

Activity data for residential combustion plants can be found within the Austrian National Energy Balance in the NFR-Codes (NFR: Nomenclature for Reporting) “Commercial/Institutional” (NFR: 1A4a, SNAP: 0201), “Residential Plants” (NFR: 1A4b1, SNAP: 0202) and “Stationary” (NFR: 1A4c1, SNAP: 0203). Since these plants are regarded as small scale installations, their emissions are allocated to the source category “Residential combustion sources”.

2.2.7.2 Activity data – NFR-code: “Residential Plants”

In 2004 total energy consumption in the NFR-code “Residential Plants” was 209 PJ. Major fuels were heating oil (light and extra light) with a share of 34.3%, followed by natural gas (30.3%), wood (26.4%), wood waste and others (4.6%). Coke (1.5%), liquefied petroleum gas (1.5%), coal (0.72%) and lignite (0.58%) are of minor importance.

According to the forecast (WIFO 2005; own calculation) total energy consumption in this category will rise to 226 PJ until 2010. The ratio of used fuels remains almost unchanged, with heating oil still at the top (35.8%), followed by natural gas (30.6%) and wood (28.7%). Consumption of wood waste and others will decrease to 2.0%. Total input of coke, coal and lignite will be reduced to a share of 2.0% (see Table 8).

Table 8: Fuel mix in the NFR-code „Residential Plants“ (UMWELTBUNDESAMT 2006a, WIFO 2005; own calculation).

Residential Plants	2004	2010
Coal	2.8%	2.0%
Heating oil	34.3%	35.8%
Wood waste	4.6%	2.0%
Wood	26.4%	28.7%
Gas	30.3%	30.6%
Others	1.5%	0.9%
Sum	100%	100%
Total Energy Consumption	208 PJ	226 PJ

2.2.7.3 Emission factors – NFR-code: “Residential Plants”

In the next table emission factors of relevant fuels are compiled:

Table 9: Emission factors for Residential Plants

Fuel Type	Emission Factor (µg/GJ)		
	UMWELTBUNDESAMT 2006a	UMWELTBUNDESAMT 2002	UNEP Toolkit
heating oil light	0.0015 (general)		0.01 (general)
heating oil extra light	0.0015 (c.h.; a.h.) 0.003 (stoves)		0.01 (general)
natural gas	0.0025 (c.h.; a.h.) 0.006 (stoves)		0.0015 (general)
wood	0.25 (c.h.) 0.38 (a.h.) 0.75 (stoves, fireplaces)	0.32 (stoves, fireplaces)	0.1 (general)
wood waste	0.25 (c.h.) 0.38 (a.h.) 0.75 (stoves, fireplaces)		1.5 (general)
coke	0.38 (c.h.; a.h.) 0.75 (stoves, fireplaces)	1.47 (stoves, fireplaces)	
coal	0.38 (c.h.; a.h.) 0.75 (stoves, fireplaces)	7.74 (stoves, fireplaces)	15 (stoves; high chlorine coal) 0.1 (stoves; low chlorine coal)

c.h.: central heating

a.h.: apartment heating

For the purpose of this calculation emission factors used in the Austrian air emission inventory (OLI) have been updated subject to available literature:

Coal:

In the OLI two different emission factors are used to calculate emissions from central and apartment heating systems and from stoves. However, in a recent study (UMWELTBUNDESAMT 2002) a ten-fold higher emission factor (7.74) has been published for stoves (see Table 9). In the Dioxin Toolkit (UNEP 2005) emission factors for coal

(0.1 µg/GJ) and coal with a high chlorine content (15 µg/GJ) are listed. Because it is assumed that coals used in Austrian residential plants are of a medium to high chlorine content, the emission factor published in the most recent study is used.

Coke:

In line with the most actual study (UMWELTBUNDESAMT 2002) an emission factor of 1.47 µg/GJ is used for calculating the emissions from stoves.

Wood:

No distinction is made between different firing systems. The emission factor is taken from UMWELTBUNDESAMT 2002 (0.32 µg/GJ).

2.2.7.4 Emissions – NFR-code: “Residential Plants”

In the table below emissions of residential plants are listed in relation to the fuel input. The largest part of the emissions stems from the incineration of wood with even a higher share in the year 2010. The incineration of fossil solid fuels (coal, lignite, coke) contributes significantly to the overall emissions of this source category. However, emissions from fossil solid fuels will decrease due to a decline in fuel consumption.

Table 10: Emissions of Dioxines/Furanes of residential plants (own calculation)

Residential Plants	2004 (g I-TEQ)	2010 (g I-TEQ)
Coal, lignite, coke	6.56	4.44
Heating oil	0.12	0.13
Wood waste	2.86	1.33
Wood	15.49	18.19
Gas	0.17	0.18
Others	0.011	0.006
Sum	25.21	24.28

2.2.7.5 Activity data – NFR-code “Commercial/Institutional” and “Stationary”

In the year 2004 total input within these subcategories was 56.0 PJ. The major fuels were natural gas and other gases (45.2%), followed by heating oil light and extralight (sum of heating oils: 30.6%). Wood waste (13.2%), industrial waste (2.6%), biomass (7.2%) and other solid fuels (total of coke, coal and lignite: 1.4%) are of minor importance. Activity rates in this sector suffer from substantial uncertainties which are the result of a lack of qualified data.

According to the trend total activity in the year 2010 will be in the magnitude of 44.2 PJ. The fuel mix will undergo slight changes until 2010: Wood waste and industrial waste will be reduced to almost half of their input in 2004, whereas solid fossil fuels will hardly be used in this sector in 2010. On the other hand activity rates of heating oil and gas will increase (see Table 11).

Table 11: Share of fuels within the subcategories “Commercial/Institutional” and “Stationary” (UMWELTBUNDESAMT 2006a, WIFO 2005; own calculation).

Commercial/Institutional + Stationary	2004	2010
Coal	1.4%	0.2%
Heating oil	30.6%	36.7%
Wood waste	13.2%	6.7%
Industrial waste	2.6%	1.4%
Wood	7.2%	10.2%
Gas	37.6%	39.7%
Others	7.6%	5.1%
Sum	100%	100%
Total Energy Consumption	56 PJ	44.2 PJ

2.2.7.6 Emissions of PCDD/F – NFR-code “Commercial/Institutional” and „Stationary“

Emission factors were taken from the OLI. Due to the high activity rate of wood waste this type of waste contributes most to the overall emissions. However, in 2010 activity rates and emissions will drop to almost half of their number in 2004.

Table 12: Emissions of Dioxines/Furanes caused by different fuel types (own calculation).

Com/Inst/Stat	2004 (g I-TEQ)	2010 (g I-TEQ)
Coal, lignite, coke	0.17	0.02
Heating oil	0.03	0.03
Wood waste	2.59	1.26
Wood	1.00	1.15
Gas	0.03	0.03
Ind. Waste	0.43	0.18
Others	0.0092	0.0049
Sum	4.26	2.67

2.2.8 Fossil fuel-fired utility and industrial boilers

Fossil fuel-fired utility and industrial boilers are described in the Stockholm Convention’s Technical Guidebook (UNEP 2006) as follows:

“Boilers are facilities designed to burn fuel to heat water or to produce steam. The majority of boilers use fossil fuels to provide the energy source, although boilers can also be designed to burn biomass and wastes. The steam produced from the boiler can be used for electricity production or used in industrial processes; likewise hot water can be used in industrial processing, or for domestic and industrial heating.”

2.2.8.1 Emission Factors and Emissions

Emission factors used by the Austrian Air Emissions Inventory are consistent with data from literature (UMWELTBUNDESAMT 2003, EUROPEAN COMMISSION 2003, 2006). In general emission concentrations of investigated boilers are (far) below 0.1 ng/Nm^3 . However, because of the high total activity number (total energy input: about 404 TJ in the year 2004) the emitted load is in the range of 1 g per year (see Table 13).

Table 13: PCDD/F-emissions of the source category fossil fuel fired utility and industrial boilers (UMWELTBUNDESAMT 2006a, WIFO 2005; own calculation).

Source Category Part III	2004 [g I-TEQ]	2010 [g I-TEQ]
Fossil fuel-fired utility and industrial boilers	1.041	0.689

The projected decrease in emissions can be explained by a change in activity data for some fuels, e.g. reduced coal input in the chemical industry.

2.2.9 Firing installations for wood and other biomass fuels

Firing installations for wood and other biomass fuels are described in the Stockholm Convention's Technical Guidebook (UNEP 2006) as follows:

“The main purpose of firing installations for wood and other biomass fuels is energy conversion. Large-scale installations for firing wood and other biomass fuels mainly use fluidized bed combustion and grate furnaces. Technologies for small-scale plants include underfeed furnaces and cyclone suspension furnaces. Recovery boilers in the pulp and paper industry apply specific combustion conditions. Technology selection is related to fuel properties and required thermal capacity. In the present section only large-scale applications in, for example, industry, power generation and district heating are covered”

2.2.9.1 Emission Factors and Emissions

Some emission factors used by the Austrian Air Emissions Inventory have been updated according to available literature (UMWELTBUNDESAMT 2007c). For example emission factors for industrial firing installations have been reduced from $0.08 \mu\text{g/GJ}$ to $0.03 \mu\text{g/GJ}$. However, the total emissions did not change substantially. Due to a predicted increase in the activity figures emissions will increase by almost 40% until the year 2010 (Table 14).

Table 14: PCDD/F-emissions of the source category firing installations for wood and other biomass fuels (UMWELTBUNDESAMT 2006a, WIFO 2005; own calculation).

Source Category Part III	2004 [g I-TEQ]	2010 [g I-TEQ]
Firing installations for wood and other biomass fuels	1.374	1.917

2.2.10 Specific chemical production processes releasing unintentionally formed persistent organic pollutants, especially production of chlorophenols and chloranil

This source category is described in the Stockholm Convention's Technical Guidebook (UNEP 2006) as follows:

“This section focuses on processes for the manufacture of industrial chemicals that could theoretically give rise to persistent organic pollutants (particularly those chemicals listed in Annex C of the Stockholm Convention). Most of the processes described share common steps, including chlorination of organic or inorganic raw materials, purification of the products, separation of product streams (usually by distillation), destruction of high-molecular-weight side products and recycle or sale of hydrogen chloride.”

2.2.10.1 Emission Factors and Emissions

No national emission factors are available. It is assumed that – if any – emissions are negligible due to low activity figures.

2.2.11 Crematoria

This source category is described in the Stockholm Convention's Technical Guidebook (UNEP 2006) as follows:

“Cremation is the disposal of a cadaver by the process of burning. This can be undertaken in either an uncontrolled, open burning fashion on funeral pyres, or in a controlled fashion within a cremator, installed within a crematorium or crematory. For the purposes of this document, only the cremator installations are discussed with respect to preventing releases of persistent organic pollutants, and not open burning.”

2.2.11.1 Emission factors and emissions

In the year 2004 three of ten Austrian crematoria were equipped with emission reduction techniques, two thereof with PCDD/F reduction techniques. The emission limit value given in the permits for these two plants is 0.1 ng/Nm³ (11% O₂) (communication by operators). There exists no generally binding rule concerning emission reduction for crematoria in Austria.

Due to a general lack of data emission factors used by the Austrian Air Emissions Inventory have been used (Table 15).

Table 15: PCDD/F-emissions of the source category crematoria (UMWELTBUNDESAMT 2006a, WIFO 2005; own calculation).

Source Category Part III	2004 [g I-TEQ]	2010 [g I-TEQ]
Crematoria	0.154	0.165



2.2.12 Motor vehicles, particularly those burning leaded gasoline

This source category is described in the Stockholm Convention's Technical Guidebook (UNEP 2006) as follows:

“The major fuels used in motor vehicle transportation are gasoline and diesel. Liquefied petroleum gas, vegetable oil-based and other biofuels, and alcohol-oil mixtures are gaining importance.”

2.2.12.1 Methodology

Activity data for Motor vehicles can be found within the Austrian National Energy Balance in the NFR-Codes:

Road Transportation (SNAP: 07):

- Passenger cars
- Light duty vehicles <3.5 t
- Heavy duty vehicles >3.5 t and buses (r)
- Mopeds and Motorcycles <50 cm³
- Motorcycles >50 cm³

Other Mobile Sources and Machinery (SNAP: 08):

- Military
- Railways
- Inland Waterways
- Agriculture
- Forestry
- Industry
- Household and gardening

2.2.12.2 Activity data – Road Transportation

In 2004 total energy consumption of “Road Transportation” was 303 PJ. The major source category with a share of 57% were passenger cars, followed by Heavy Duty Vehicles (35%).

According to the forecast total energy consumption in this category will slightly decrease to 297 PJ until 2010. Generally, the ratio of used fuels remains constant, with passenger cars still at the top (54%), followed by Heavy Duty Vehicles (39%). Consumption of gasoline cars will decrease from 28% in 2004 to 19% in 2010 (–35%). Fuel Consumption from Diesel cars will increase by about 22%.

Table 16: Fuel Allocation Road Transportation (HAUSBERGER 1997, WIFO 2005, UMWELTBUNDESAMT 2006a).

Source Category	Activity 2004		Activity 2010		Change 2004–2010
	(PJ)	(%)	(PJ)	(%)	
Passenger cars	172	57%	161	54%	–6%
Gasoline	85	28%	56	19%	–35%
Diesel	86	28%	105	35%	22%
Light duty vehicles <3.5 t (r)	23	8%	20	7%	–13%
Heavy duty vehicles >3.5 t and buses (r)	107	35%	115	39%	7%
Mopeds and Motorcycles <50 cm ³	0	0%	0	0%	–5%
Motorcycles >50 cm ³	1	0%	1	0%	15%
Total	303	100%	297	100%	–2%

2.2.12.3 Activity data – Other Mobile Sources and Machinery

In 2004 total energy consumption of “Other Mobile Sources and Machinery” was 41.41 PJ.

The major source category was Industry (industrial machinery with a share of 37%), followed by machinery of the agricultural sector (28%). According to the forecast total energy consumption in this category will be stable until 2010. Fuel consumption of inland waterways machineries is projected to increase by about 24% until 2010.

Table 17: Fuel Allocation Other Mobile Sources and Machinery (HAUSBERGER 1997, WIFO 2005, UMWELTBUNDESAMT 2006a).

Source Category	Activity 2004		Activity 2010		Change 2004–2010
	(PJ)	(%)	(PJ)	(%)	
Military	0.03	0%	0.03	0%	–3%
Railways	2.50	6%	2.20	5%	–12%
Inland Waterways	1.04	3%	1.29	3%	24%
Agriculture	11.78	28%	12.03	29%	2%
Forestry	8.65	21%	7.28	18%	–16%
Industry	15.52	37%	16.45	40%	6%
Household and gardening	1.89	5%	1.89	5%	0%
Total	41.41	100%	41.16	100%	–1%

2.2.12.4 Emission factors – NFR-code: “Road Transportation, Other Mobile Sources and Machinery”

The emission factors used in the Austrian air emission inventory are also used for the emission projection. These Emission factors are based on a study “Österreichische Emissionsinventur für POPs, Forschungsgesellschaft Techn. Umweltschutz GmbH” financed by the Umweltbundesamt and of relevant finished in 2001.



In the next table emission factors fuels are compiled:

Table 18: Emission factors for Road Transportation and other Mobile Sources and Machinery (HÜBNER 2001).

Source Category	NFR Code	SNAP Code	Split	Fueltype	EF µg/GJ
Passenger cars (r)	1 A 3 b 1	0701	737	Gasoline	0.0460
Passenger cars (r)	1 A 3 b 1	0701	738	Gasoline	0.0012
Passenger cars (r)	1 A 3 b 1	0701	XXX	Diesel	0.0007
Light duty vehicles < 3.5 t (r)	1 A 3 b 2	0702	XXX	Diesel	0.0007
Light duty vehicles < 3.5 t (r)	1 A 3 b 2	0702	XXX	Gasoline	0.0460
Heavy duty vehicles > 3.5 t and buses (r)	1 A 3 b 3	0703	X71	Diesel	0.0055
Heavy duty vehicles > 3.5 t and buses (r)	1 A 3 b 3	0703	XXX	Gasoline	0.0460
Mopeds and Motorcycles < 50 cm ³	1 A 3 b 4	0704	737	Gasoline	0.0031
Mopeds and Motorcycles < 50 cm ³	1 A 3 b 4	0704	738	Gasoline	0.0012
Motorcycles > 50 cm ³	1 A 3 b 4	0705	XXX	Gasoline	0.0031
Military	1 A 5 b	0801	XXX	Diesel	0.01
Shunting locs	1 A 3 c	080201	XXX	Diesel	0.01
Rail-cars	1 A 3 c	080202	XXX	Diesel	0.01
Locomotives	1 A 3 c	080203	XXX	Coal	0.38
Locomotives	1 A 3 c	080203	XXX	Diesel	0.01
Personal watercraft	1 A 3 d 2	080303	XXX	Gasoline	0.05
Inland goods carrying vessels	1 A 3 d 2	080304	XXX	Diesel	0.01
Agriculture	1 A 4 c 2	0806	XXX	Diesel	0.01
Agriculture	1 A 4 c 2	0806	XXX	Gasoline	0.05
Forestry	1 A 4 c 2	0807	XXX	Diesel	0.01
Forestry	1 A 4 c 2	0807	XXX	Gasoline	0.05
Industry	1 A 2 f 1	0808	XXX	Diesel	0.01
Industry	1 A 2 f 1	0808	XXX	Gasoline	0.05
Household and gardening	1 A 4 b 2	0809	XXX	Diesel	0.01
Household and gardening	1 A 4 b 2	0809	XXX	Gasoline	0.05

2.2.12.5 Emissions of Dioxines/ – NFR-code “Road Transportation” and “Other Mobile Sources and Machinery”

Table 19: Emissions of Dioxins from Road Transportation, (UMWELTBUNDESAMT 2006b)

Source category	Emission 2004		Emission 2010		Change 2004–2010
	(g)	(%)	(g)	(%)	
Passenger cars	0.47	40%	0.29	29%	–38%
thereof Gasoline conventional	0.31	27%	0.15	16%	–51%
Light duty vehicles <3.5 t(r)	0.12	10%	0.06	6%	–52%
Heavy duty vehicles >3.5 t and buses (r)	0.59	50%	0.63	64%	7%
Mopeds and Motorcycles <50 cm ³	0.00	0%	0.00	0%	–19%
Motorcycles >50 cm ³	0.00	0%	0.00	0%	15%
Total	1.19	100%	0.98	100%	–17%

Table 20: Emissions of Dioxins Other Mobile sources and Machinery (UMWELTBUNDESAMT 2006b).

Source category	Emission 2004		Emission 2010		Change 2004–2010
	(g)	(%)	(g)	(%)	
Military	0.000	0%	0.000	0%	–3%
Railways	0.022	7%	0.020	6%	–11%
Inland Waterways	0.011	3%	0.012	4%	11%
Agriculture	0.081	26%	0.082	27%	1%
Forestry	0.056	18%	0.048	15%	–16%
Industry	0.089	29%	0.094	31%	6%
Household and gardening	0.053	17%	0.053	17%	–1%
Total	0.313	100%	0.308	100%	–1%

2.2.13 Destruction of animal carcasses

This source category is described in the Stockholm Convention’s Technical Guidebook (UNEP 2006) as follows:

“Destruction of animal carcasses is generally achieved by incineration, rendering or a combination of these two activities. Incineration techniques may include pyrolysis, gasification or other forms of heat treatment, and may involve burning of complete carcasses or parts of carcasses. Rendering covers a range of activities for processing of carcasses to recover materials.”

2.2.13.1 Emission Factors and Emissions

No national emission factors are available. It is assumed that – if any – emissions are negligible due to low activity figures.



2.2.14 Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction)

This source category is described in the Stockholm Convention's Technical Guidebook (UNEP 2006) as follows:

“Woven and knit fabrics cannot be processed into finished goods until the fabrics have passed through several water-intensive wet processing stages (also known as finishing) such as fabric preparation, dyeing, printing and finishing. Natural fibres typically require more processing steps than artificial fibres. Relatively large volumes of wastewater are generated, containing a wide range of contaminants, which must be treated prior to disposal. Significant quantities of energy are used in heating and cooling chemical baths and drying fabrics and yarns.”

2.2.14.1 Emission Factors and Emissions

No national emission factors are available. It is assumed that – if any – emissions are negligible due to low activity figures.

2.2.15 Shredder plants for the treatment of end of life vehicles

This source category is described in the Stockholm Convention's Technical Guidebook (UNEP 2006) as follows:

“Shredder plants for treatment of end-of-life vehicles are listed in Annex C of the Stockholm Convention as a source that has the potential to form and release chemicals listed in Annex C. Shredders are large-scale machines equipped inside with one or more anvils or breaker bars and lined with alloy steel wear plates. An electric motor drives the rotor with the freeswinging alloy steel hammers. Beneath the shredder is a vibratory pan, which receives the shredded material discharged through the grates. Typically a ferrous metal stream is produced, which is relatively clean and consists of small (50 mm) pieces of steel and a “fluff” stream, which contains the fragments of non-ferrous metals and other materials that entered the shredder (also known as fragmentizer). Very few data of stack emission measurements at shredder plants are available. However, the results of some studies have shown levels of dioxin compounds greater than 0.1 ng I-TEQ/m³.

At present there is not sufficient evidence that new formation of polychlorinated dibenzo-p-dioxins (PCDD), polychlorinated dibenzofurans (PCDF) or polychlorinated biphenyls (PCB) occurs in the (mechanical) shredding of vehicles, household electrical equipment or other electrical appliances. The data available indicate that the PCDD/PCDF and PCB released from shredder plants are from industrial, intentional production and have been introduced with oils, dielectric fluids, and other materials contained in these vehicles or consumer goods and which are simply set free through this mechanical process.”

2.2.15.1 Emission Factors and Emissions

No national emission factors are available for this activity.

2.2.16 Smouldering of copper cables

This source category is described in the Stockholm Convention's Technical Guidebook (UNEP 2006) as follows:

“Smouldering of copper cables involves the open burning of plastic coatings from electrical cable and wiring to recover scrap copper and other constituents of the cables. This process is labour intensive, and is performed by individuals or in small facilities without any abatement measures for air emissions. Smouldering is conducted in burn barrels or on open ground. No means of temperature control or oxygen addition are used to achieve complete combustion of plastic compounds.”

2.2.16.1 Emission Factors and Emissions

This process is not applied in Austria.

2.2.17 Waste oil refineries

This source category is described in the Stockholm Convention's Technical Guidebook (UNEP 2006) as follows:

“For the purpose of this guidance section, waste oils (or used oils) are defined as any petroleum-based, synthetic, or plant- or animal-based oil that has been used. Waste oils may originate from two large sources: industrial waste oils, and vegetable and animal waste oils. Among the industrial waste oils, three main oil streams can be identified: industrial oil (e.g. hydraulic oil, engine lubricant, cutting oil); garage or workshop oil; and transformer oil.

Waste oils have been found to be contaminated with PCDD, PCDF and PCB. At present there is no available evidence that PCDD/PCDF or PCB are newly formed in waste oil refineries. The data available indicate that the PCDD/PCDF and PCB released from waste oil refineries or waste oil handling and management plants are from industrial, intentional production of PCB or chlorobenzenes that are present in the waste oils either by contamination in the synthesis process (of these chemicals) or have become contaminated during the use phase or earlier recycling processes. In this sense, waste oil refineries represent a distribution source of chemicals listed in Annex C rather than a formation source. According to available information, waste oil management options include reuse or regeneration; thermal cracking; and incineration or use as fuel. It should be noted that dumping and open burning are also practised in many countries.”

2.2.17.1 Emission Factors and Emissions

This process is not applied in Austria.

2.2.18 Summary of PCDD/F – Releases to Air from Source Categories of the Stockholm Convention

In the year 2004 a total of 39.8 g PCDD/F (I-TEQ) were emitted in Austria from source categories according to the Stockholm Convention. In the Austrian Air Emissions Inventory (OLI) PCDD/F emissions into air were calculated to be 40.7 g

(I-TEQ, 2004). The difference can be explained by the fact, that the OLI is more comprehensive as far as activities are concerned. On the other hand some emission factors have been updated in the course of this report (see description of source categories).

Only a few source categories contribute significantly to total emissions of dioxins and furans, the most important being residential combustion sources with a share of 74% and thermal processes in the metallurgical sector with a share of 14%. Other sources are motor vehicles with 3.8%, biomass combustion (3.5%) and fossil fuel use in industry (2.6%) (see Table 21, Table 22 and Figure 2).

In addition to that the following tables include a projection of the emissions for the year 2010. The projection is based on activity data from the Austrian energy projection (WIFO 2005). According to the projection total emissions will decrease to 36.8 g I-TEQ in the year 2010. Emission reductions will occur in sinter plants, residential combustion (due to less use of coal and wood waste; however, emissions from wood combustion in the source category residential combustion plants will increase), mobile vehicles and fossil fuel fired boilers in industry and energy. Emissions will slightly increase in biomass combustion, waste incineration, co-incineration in cement kilns, some metallurgical processes and crematoria. This increase is the result of higher activity rates, it is assumed that emission concentrations remain unchanged (see specific chapters).

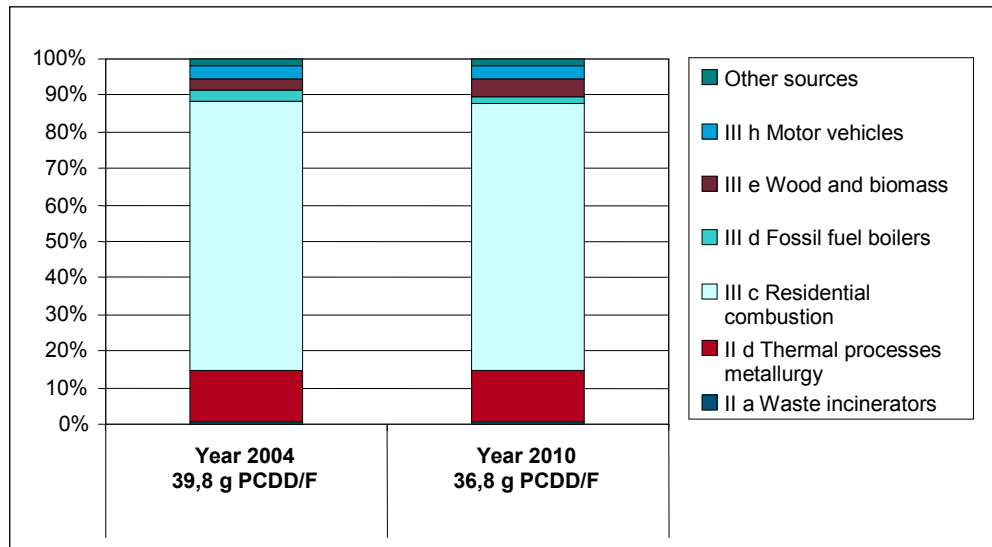


Figure 2: Relevant source categories of PCDD/F (UMWELTBUNDESAMT 2006a, b; own calculation).

Table 21: PCDD/F emissions from Source Categories Part II for 2004 and projection to 2010 (WIFO 2005, UMWELTBUNDESAMT 2006a, b; own calculation).

Source Category Part II	2004 [g I-TEQ]	2010 [g I-TEQ]
Waste incinerators, including co-incinerators of municipal, hazardous or medical waste or of sewage sludge	0.230	0.282
Cement kilns firing hazardous waste ¹	0.108	0.114
Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching ²	0.000	0.000
The following thermal processes in the metallurgical industry		
(i) Secondary copper production	0.512	0.512
(ii) Sinter plants in the iron and steel industry	3.040	2.300
(iii) Secondary aluminium production	1.813	1.813
(iv) Secondary zinc production	NO	NO
Total (Part II)	5.703	5.021

¹ figures represent total emissions from cement kilns

² only process emissions are covered here; PCDD/F emissions from combustion processes are included in fossil fuel fired utility and industrial boilers and in firing installations for wood and other biomass fuels.

NO: not occurring.

Table 22: PCDD/F emissions from Source Categories Part III for 2004 and projection to 2010 (WIFO 2005, UMWELTBUNDESAMT 2006a, b; own calculation).

Source Category Part III	2004 [g I-TEQ]	2010 [g I-TEQ]
Open burning of waste	0.216	0.216
Thermal processes in the metallurgical industry not mentioned in Part II	0.375	0.499
Residential combustion sources	29.468	26.945
Fossil fuel-fired utility and industrial boilers	1.041	0.689
Firing installations for wood and other biomass fuels	1.374	1.917
Specific chemical production processes releasing unintentionally formed persistent organic pollutants, especially production of chlorophenols and chloranil	NA	NA
Crematoria	0.154	0.165
Motor vehicles, particularly those burning leaded gasoline	1.503	1.303
Destruction of animal carcasses	NA	NA
Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction)	NA	NA
Shredder plants for treatment of end of life vehicles	NA	NA
Smouldering of copper cables	NA	NA
Waste oil refineries	0.000	0.000
Total (Part III)	34.131	31.733

* without burning of landfill sites and accidental fires

NA: not available.

2.2.19 Austrian Air Emissions Inventory – Polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF)

In 1985 national total dioxin/furan emissions amounted to about 187 g and in 1990 they amounted to about 160 g; emissions have decreased steadily and by the year 2004 emissions were reduced by about 78% (to 41 g in 2004).

In 1985 the main sources for dioxin/furan (as I-TEQ) emissions were the NFR-Sectors *Energy* (59%; note: the NFR-code *Energy* includes Energy consumption in industry and energy as well as in the traffic sector) and *Industrial Processes* (especially iron and steel production) (27%). In 2004 the main sector regarding PCDD/F (as I-TEQ) emissions is *Energy* with a share in National Total of 91%.

The dioxin/furan (as I-TEQ) emissions of the NFR-sectors Agriculture and Industrial processes decreased by 94% and 96%, respectively, due to prohibition of open field burning and improved emission abatement technologies in iron and steel industries. However, calculation of emissions resulted in a slight increase of PCDD/F (as I-TEQ) emissions of the NFR-sector Energy between 2002 and 2004.

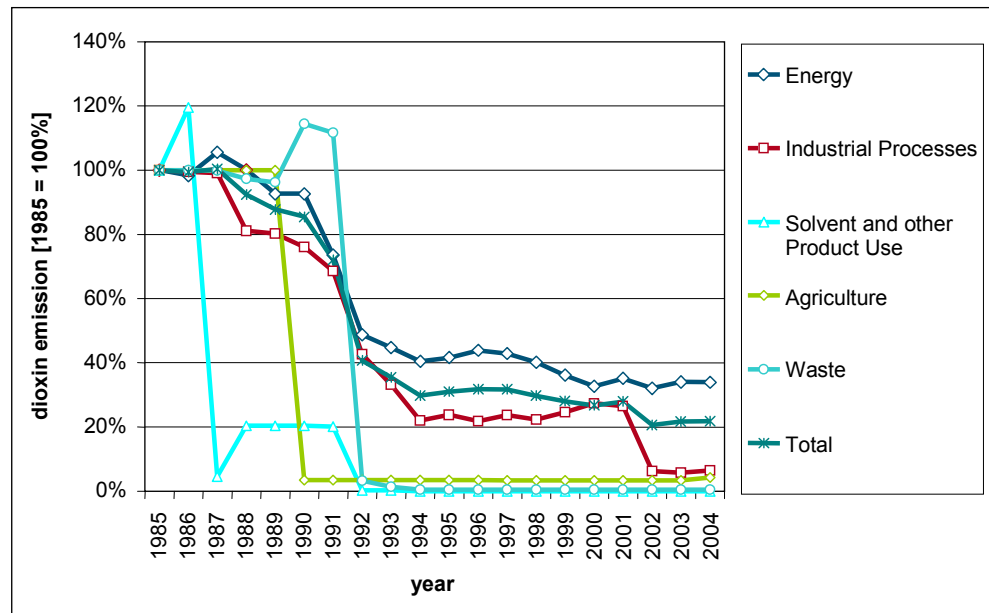


Figure 3: Dioxin emission trend per NFR Category 1990–2004 (base year 1985 = 100%)
Source: UMWELTBUNDESAMT (2006b).

2.3 Releases of Hexachlorobenzene (HCB) – Source categories of the Stockholm Convention

Emission factors used by the Austrian Air Emissions Inventory for calculating emissions have been checked and considered actual. Minor changes could be observed in the source category “Motor vehicles” only.

2.3.1 Motor vehicles, particularly those burning leaded gasoline

2.3.1.1 Activity data – “Road Transportation, Other Mobile Sources and Machinery”

Activity data can be found in chapter 2.2.12.2.

2.3.1.2 Emission factors – NFR-code: “Road Transportation, Other Mobile Sources and Machinery”

The emission factors used in the Austrian air emission inventory are also used for emission projection. These emission factors are based on a study “Österreichische Emissionsinventur für POPs, Forschungsgesellschaft Techn. Umweltschutz GmbH”.

In the next table emission factors of relevant fuels are compiled:

Table 23: Emission factors for road transportation and other mobile sources and machinery (HÜBNER 2001).

Source Category	NFR Code	SNAP Code	Split	Fueltype	EF µg/GJ
Passenger cars (r)	1 A 3 b 1	0701	737	Gasoline	9.20
Passenger cars (r)	1 A 3 b 1	0701	738	Gasoline	0.24
Passenger cars (r)	1 A 3 b 1	0701	XXX	Diesel	0.14
Light duty vehicles <3.5 t (r)	1 A 3 b 2	0702	XXX	Diesel	0.14
Light duty vehicles <3.5 t (r)	1 A 3 b 2	0702	XXX	Gasoline	9.20
Heavy duty vehicles >3.5 t and buses (r)	1 A 3 b 3	0703	X71	Diesel	1.10
Heavy duty vehicles >3.5 t and buses (r)	1 A 3 b 3	0703	XXX	Gasoline	9.20
Mopeds and Motorcycles <50 cm ³	1 A 3 b 4	0704	737	Gasoline	0.62
Mopeds and Motorcycles <50 cm ³	1 A 3 b 4	0704	738	Gasoline	0.24
Motorcycles >50 cm ³	1 A 3 b 4	0705	XXX	Gasoline	0.62
Military	1 A 5 b	0801	XXX	Diesel	1.10
Shunting locs	1 A 3 c	080201	XXX	Diesel	1.10
Rail-cars	1 A 3 c	080202	XXX	Diesel	1.10
Locomotives	1 A 3 c	080203	XXX	Coal	76.00
Locomotives	1 A 3 c	080203	XXX	Diesel	1.10
Personal watercraft	1 A 3 d 2	080303	XXX	Gasoline	9.20
Inland goods carrying vessels	1 A 3 d 2	080304	XXX	Diesel	1.10
Agriculture	1 A 4 c 2	0806	XXX	Diesel	1.10
Agriculture	1 A 4 c 2	0806	XXX	Gasoline	9.20
Forestry	1 A 4 c 2	0807	XXX	Diesel	1.10
Forestry	1 A 4 c 2	0807	XXX	Gasoline	9.20
Industry	1 A 2 f 1	0808	XXX	Diesel	1.10
Industry	1 A 2 f 1	0808	XXX	Gasoline	9.20
Household and gardening	1 A 4 b 2	0809	XXX	Diesel	1.10
Household and gardening	1 A 4 b 2	0809	XXX	Gasoline	9.20

2.3.1.3 Emissions HCB – NFR-code “Road Transportation” and “Other Mobile Sources and Machinery”

Table 24: Emissions of HCB from road transport (UMWELTBUNDESAMT 2006b).

Source category	Emission 2004		Emission 2010		Change 2004–2010
	(g)	(%)	(g)	(%)	
Passenger cars	93.80	40%	58.06	29%	–38%
thereof Gasoline conventional	62.91	27%	30.78	16%	–51%
Light duty vehicles <3.5 t (r)	23.78	10%	11.34	6%	–52%
Heavy duty vehicles >3.5 t and buses (r)	118.89	50%	126.64	64%	7%
Mopeds and Motorcycles <50 cm ³	0.08	0%	0.07	0%	–19%
Motorcycles >50 cm ³	0.63	0%	0.73	0%	15%
Total	237.19	100%	196.83	100%	–17%

Table 25: Emissions of HCB from other mobile sources and machinery, UMWELTBUNDESAMT (2006b)

Source category	Emission 2004		Emission 2010		Change 2004–2010
	(g)	(%)	(g)	(%)	
Military	0.03	0%	0.03	0%	–3%
Railways	4.49	7%	3.99	6%	–11%
Inland Waterways	2.11	3%	2.35	4%	11%
Agriculture	16.17	26%	16.33	27%	1%
Forestry	11.29	18%	9.52	15%	–16%
Industry	17.82	29%	18.84	31%	6%
Household and gardening	10.60	17%	10.52	17%	–1%
Total	62.504	100%	61.572	100%	–1%

2.3.2 Summary of Source Categories of the Stockholm Convention: HCB – Releases to Air

In Austria only a few source categories contribute significantly to the total emissions of HCB. In the year 2004 a total of 44.8 kg were emitted (Table 26, Table 27 and Figure 5). Residential combustion sources had the lion's share of 88.7% and thermal processes in the metallurgical sector (predominantly sinter plants) had a combined 9%. All other sources are below 1%.

According to the emission projection for the year 2010 total emissions will rise to 45.6 kg due to capacity increases in the metallurgical sector. Hence the share of this source category (IId in the figure below) will increase to 10.8% and the share of residential sources slightly decrease to 86.6%. Biomass combustion will become more important and will contribute 0.9% to total emissions.

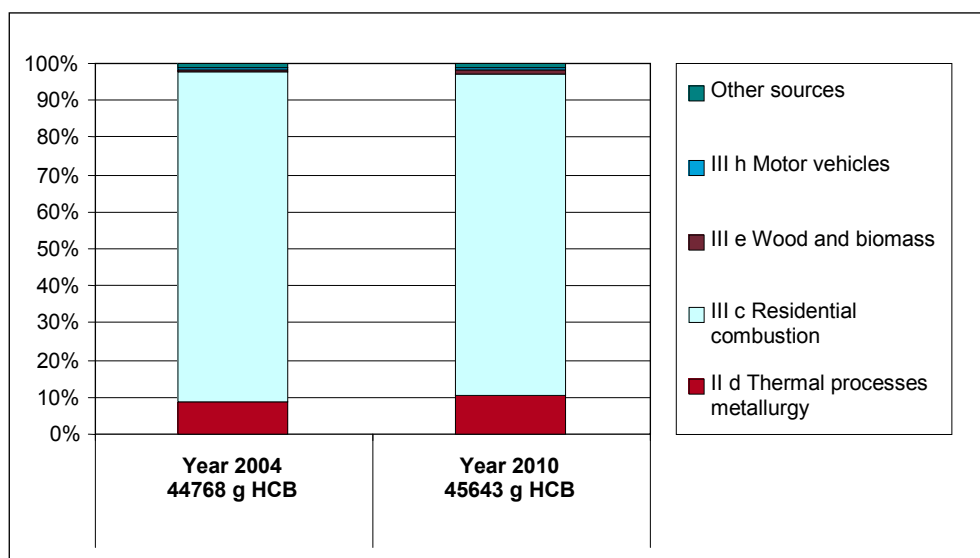


Figure 4: Relevant source categories of HCB (UMWELTBUNDESAMT 2006a, b; own calculation).

Table 26: HCB emissions in Source Category Part II for 2004 and projection to 2010 (UMWELTBUNDESAMT 2006a, b; own calculation).

Source Category Part II	2004 [kg HCB]	2010 [kg HCB]
Waste incinerators, including co-incinerators of municipal, hazardous or medical waste or of sewage sludge	0.196	0.282
Cement kilns firing hazardous waste ¹	0.016	0.020
Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching ²	0.000	0.000
The following thermal processes in the metallurgical industry		
(i) Secondary copper production	0.090	0.166
(ii) Sinter plants in the iron and steel industry	3.261	3.863
(iii) Secondary aluminium production	0.665	0.907
(iv) Secondary zinc production	NO	NO
Total (Part II)	4.230	5.211

¹ figures represent total emissions from cement kilns

² only process emissions are covered here; PCDD/F emissions from combustion processes are included in fossil fuel fired utility and industrial boilers and in firing installations for wood and other biomass fuels.

NO: not occurring.



Table 27: HCB emissions in Source Category Part III for 2004 and projection to 2010
(UMWELTBUNDESAMT 2006a, b; own calculation).

Source Category Part III	2004 [kg HCB]	2010 [kg HCB]
Open burning of waste, including burning of landfill sites	0.043	0.043
Thermal processes in the metallurgical industry not mentioned in Part II	0.016	0.016
Residential combustion sources	39.722	39.509
Fossil fuel-fired utility and industrial boilers	0.192	0.147
Firing installations for wood and other biomass fuels	0.250	0.426
Specific chemical production processes releasing unintentionally formed persistent organic pollutants, especially production of chlorophenols and chloranil	NA	NA
Crematoria	0.015	0.032
Motor vehicles, particularly those burning leaded gasoline	0.300	0.258
Destruction of animal carcasses	NA	NA
Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction)	NA	NA
Shredder plants for treatment of end of life vehicles	NA	NA
Smouldering of copper cables	NA	NA
Waste oil refineries	NA	NA
Total (Part III)	40.538	40.432

NA: not available.

2.3.3 Austrian Air Emissions Inventory – Hexachlorobenzene (HCB)

In 1985 national total HCB emissions came to 106 kg and decreased to 92 kg in 1990; emissions have decreased steadily and by the year 2005 emissions were reduced by about 58% (to 44 kg in 2004).

In 1985 the two main sources for HCB emissions were the NFR-sectors Energy (78%; note: the NFR-code *Energy* includes Energy consumption in industry and energy as well as in the traffic sector) and Industrial processes (12%). In 2004 the main NFR-sector of HCB emissions is Energy with a share in National Total of 92%.

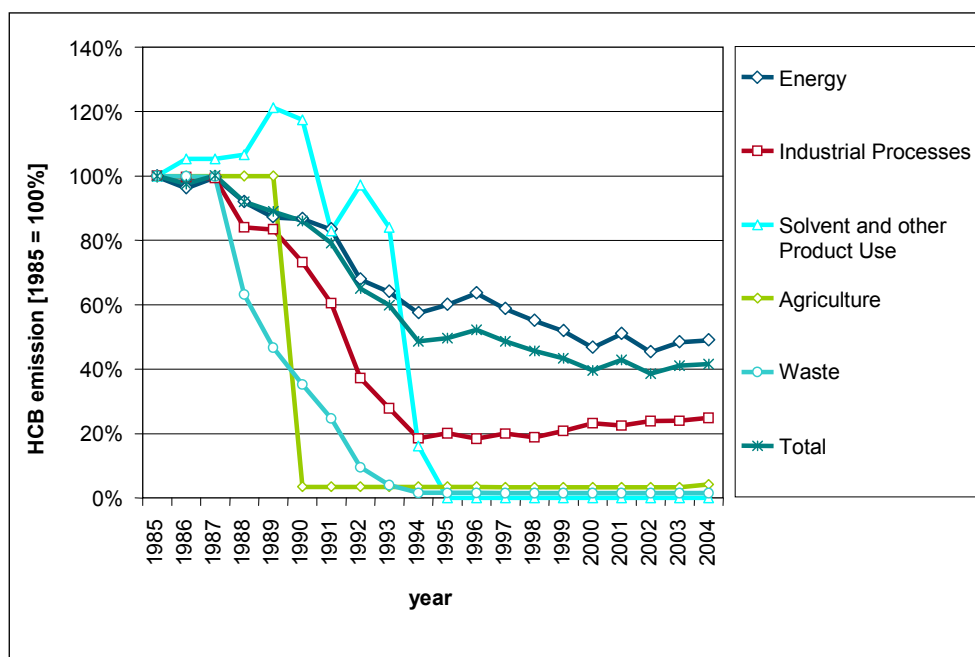


Figure 5: HCB emission trend per NFR Category 1990–2004 (base year 1985 = 100%)
Source: UMWELTBUNDESAMT (2006b).

From 1985 to 2004 HCB emissions from the NFR-sectors Waste and Agriculture as well as Solvents and Other Products decreased remarkably by 96% and more due to stringent legislation and modern technology. HCB emissions of the NFR-sectors Industrial processes decreased until 1994 but since then are slightly but steadily increasing. Emissions of the NFR-sector Energy exhibit a slight increase since 2002. However, national total emissions decreased by 58% in the period from 1985 to 2004.

2.4 Releases of Polychlorinated Biphenyls (PCB) – Source categories of the Stockholm Convention

Due to limited availability of qualified data releases of PCB could not be calculated.

2.5 Releases of Polycyclic Aromatic Hydrocarbons (PAH) – Source categories of the Stockholm Convention

Emission factors used by the Austrian Air Emissions Inventory for calculating emissions have been checked and considered appropriate. Minor changes could be observed in the source category “Motor vehicles” only.



2.5.1 Motor vehicles, particularly those burning leaded gasoline

2.5.1.1 Activity data – “Road Transportation, Other Mobile Sources and Machinery”

Activity data can be found in chapter 2.2.12.2.

2.5.1.2 Emission factors – NFR-code: “Road Transportation, Other Mobile Sources and Machinery”

The emission factors used in the Austrian air emission inventory are also used for emission projection. These Emission factors are based on a study “Österreichische Emissionsinventur für POPs, Forschungsgesellschaft Techn. Umweltschutz GmbH”.

In the next table emission factors of relevant fuels are compiled:

Table 28: Emission factors for Road Transportation and other Mobile Sources and Machinery (HÜBNER 2001).

Source Category	NFR Code	SNAP Code	Split	Fueltype	EF [mg/GJ]
Passenger cars (r)	1 A 3 b 1	0701	737	Gasoline	5.30
Passenger cars (r)	1 A 3 b 1	0701	738	Gasoline	0.32
Passenger cars (r)	1 A 3 b 1	0701	XXX	Diesel	6.40
Light duty vehicles <3.5 t (r)	1 A 3 b 2	0702	XXX	Diesel	6.40
Light duty vehicles <3.5 t (r)	1 A 3 b 2	0702	XXX	Gasoline	5.30
Heavy duty vehicles >3.5 t and buses (r)	1 A 3 b 3	0703	X71	Diesel	6.40
Heavy duty vehicles >3.5 t and buses (r)	1 A 3 b 3	0703	XXX	Gasoline	5.30
Mopeds and Motorcycles <50 cm ³	1 A 3 b 4	0704	737	Gasoline	21.00
Mopeds and Motorcycles <50 cm ³	1 A 3 b 4	0704	738	Gasoline	2.10
Motorcycles >50 cm ³	1 A 3 b 4	0705	XXX	Gasoline	33.00
Military	1 A 5 b	0801	XXX	Diesel	6.40
Shunting locs	1 A 3 c	080201	XXX	Diesel	6.40
Rail-cars	1 A 3 c	080202	XXX	Diesel	6.40
Locomotives	1 A 3 c	080203	XXX	Coal	85.00
Locomotives	1 A 3 c	080203	XXX	Diesel	6.40
Personal watercraft	1 A 3 d 2	080303	XXX	Gasoline	5.30
Inland goods carrying vessels	1 A 3 d 2	080304	XXX	Diesel	6.40
Agriculture	1 A 4 c 2	0806	XXX	Diesel	6.40
Agriculture	1 A 4 c 2	0806	XXX	Gasoline	5.30
Forestry	1 A 4 c 2	0807	XXX	Diesel	6.40
Forestry	1 A 4 c 2	0807	XXX	Gasoline	21.00
Industry	1 A 2 f 1	0808	XXX	Diesel	6.40
Industry	1 A 2 f 1	0808	XXX	Gasoline	21.00
Household and gardening	1 A 4 b 2	0809	XXX	Diesel	6.40
Household and gardening	1 A 4 b 2	0809	XXX	Gasoline	21,00

2.5.1.3 Emissions PAH – NFR-code “Road Transportation” and “Other Mobile Sources and Machinery”

Table 29: Emissions of PAH from road transport (UMWELTBUNDESAMT 2006b).

Source category	2004	%	2010	%	Change 2004–2010
Passenger cars	613.98	41%	707.45	44%	15%
thereof Gasoline conventional	552.66	37%	672.98	42%	22%
Light duty vehicles <3.5 t (r)	147.74	10%	129.02	8%	–13%
Heavy duty vehicles >3.5 t and buses (r)	686.27	46%	734.34	46%	7%
Mopeds and Motorcycles <50 cm ³	2.17	0%	1.48	0%	–32%
Motorcycles >50 cm ³	33.73	2%	38.65	2%	15%
Emissions [kg]	1483.89	100%	1610.94	100%	9%

Table 30: Emissions of PAH from Other Mobile Sources and Machinery (UMWELTBUNDESAMT 2006b).

Source category	2004	%	2010	%	Change 2004–2010
Military	0.17	0%	0.17	0%	–3%
Railways	17.81	6%	15.74	6%	–12%
Inland Waterways	6.53	2%	8.10	3%	24%
Agriculture	74.95	26%	76.59	27%	2%
Forestry	58.57	20%	49.31	17%	–16%
Industry	100.68	35%	106.60	38%	6%
Household and gardening	27.47	10%	27.30	10%	–1%
Emissions [kg]	286.17	100%	283.81	100%	–1%

2.5.2 Summary of Source Categories of the Stockholm Convention: PAHs – Releases to Air

In the year 2004 8,789 kg PAH were emitted in Austria. PAH emissions are mainly caused by two source categories (Figure 6, Figure 6: Relevant source categories of PAH (UMWELTBUNDESAMT 2006a, b; own calculation).

Table 31, Table 32 and Figure 7). Residential combustion sources had the lion share of 73.9% and mobile vehicles a share of 20.1%. Other notable sources are open burning of waste (3.4%) and sinter plants (1.8%).

According to the emission projection for the year 2010 emissions from mobile vehicles will increase more strongly than those of residential sources. Hence the share of vehicles will increase to 20.8% and that of residential sources decrease to 73.3%. Overall emissions will increase to 9,130 kg. The shares of open burning of waste (3.2%) and sinter plants (1.6%) will diminish.

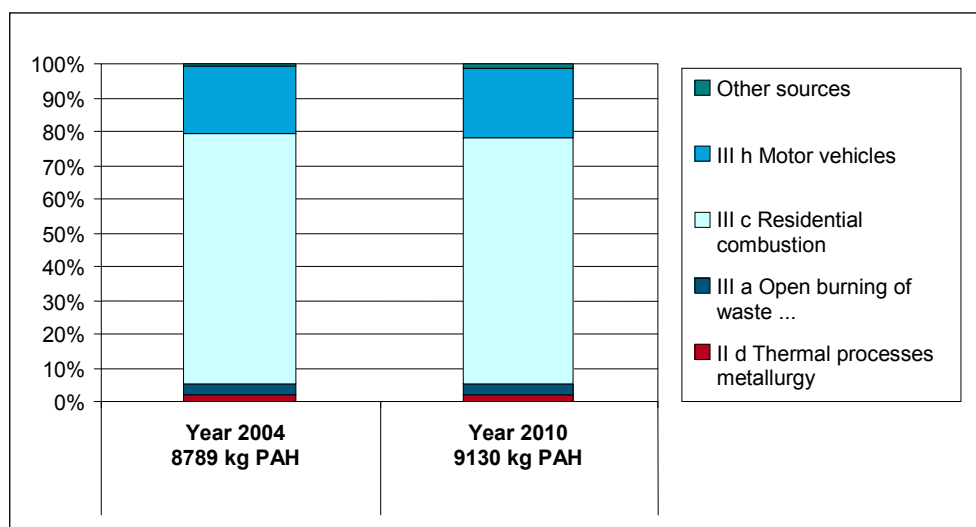


Figure 6: Relevant source categories of PAH (UMWELTBUNDESAMT 2006a, b; own calculation).

Table 31: PAH emissions in Source Category Part II for 2004 and projection to 2010.

Source Category Part II	2004 [kg PAH]	2010 [kg PAH]
Waste incinerators, including co-incinerators of municipal, hazardous or medical waste or of sewage sludge	11.7	12.1
Cement kilns firing hazardous waste ¹	2.5	2.8
Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching ²	0.0	0.0
The following thermal processes in the metallurgical industry		
(i) Secondary copper production	0.0	0.0
(ii) Sinter plants in the iron and steel industry	156.5	150.4
(iii) Secondary aluminium production	0.0	0.0
(iv) Secondary zinc production	NO	NO
Total (Part II)	170.7	165.3

¹ figures represent total emissions from cement kilns

² only process emissions are covered here; PCDD/F emissions from combustion processes are included in fossil fuel fired utility and industrial boilers and in firing installations for wood and other biomass fuels.

NO: not occurring.

Table 32: PAH emissions in Source Category Part III for 2004 and projection to 2010.

Source Category Part III	2004 [kg PAH]	2010 [kg PAH]
Open burning of waste, including burning of landfill sites	295.6	295.6
Thermal processes in the metallurgical industry not mentioned in Part II	2.9	2.9
Residential combustion sources	6,492	6,696
Fossil fuel-fired utility and industrial boilers	22.3	11.4
Firing installations for wood and other biomass fuels	33.1	63.8
Specific chemical production processes releasing unintentionally formed persistent organic pollutants, especially production of chlorophenols and chloranil	NA	NA
Crematoria	0.0	0.0
Motor vehicles, particularly those burning leaded gasoline	1,770.1	1,894.8
Destruction of animal carcasses	NA	NA
Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction)	NA	NA
Shredder plants for treatment of end of life vehicles	NA	NA
Smouldering of copper cables	NA	NA
Waste oil refineries	NA	NA
Total (Part III)	8,618	8,964

NA: not available.

2.5.3 Austrian Air Emissions Inventory – Polycyclic Aromatic Hydrocarbons (PAH)

In 1985 national total PAH emissions were 27 Mg and decreased to 17 Mg in 1990; emissions have decreased steadily and by the year 2005 emissions were reduced by about 68% (to 9 Mg in 2004).

In 1985 the main emission sources for PAH emissions were the NFR-sectors Energy (44%; note: the NFR-code *Energy* includes Energy consumption in industry and energy as well as in the traffic sector), Industrial processes (29%) and Agriculture (26%). In 2004 the main NFR-sector regarding PAH emissions is *Energy* with a share in the national total of 94%, showing an upward trend from 2002. From 1985 to 2004 PAH emissions from Agriculture decreased remarkably by 96% due to prohibition of open field burning, PAH emissions from the sector Industrial processes decreased by 98% due to the shut down of primary aluminium production in Austria, which was a main source for PAH emissions.

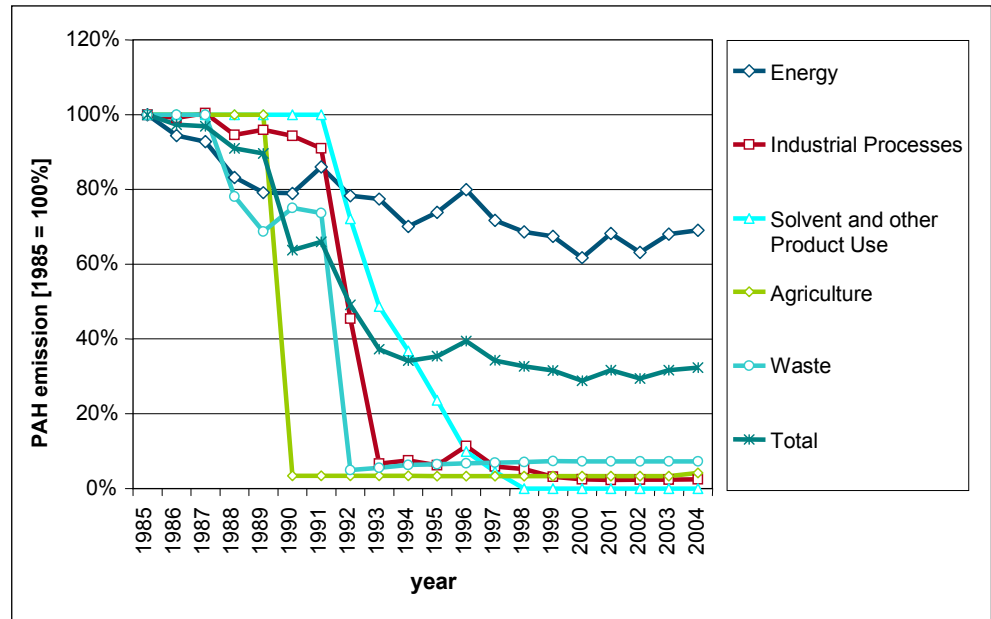


Figure 7: PAH emission trend per NFR Category 1990–2004 (base year 1985 = 100%)
Source: UMWELTBUNDESAMT (2006b).

3 SOURCE INVENTORY OF POPS RELEASES INTO WATER

Up to now data on POP emissions into ground and surface waters are limited which is in part due to the fact that emissions of POP into ground and surface water seem to be low in Austria.

Information on PAHs and HCB emissions into surface waters can be obtained in principle from the European Pollutant and Emission Register (EPER⁸) which reports emissions from certain industrial installations. According to Austria's release data from EPER (basic year: 2004) there are no industrial facilities which exceed the release thresholds values for PAHs and HCB⁹.

In 2004 a comprehensive assessment of pollutant emissions to ground and surface waters has been carried out within the characterisation of river basin districts according to Article 5 of the Water Framework Directive (WFD)¹⁰. HCB, aldrin, endrin, dieldrin, DDT and HCH only were included in this exercise for surface waters because a previous prioritisation study has shown that emissions of other POP are of minor or no relevance¹¹. In the report pursuant to Article 5 of the WFD only one water body with a potential risk with regard to HCB was identified due to a contaminated site (see Other sources: Contaminated Sites & Persistent Organic Pollutants).

For HCB a programme of measures for the reduction of emissions into surface waters was developed in 2002 (Implementation of Dangerous Substances Directive 76/464/EEC and daughter directives 86/280/EEC and 88/347/EEC) and updated in 2005 according to the results of the report pursuant to Article 5 of the WFD¹².

For the purpose of the forementioned reports and programmes, except for EPER, only preliminary emission inventories have been used. A comprehensive permanent national emission inventory will become operative in the near future as part of the Water Information System Austria – WISA (§§ 59, 59a Water Act 1959).

Another reason for the great uncertainties associated with water emission data is the fact, that most POPs are nearly insoluble in water. Acknowledging this, legally binding emission limit values are prescribed in certain cases only (such as for the wet treatment of flue gas from waste incineration).

Furthermore possible emitters of POPs are equipped with a waste water treatment plant or discharge their waste water into a municipal waste water treatment plant. In both cases POPs are accumulating in the sludges and are released via them. Whenever these sludges are thermally treated (either externally or internally such as e.g. in fluidised bed boilers of the pulp and paper industry) it can be expected that POPs are oxidised and destroyed to the major extent.

⁸ <http://www.eper.ec.europa.eu/eper/>

⁹ For dioxins and furans and PCBs no threshold values for water have been set in the Commission Decision 2000/479/EC of 17 July 2000 on the implementation of a European pollutant emission register (EPER).

¹⁰ EU Wasserrahmenrichtlinie 2000/60/EG, Österreichischer Bericht über die Ist-Bestandsaufnahme, BMLFUW 2005, p. 91ff.

¹¹ Gefährliche Stoffe in Oberflächengewässern – Fachgrundlagen für österreichische Programme nach Artikel 7 der Richtlinie 76/464/EWG. Textband, BMLFUW 2002

¹² Dangerous Substances Directive 76/464/EEC, Austrian Report 1999–2001, BMLFUW 2002; Dangerous Substances Directive 76/464/EEC, Austrian Report 2002–2004, BMLFUW 2005

3.1.1 Other sources: Contaminated Sites & Persistent Organic Pollutants

The most important problem regarding POPs and especially HCB stems from a contaminated site resulting from the production of chloroalkanes. The production was shut down in 1992. A nearby river is influenced by the contaminated site via groundwater exchange. Sanitation measures are under way since the 1995.

Other most commonly recognised and wide spread contaminated sites problems correlated to persistent organic pollutants in Austria are old gaswork sites and tar manufacturing facilities. Regarding PCDD/F, HCB and PCB there is hardly any data on site pollution or wider environmental impacts.

Most gaswork sites in Austria shut down the production during the early 60ies of the last century. Due to the usual practices of operation and closure it is in general likely that severe soil and groundwater contamination exist. Persistent organic pollutants of concern stem from tar oil spills and losses. Main components of tar oils are PAH (~ 85%), heterocyclic PAH (N,S,O-PAH 5 to 13%), phenols (1–10%). Fate and transport of those pollutants in the underground environment is governed by their physical-chemical properties and interactions to a specific geological and hydrogeological situation. According to the available literature and the experiences in Austria the environmental impacts of sites contaminated by PAH are generally limited. Especially benzo(a)pyrene and also the other regulated PAH substances are to be characterised by hardly any significant volatilisation to soil vapour, only a low solution to groundwater but a strong sorption to the solid phase. Also because of the strong retardation of these higher molecular PAH reports on travel distances show that pollutant plumes in groundwater are even after several decades rather short (<100 m). As a summary it can be concluded that underground pollution by PAH causes in general only local impacts to soil and groundwater. Nevertheless it must be recognised that depending on the site-specific situation and interrelating to sensitive land uses risks to human health or to ecosystems need to be analysed.

Whereas underground pollution by PAH is a well known problem the available information on sites contaminated by PCDD/F, HCB and PCB is scarce. As for the sites recorded in the register of polluted sites the share of such sites can be estimated as being rather low (<5%). Referring to the experiences regarding fate and transport of PAH in the underground environment and assuming the physical-chemical properties of PCDD/F, HCB or PCB wider environmental impacts seem to be unlikely in general, but may appear if the surrounding of a specific site shows sensitive land use patterns.

As for old municipal landfill sites, where it is likely that ashes and slags have been disposed, there are hardly any data on PCDD/F, HCB and PCB. Regarding PAH, which might be addressed as an 'indicator' for POP, the available data do not show significant loads for percolating water or groundwater. Apart from old landfill sites which have been built before 1997 there is no information available for new landfills in compliance to the Landfill Ordinance.



4 SOURCE INVENTORY OF POPS RELEASES VIA WASTE

With regard to waste an estimation of releases can be done for PCDD/F only. In the case of other POPs qualified data are not available.

4.1 Releases of Polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF)

Figure 8 gives an overview of the contribution of the source categories to PCDD/F emissions to waste. In the year 2004 a total of 267.1 g I-TEQ were emitted, which is approximately seven times as much as to air (see 2.2.18). Solid waste from waste incineration contributes most (59%) to the overall releases. Waste from residential sources presents also a significant release (28%). Other releases come from thermal processes in the metallurgical sector and from fossil fuel and biomass combustion.

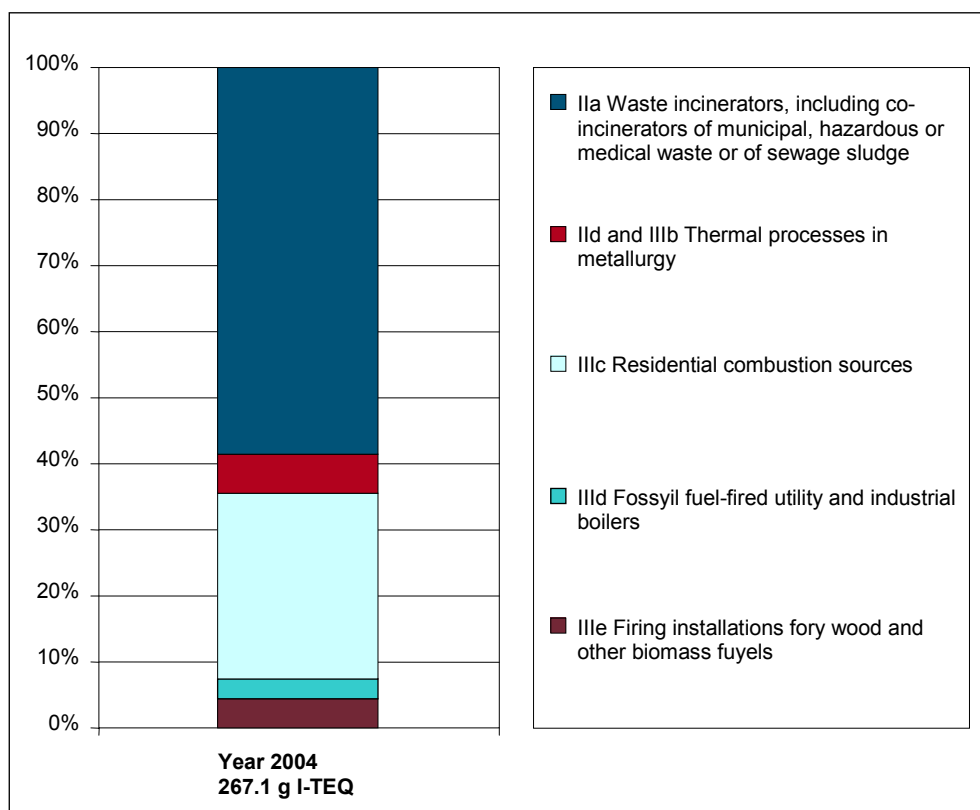


Figure 8: Releases (although hardly bio-available) of PCDD/F via waste (own calculation).

Note: Total releases may be higher since for many source categories (e.g. metallurgical sector) which have the potential of POPs releases via waste qualified emission factors are not available.

4.1.1 Waste incinerators, including co-incinerators of municipal, hazardous or medical waste or of sewage sludge

Table 33 gives an estimation of PCDD/F releases via waste. Concentrations as well as loads are considerable high with an upward trend. However, it must be stated here that all waste streams from waste incineration are sent to landfills (mass waste, residual waste, underground disposal) and in case of proper design and operation of the landfills do not represent a risk for the environment anymore.

Table 33: Estimation of PCDD/F releases via waste from waste incineration (municipal solid waste, hazardous waste, medical waste; own calculation).

Type of Waste	PCDD/F		
	Average concentration (µg/kg)	Total mass 2004 (g/a)	Total mass 2010 (g/a)
Bottom Ash (MSW)	0.046	11.4	14.89
Fly Ash (MSW)	2.95	138.29	172.15
Filtercake (MSW)	4.0	6.68	8.3

4.1.2 Secondary aluminium production

Wastes/residues from secondary aluminium production are salt slag, filter dust, furnace linings and drosses/skimmings (UMWELTBUNDESAMT 2000).

The following table gives an overview of the wastes/residues arising from secondary aluminium production, their treatment and disposal.

Estimated releases using the reported values of “Stand der Technik in der Sekundär-aluminiumerzeugung im Hinblick auf die IPPC-Richtlinie” (UMWELTBUNDESAMT 2000) and the BREF “Non Ferrous Metals Industries” (EUROPEAN COMMISSION 2001) are given in the next table:

Table 34: Estimation of PCDD/F releases via wastes/residues arising from secondary aluminium production (UMWELTBUNDESAMT 2000).

Waste/Residue	Release (g/a)	Treatment
Filter dust	1,25	Underground disposal, disposal with pre-treatment, partly reconditioned with salt slag, use in steel industry.
Salt slag	0,175	Treatment via dissolution and crystallization technique → reusable substances Al-granulate, mixed salt, non metallic products. Also other treatment techniques are used which are not state of the art.
Furnace lining	No data available	Leaching and landfill, potential for reconditioning with skimmings
Drosses/skimmings	No data available	Recovery

Table 35: Composition of salt slag (UMWELTBUNDESAMT 2000).

Pollutant	Typical value	Range
PCDD/F	5 ng/kg	2–20 ng/kg

Table 36: Composition of filter dust (UMWELTBUNDESAMT 2000).

Pollutant	Typical value	Range
PCDD/F	5 µg/kg	3–10 µg/kg

4.1.3 Secondary copper production

In Austria there is one secondary copper plant in operation which produces approximately 74,000 t copper-cathodes and 100,000 t bolts per year (UMWELTBUNDESAMT 2004). Wastes/residues from the secondary copper plant are given in the table below. Releases in g/a could not be estimated due to a lack of data.

Table 37: PCDD/F releases via wastes/residues arising from secondary copper production (UMWELTBUNDESAMT 1999b).

Residue	Treatment
Filter dust from the shaft furnace	exported
Filter dust from the converter	exported
Filter dust from the anode furnace	Use in shaft furnace
Furnace linings	use in furnace
Slag from the shaft furnace	Construction material
Slag from the converter	Use in shaft furnace
Slag from the anode furnace	Use in shaft furnace

4.1.4 Secondary lead production

The only secondary lead plant in Austria produces approximately 23,000 t lead/a. Residues/wastes from the secondary lead plant are given below (UMWELTBUNDESAMT 2004). Releases in g/a could not be estimated due to a lack of data.

Table 38: PCDD/F releases via wastes/residues arising from secondary lead production (UMWELTBUNDESAMT 2004).

Residue	Treatment
Filter dust	Reuse in furnace
Furnace linings	Landfill
Slag	Landfill

4.1.5 Thermal processes in the metallurgical industry

PCDD/F releases are summarised in Table 39:

Table 39: PCDD/F releases via waste from thermal processes in the metallurgical industry (own calculation, ENVIRONMENTAL IMPACT STATEMENT 2006, ENVIRONMENTAL IMPACT ASSESSMENT 2004).

Residue	Release (g/a)
Sinter plant – residue from flue gas cleaning	2.0
Electric arc furnace – slag	0.08
Electric arc furnace – residue from flue gas cleaning	9.78
Ferrous metal foundries – residue from flue gas cleaning	1.90
Ferrous metal foundries – sand	0.10

4.1.6 Residential combustion sources

The Dioxin Toolkit reports concentration of PCDD/F in the ash of 10 µg/kg ash for clean biomass and 1,000 µg/kg ash for contaminated biomass, respectively. Both values seem to be unreasonably high (UNEP 2005).

Another study (UMWELTBUNDESAMT 2002) gives emission factors based on the fuel input for chimney soot of 5 ng/kg fuel (coal) and 1 ng/kg fuel in the case of biomass combustion. According to this study releases via bottom ash are below 1 ng/kg combusted fuel (both for biomass and coal).

BIPRO based their calculations on average values of 0.11 µg/kg (ash from wood combustion) and 0,056 µg/kg (ash from coal combustion). As regards chimney soot BIPRO uses values of 6,15 µg/kg (coal) and 3,19 µg/Kg (wood) (BIPRO 2005).

In the field tests described in (UMWELTBUNDESAMT 2002) untreated beech wood were used, whereas the value used by (BIPRO 2005) includes all kind of treated and untreated wood.

Ash content of biomass is in the range of 1% (wood) and 5% (bark). Normally, only bottom ash accumulates in residential plants.

Estimated releases using the reported values are given in the next table:

Table 40: Calculation of PCDD/F releases via waste based on available literature (UMWELTBUNDESAMT 2002, BIPRO 2005; own calculation).

Residue	Release (g/a)	Treatment
Bottom ash from biomass combustion	0.1–6.98 ¹	Disposal with MSW; spreading on land
Bottom ash from coal combustion	0.24–0.589 ¹	Disposal with MSW; spreading on land
Chimney soot – wood combustion	6.34–60.69 ¹	Disposal with MSW; spreading on land; others?
Chimney soot – coal combustion	1.18–7.25 ¹	Disposal with MSW; spreading on land; others?

¹ higher value founds more support by data from literature; MSW: Municipal Solid Waste



As can be seen from the results given in the table above calculation of releases via waste from residential combustion sources is associated with great uncertainties. Reasons for these uncertainties are (among others) the wide variety of type (including some types of waste) and quality of used fuels (e.g. water content, ash content, calorific value, chlorine content), the wide variety of firing systems with different combustion conditions and the wide variety of “local” factors (such as manual loading of the firing system).

However, these releases are relevant because a certain part of this waste is re-transferred to the environment (e.g. when ash is used as “fertiliser” in private gardens).

4.1.7 Fossil fuel-fired utility and industrial boilers

Few data are available concerning POPs concentrations of solid residues/wastes from fossil fuel fired utility and industrial boilers. The Dioxin Toolkit (UNEP 2005) gives a value of 14 µg/TJ for the combustion of coal and a value of 15 µg/TJ for biomass combustion. Concentrations in fly ash from coal combustion range from 0.23–8.7 ng/kg and for bottom ash from 0.02–13.5 ng/kg (UNEP 2005). For the following calculation a concentration of 5 ng/kg (fly ash) and 10 ng/kg (bottom ash) has been used. Total emission factors for coal and lignite combustion reported by BIPRO do not differentiate between fly ash and bottom ash and result in much higher release estimations (see Table 41).

Table 41: Calculation of PCDD/F releases via ashes from coal combustion based on available literature (UNEP 2005, BIPRO 2005; own calculation).

Type of Residue/Waste	Release (g/a)	Treatment
Fly ash (coal combustion)	0.70	Use in cement, brick and construction industry
Bottom ash (coal combustion)	0.46	Use in cement, brick and construction industry
All ashes from coal combustion – BIPRO	3.00	Use in cement, brick and construction industry
Ashes from lignite – BIPRO (other data not available)	3.52	Backfilling of coal mine

Total releases are estimated to be in the range of 1.16 g/a (UNEP 2005) and 6.62 g/a (BIPRO 2005).

4.1.8 Firing installations for wood and other biomass fuels

For biomass combustion a wide range of emission factors are reported:

- UNEP 2005: Fly ash: 30–23,300 ng/kg; bottom ash: 30–3,000 ng/kg
- BIPRO 2005: all ashes: 1,135 µg/kg
- UMWELTBUNDESAMT 2002: 0.03 µg/kg (both for fly ash and bottom ash)

Results (using the concentration figures outlined) are presented in the table below:



Table 42: Calculation of PCDD/F releases via ashes from biomass combustion based on available literature (UNEP 2005, BIPRO 2005, UMWELTBUNDESAMT 2002; own calculation).

Type of Residue/Waste	Release (g/a)	Treatment
Fly ash (conc: 0.03 µg/kg)	0.67	Landfill
Bottom ash (conc: 0.03 µg/kg)	2.67	Application on land; composting
Ashes from Biomass combustion (conc: 0.11 µg/kg)	12.21	Fly ash: landfilled; bottom ash: use as composting agent

These releases are potentially relevant because some part of bottom ash is used as composting agent and applied on soil.

5 SOURCE INVENTORY OF POPS RELEASES VIA PRODUCTS

Some data can be found in the literature regarding concentrations of PCDD/F in the sold products cement and pulp and paper (KARSTENSEN 2006, UNEP 2005, GRUBER 1996). Concerning the other POPs described in this report there are no proven data available.

However, for most source categories there are no relevant releases via the product.

Table 43: PCDD/F-Releases via the products cement and pulp and paper – calculations were based on data from literature (KARSTENSEN 2006, UNEP 2005, GRUBER 1996).

	Release (g I-TEQ/a)
Cement	4.02
Paper	4.98
Pulp exported ¹	0.123

¹ Releases via pulp occur only via export; Releases via pulp which is not exported is included in the figure for paper

Concentrations of PCDD/F in cement are considered to be low and can be explained by the fact that filter dust from the clinker process (average PCDD/F concentration: 6.7 ng I-TEQ/kg) is added to the product and by the use of secondary raw materials (e.g. fly ash, gypsum from flue gas desulphurisation). On the other hand cement clinker itself is contaminated with low concentrations of PCDD/F (average: 0.9 ng I-TEQ/kg clinker) (KARSTENSEN 2006).

Here again, it has to be mentioned that the bio-availability of POPs in cement is greatly reduced.

In the case of the Pulp- and Paper production PCDD/F are introduced into the products mainly via the bleached (Kraft-)pulp and via the recycled papers.

In Austria total pulp production (reference year 2004) came to 1,509 kt with bleached sulphite pulp (TCF bleaching) having a share of 30%, bleached Kraft-pulp (ECF-bleaching) 22%, unbleached Kraft-pulp 33% and textile pulp 16% (AUSTROPAPIER 2006).

Calculation of releases from pulp were based on emission factors of 0.5 µg/t (bleached Kraft-pulp) and 0.1 µg/t (other pulp) (UNEP 2005). Thus total releases via pulp came to 0.28 g in the year 2004.

Relevant raw materials for paper production are pulp (both from national production and from import), wood pulp and recovered paper (either de-inked or not de-inked).

In addition to the pulp produced in Austria (see above) imported pulp has to be taken into account: In 2004 about 600,000 t of bleached (Kraft-) pulp was imported, part of the imported pulp come from countries where chlorine is still used as bleaching agent (AUSTROPAPIER 2006). For calculation of the PCDD/F content it is assumed that 10% of the imported pulp has an emission factor of 0.5 µg/t, whereas the other imported pulp is less contaminated (0.1 µg/t). This leads to a total import of 0.096 g I-TEQ via pulp. In the year 2004 about 0.123 g I-TEQ were exported via pulp.



Input of PCDD/F via wood-pulp has been calculated using an emission factor of 0.1 µg/t (UNEP 2005; total input: 0.044 g I-TEQ).

On the other hand PCDD/F is introduced via the recycled paper and more specific via the impurities in the used inks. In case de-inking is applied (about 40% of recovered paper is de-inked in Austria) PCDD/F will be reduced by a factor 3 (GRUBER 1996). Comparable high concentrations (up to 12 ng/kg) could be found in packaging papers and paper board in the early nineties. In general a sharp decline of the average concentrations could be observed between 1989 and 1994 whereas concentrations are slowly decreasing since 1994 (GRUBER 1996).

Based on that information and on data given in the Dioxin Toolkit (UNEP 2005) it was assumed that PCDD/F concentration in recovered paper is 3 µg/t (without de-inking) and 0.99 µg/t (with de-inking). These assumptions result in an average emission factor of 2.18 µg/t (averaged over paper which undergo a de-inking step and which not). Thus total release via paper comes to 4.98 g (reference year: 2004).



6 POLICIES (PROVISIONS) AND MEASURES

6.1 International and European Legislation

6.1.1 Stockholm Convention

The Stockholm Convention on POPs was formally adopted on 22–23 May 2001 in Stockholm, Sweden, upon completion of three years of negotiations conducted in the framework of the United Nations Environment Programme (UNEP). Altogether 150 countries and the Community signed the Stockholm Convention in the time limit set for signatories. The Convention entered into force 17 May 2004.

This international regime promotes global action on an initial cluster of twelve POP substances, which are all included in the UNECE Protocol, too. The overall objective of the Convention is to protect human health and the environment from POPs. Specific reference is made to a precautionary approach as set forth in Principle 15 of the Rio Declaration on Environment and Development. Most importantly, this principle is made operational in Article 8, which lays down the rules for including additional chemicals in the Convention.

The nine intentionally produced chemicals currently listed in Annex A of the Convention (aldrin, chlordane, dieldrin, endrin, hexachlorobenzene, heptachlor, mirex, toxaphene and PCBs) are subject to a ban on production and use except where there are generic or specific exemptions. In addition, the production and use of DDT, a pesticide still used in many developing countries for malaria and other disease vector control, is severely restricted, as set out in Annex B of the Convention.

Releases of unintentionally produced by-products listed in Annex C (dioxins, furans, PCBs and HCB) are subject to continuous minimisation with, as objective, the ultimate elimination where feasible. The main tool for this is the National Action Plan which should cover the source inventories and release estimates as well as plans for release reductions.

Under the Stockholm Convention on Persistent Organic Pollutants, Parties shall promote in some cases and require in others the use of best available techniques, and promote the application of best environmental practices. In short, each Party shall:

- Develop, within two years of the date of entry into force of the Convention for it, an action plan (national or regional) where releases of chemicals listed in Annex C of the Convention are identified, characterized and addressed; the plan shall include source inventories and take into consideration the source categories listed in Parts I and II of Annex C (subparagraph (a) of Article 5);
- For **new sources**:
 - Promote and, in accordance with the schedule in its action plan, require the use of best available techniques within source categories identified as warranting such action, with particular initial focus on sources categories identified in Part II of Annex C; the requirement to use best available techniques for Part II source categories shall be phased in as soon as practicable, but no later than four years after entry into force of the Convention for the Party (subparagraph (d) of Article 5);
 - Promote, for those categories identified above, the use of best environmental practices (subparagraph (d) of Article 5);

- Promote in accordance with its actions plan, best available techniques and best environmental practices within source categories such as those listed in Part III of Annex C which a Party has not addressed above (subparagraph (d) (ii) of Article 5);
- For existing sources:
Promote, in accordance with its action plan the use of best available techniques and best environmental practices for source categories listed in Part II of Annex C and such sources as those in Part III of the Annex (subparagraph (d) (i) of Article 5).

Table 44: Source Categories according to Annex C of the Stockholm Convention on POPs.

Part II: Source categories	Part III: Source categories
Waste incinerators, including co-incinerators of municipal, hazardous or medical waste or of sewage sludge	Open burning of waste, including burning of landfill sites
Cement kilns firing hazardous waste	Thermal processes in the metallurgical industry not mentioned in Part II
Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching	Residential combustion sources
The following thermal processes in the metallurgical industry: (i) Secondary copper production; (ii) Sinter plants in the iron and steel industry; (iii) Secondary aluminium production; (iv) Secondary zinc production	Fossil fuel-fired utility and industrial boilers
	Firing installations for wood and other biomass fuels
	Specific chemical production processes releasing unintentionally formed persistent organic pollutants, especially production of chlorophenols and chloranil
	Crematoria
	Motor vehicles, particularly those burning leaded gasoline
	Destruction of animal carcasses
	Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction)
	Shredder plants for the treatment of end of life vehicles
	Smouldering of copper cables
	Waste Oil Refineries

When applying best available techniques and best environmental practices for the above, Parties should take into consideration the general guidance on prevention and release reduction measures in Annex C and guidelines on best available techniques and best environmental practices.

These Guidelines have been finalised by an international Expert Group in November 2006 and were adopted by the Conference of the Parties (May 2007).



In addition to the control measures, the Convention includes several general obligations. Each Party is obliged to develop and endeavour to implement a National Implementation Plan, facilitate or undertake the exchange of information and promote and facilitate awareness and public access to information on POPs. The Parties shall also encourage or undertake appropriate research, development, monitoring and co-operation pertaining to POPs, and where relevant, to their alternatives and to candidate POPs. They shall also regularly report to the Conference of the Parties on the measures taken to implement the provisions of the Convention.

The Convention recognises the particular needs of developing countries and countries with economies in transition and therefore specific provisions on technical assistance and on financial resources and mechanisms are included in the general obligations.

6.1.2 EU POP-Regulation

The main legal instrument for implementing the Stockholm Convention and the UNECE Protocol in the EU is the [Regulation \(EC\) No 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC](#)¹³. This Regulation entered into force on 20 May 2004 and as a regulation it is directly applicable in all Member States, including those which are not yet Parties to the Convention or the Protocol.

The Regulation bans production, placing on the market and use of the 13 intentionally produced POP substances listed in the Convention and the Protocol. General and specific exemptions to these prohibitions are limited to a minimum. All remaining stockpiles for which no use is permitted shall be managed as hazardous waste. Stockpiles greater than 50 kg meant for permitted uses shall be notified to the competent authority and managed in a safe, efficient and environmentally sound manner. Holder of a stockpile consisting of or containing any POPs for which no use is permitted shall manage that stockpile as waste generally in such a way that the POP content is destroyed or irreversibly transformed.

The Regulation obliges Member States to draw up and maintain comprehensive release inventories for dioxins, furans, PCBs and polyaromatic hydrocarbons (PAH) and to communicate their national action plans on measures to identify, characterise and minimise total releases of these substances to the Commission and to the other Member States. The action plan shall include an evaluation of the efficacy of the laws and policies related to the management of the releases.

The action plan shall also include measures to promote the development of substitute or modified materials, products and processes to prevent the formation and releases of POPs. Producers and holders of waste are obliged to undertake measures to avoid contamination of waste with POP substances. The control measures on waste follow closely those of the Stockholm Convention and provide more details in some aspects.

Concerning the disposal of wastes, Article 7(2) of Regulation (EC) No. 850/2004 states that the persistent organic pollutant content has to be destroyed or irreversibly transformed. According to Annex V to Regulation (EC) No. 850/2004 the follow-

¹³ OJ L 229, 29.6.2004, p. 5.

ing disposal and recovery operations, as provided for in Annex IIA and IIB of Directive 2006/12/EC are permitted for these purposes:

D9 Physico-chemical treatment;

D10 Incineration on land, and

R1 Use principally as a fuel or other means to generate energy, excluding waste containing PCBs.

However, Article 7(4)a states, that by way of derogation from Article 7(2) waste containing or contaminated by any substance listed in Annex IV may be otherwise disposed of or recovered in accordance with the relevant Community legislation, provided that the content of the listed substances in the waste is below the concentration limits specified in Annex IV (low POP concentration, adopted through [Council Regulation \(EC\) No 1195/2006](#)).

Waste with POPs content above these limits must generally be disposed or recovered in such a way that the POP content is destroyed or irreversibly transformed.

But article 7(4)b includes also the option to deal with waste in exceptional circumstances otherwise than to destroy or irreversible transform the POPs content in the waste up to the concentration limits specified in annex V of the EU-POP Regulation. This derogation may only be applied if several conditions are complied with:

- the holder of the waste has demonstrated to the competent authority that the operation is environmentally preferable to the destruction or irreversible transformation of the waste content;
- the operation is in accordance with relevant Community legislation;
- the Member State concerned has informed the other Member States and the Commission of its authorisation and the justification for it.

The Regulation only allows the permanent storage in safe, deep, underground, hard rock formations and salt mines or a landfill site for hazardous waste, provided that the waste is solidified or partly stabilised where technically feasible (for POPs waste under a certain limit level, specified in annex V).

Table 45: List of Substances subject to waste management provisions together with concentration limits of Annex IV and V (EU POP Regulation No. 850/2004).

Substance	Low POP content (Annex IV)	Maximum concentra- tion limit (Annex V)
Aldrin	50 mg/kg	5,000 mg/kg
Chlordane	50 mg/kg	5,000 mg/kg
Dieldrin	50 mg/kg	5,000 mg/kg
Endrin	50 mg/kg	5,000 mg/kg
Heptachlor	50 mg/kg	5,000 mg/kg
Hexachlorobenzene	50 mg/kg	5,000 mg/kg
Mirex	50 mg/kg	5,000 mg/kg
Toxaphene	50 mg/kg	5,000 mg/kg
Polychlorinated Biphenyls (PCB)	50 mg/kg	50 mg/kg
DDT (1,1,1-trichloro-2,2-bis(4-chlorophenyl) ethane)	50 mg/kg	5,000 mg/kg
Chlordecone	50 mg/kg	5,000 mg/kg
Polychlorinated dibenzo-p-dioxins and dibenzofurans PCDD/PCDF)	15 µg/kg	5 mg/kg
The sum of alpha-, beta- and gamma-HCH	50 mg/kg	5,000 mg/kg
Hexabromobiphenyl	50 mg/kg	5,000 mg/kg

6.1.3 Supervision and Control of Shipments of Waste

Transboundary shipments of waste are covered by [Council Regulation \(EC\) No 1013/2006](#) on the supervision and control of shipments of waste within, into and out of the Community¹⁴. This regulation is the main instrument to transpose the Basel Convention as well as the OECD Decision C(2001) 107 final into Community legislation.

Movements of waste consisting of, containing or contaminated with POP substances are also covered by that regulation. The type of control depends on the classification of the waste, its destined location and whether it is to be disposed or recovered. The regulation prohibits the export of all waste for disposal outside the Community. It does not prohibit imports for disposal, but Member States have the ability to impose more restrictive controls if they wish. Hazardous wastes may be traded between OECD countries for recovery or recycling, but may not be sent to non-OECD countries. The movement of non-hazardous waste into non-OECD countries for recovery is – dependent on the wishes of the country of destination – governed by a tiered control procedure (Council Regulation (EC) No. 1418/2007).

6.1.4 UNECE Convention on Long-range Transboundary Air Pollution (LRTAP)

Since 1979 the **Convention on Long-range Transboundary Air Pollution (LRTAP)**¹⁵ has addressed some of the major environmental problems of the UNECE region through scientific collaboration and policy negotiation. The Convention has been extended by eight protocols that identify specific measures to be taken by Parties to cut their emissions of air pollutants.

The aim of the Convention is that Parties shall endeavour to limit and, as far as possible, gradually reduce and prevent air pollution including long-range transboundary air pollution. Parties develop policies and strategies to combat the discharge of air pollutants through exchange of information, consultation, research and monitoring.

¹⁴ OJ L 30, 6.2.1993, p. 1. Regulation as last amended by Commission Regulation (EC) No 2557/2001 (OJ L 349, 31.12.2001, p. 1).

¹⁵ <http://www.unece.org/env/lrtap/welcome.html>

Table 46: *Protocols of UNECE Convention on Long-range Transboundary Air Pollution (LRTAP).*

Year	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	16.12.1988 (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>

6.1.4.1 The 1998 Aarhus Protocol on Persistent Organic Pollutants (POPs)

The Executive Body to the UNECE (United Nations Economic Commission for Europe) Convention on Long-Range Transboundary Air Pollution (LRTAP) adopted the Protocol on POPs¹⁶ on 24 June 1998 in Aarhus, Denmark. The Protocol entered into force on 23 October 2003. By December 2006, 28 Parties, including the Community, 19 Member States and the two Acceding Countries have ratified the Protocol.

The Protocol comprises currently a list of 16 substances including eleven pesticides, two industrial chemicals and three unintentional by-products. The ultimate objective is to eliminate any discharges, emissions and losses of these POP substances.

The Protocol bans the production and use of some products outright (aldrin, chlordane, chlordecone, dieldrin, endrin, hexabromobiphenyl, mirex and toxaphene). Others are scheduled for elimination at a later stage (DDT, heptachlor, hexachlorobenzene and polychlorinated biphenyls (PCBs)). Finally, the Protocol severely restricts the use of DDT, HCH (including lindane) and PCBs. The Protocol also includes provisions for dealing with the wastes of products that will be banned.

¹⁶ http://www.unece.org/env/lrtap/pops_h1.htm

The Protocol obliges Parties to reduce their emissions of dioxins/furans, PAHs and HCB (substances listed in Annex III) 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).

Annex IV lists the following emission limit values for PCDD/F (referring to 11% O₂ concentration in flue gas):

- Municipal solid waste (burning more than 3 tonnes per hour): 0.1 ng TE/m³
- Medical solid waste (burning more than 1 tonne per hour): 0.5 ng TE/m³
- Hazardous waste (burning more than 1 tonne per hour): 0.2 ng TE/m³

Annex V contains a description of best available technologies to control the emissions of POPs from major stationary sources.

PCDD/F are emitted from thermal processes involving organic matter and chlorine as a result of incomplete combustion or chemical reactions. Major stationary sources of PCDD/F may be as follows:

- Waste incineration, including co-incineration;
- Thermal metallurgical processes, e.g. production of aluminium and other non-ferrous metals, iron and steel;
- Combustion plants providing energy;
- Residential combustion; and
- Specific chemical production processes releasing intermediates and by-products.

Major stationary sources of **PAH** emissions may be as follows:

- Domestic wood and coal heating;
- Open fires such as refuse burning, forest fires and after-crop burning;
- Coke and anode production;
- Aluminium production (via Soederberg process); and
- Wood preservation installations, except for a Party for which this category does not make a significant contribution to its total emissions of PAH (as defined in annex III).

Emissions of **HCB** result from the same type of thermal and chemical processes as those emitting PCDD/F, and HCB is formed by a similar mechanism. Major sources of HCB emissions may be as follows:

- Waste incineration plants, including co-incineration;
- Thermal sources of metallurgical industries; and
- Use of chlorinated fuels in furnace installations.

Annex V provides a list of general available measures to controlling emissions of POPs:

- Replacement of feed materials (primary measures)
- Best environmental practices (primary measures)

- Modification of process design
- Methods for flue-gas cleaning
- Treatment of residuals, wastes and sewage sludge

In addition it gives a list of source specific control techniques as well as achievable emission levels for PCDD/F and B(a)b.

Currently the protocol and its annexes are in the reviewing stage¹⁷. As far as Annex V is concerned recent development of techniques for POPs control will be considered.

6.1.5 IPPC-Directive

The Directive on Integrated Pollution Prevention and Control (IPPC Directive; 96/61/EC) aims at preventing or at least reducing pollution based on the best available technologies in order to achieve a high level of protection for the environment as a whole. The conformity of the integrated concept with the polluter pays and precautionary principle (Art. 174 EC Treaty “environmental damage should as a priority be rectified at source”) is expressly emphasised in the considerations of the IPPC Directive.

New installations and existing installations which have been subject to “substantial changes” have to meet the requirements of the IPPC Directive since 30 October 1999. Existing facilities had to comply by 30 October 2007 at the latest. According to surveys carried out by Austria's Federal Ministry of Agriculture, Forestry, Environment and Water Management, approximately 500 existing plants are currently subject to this directive in Austria.

The IPPC Directive is based on several principles, namely (1) an integrated approach, (2) best available techniques, (3) flexibility and (4) public participation.

1. The **integrated approach** means that the permits must take into account the whole environmental performance of the plant, covering e.g. emissions to air, water and land, generation of waste, use of raw materials, energy efficiency, noise, prevention of accidents, and restoration of the site upon closure. The purpose of the Directive is to ensure a high level of protection of the environment taken as a whole.
2. The permit conditions including emission limit values (ELVs) must be based on **Best Available Techniques (BAT)**, as defined in the IPPC Directive. To assist the licensing authorities and companies to determine BAT, the Commission organises an exchange of information between experts from the EU Member States, industry and environmental organisations. This work is co-ordinated by the [European IPPC Bureau](#) of the Institute for Prospective Technology Studies at EU Joint Research Centre in Seville (Spain). This results in the adoption and publication by the Commission of the [BAT Reference Documents](#) (the so-called BREFs).
3. The IPPC Directive contains elements of **flexibility** by allowing the licensing authorities, in determining permit conditions, to take into account:
 - (a) the technical characteristics of the installation,
 - (b) its geographical location and
 - (c) the local environmental conditions.

¹⁷ <http://www.unep.org/popsg/welcome.html>

4. The Directive ensures that the **public has a right to participate** in the decision making process, and to be informed of its consequences, by having access to
- permit applications in order to give opinions,
 - permits,
 - results of the monitoring of releases and
 - the [European Pollutant Emission Register \(EPER\)](#). In EPER, emission data reported by Member States are made accessible in a public register, which is intended to provide environmental information on major industrial activities. EPER will be replaced by the European Pollutant Release and Transfer Register (E-PRTR) from 2007 reporting period onwards.

It must be noted that the type of installations listed in Annex I of the IPPC-Directive do not directly correspond to the source categories of Annex C of the Stockholm Convention. Annex I of the IPPC-Directive gives a list of major industrial activities which may give cause to general Environmental Impacts, whereas Annex C of the Stockholm Convention lists source categories which have the potential to release POPs. Therefore the Stockholm Convention is more specific with regard to pollutants, but covers also small scale sources (e.g. residential combustion plants, crematoria, open burning).

The above mentioned BAT Reference Documents (BREFs) give a detailed overview on what represents Best Available Techniques for the sectors in question together with emission and consumption levels.

Table 47: Type of installations listed in Annex I of the IPPC-Directive.

Name of Euro-pean BREF	Corresponding Source category of Stockholm Convention (annex C)	BAT associated emission level for PCDD/F	BAT associated emission level for PAH
Waste incineration	II a (Waste incinerators, ...) II b (Cement kilns ...)	air: 0.01–0.1 ng TEQ/Nm ³ (split view 0.01–0.05) water: 0.01–0.1 ng TEQ/l (split view <0.01)	
Non-Ferrous Metals	II d i (Sec. copper prod.) II d iii (Sec. aluminium prod.) II d iv (Sec. zinc prod.) III b (Thermal processes in metallurgy ...)	air: < 0.1–0.5 ng TEQ/Nm ³	air: <200 µgC/Nm ³ *)
Iron and Steel	II d ii (Sinter Plants) III b (Thermal processes ...)	air: 0.1–0.5 ng I-TEQ/Nm ³ (sinter, electric steelmaking and casting)	
Large Combustion Plants	III e (biomass fuels)	air: < 0.1 ng/Nm ³	
Wastewater and Waste Gas	III f (Specific chemical prod. ...)	air: 0.1 ng TEQ/Nm ³ (combustion exhaust gas treatment)	

* for the 11 compounds (phenanthrene, anthracene, fluoranthene, benzo(a)pyrene, dibenzo(a,h)anthracene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, indeno(1,2,3,-cd)pyrene, benzo(ghi)perylene



No specific BREF has been written for the source categories III a (Open burning of waste, including burning of landfill sites), III c (Residential combustion sources), III g (Crematoria), III h (Motor vehicles, particularly those burning leaded gasoline), III i (Destruction of animal carcasses), III k (Shredder plants for the treatment of end of life vehicles) and III l (Smouldering of copper cables).

On the other hand the relevant BREFs for the source categories II b (Cement kilns firing hazardous waste; BREF “Cement and Lime”), II c (Production of pulp using elemental chlorine or chemicals generating elemental chlorine for bleaching; BREF “Pulp and Paper”), III d (Fossil fuel-fired utility and industrial boilers; BREF LCP), III j (Textile and leather dyeing (with chloranil) and finishing (with alkaline extraction); BREF “Textile Manufacturing”) and III m (Waste oil refineries; BREF “Waste Treatment”) do not define BAT associated emission levels for PCDD/F or PAH.

Currently, the IPPC Directive is under revision (Proposal for a Directive on Industrial Emissions – Integrated Pollution prevention and Control)¹⁸. It is foreseen to integrate other sector specific directives (amongst them the Large Combustion Plants Directive and the Waste Incineration Directive).

6.1.6 Large Combustion Plants Directive

The Large Combustion Plants Directive (LCPD, 2001/80/EC) applies to combustion plants with a rated thermal input of greater than 50 MW. It defines requirements for emission control (Emission Limit Values for the air pollutants SO₂, NO_x and dust) and for reporting of emissions for existing and new large combustion plants. The LCPD represents an EU-wide compromise and is regarded as a kind of safety net in addition to the flexible approach of the IPPC Directive (see 6.1.5). From an environmental point of view emission limit values laid down in the LCP-Directive are not very ambitious.

The LCPD does not cover POPs emission directly. However, it has some effect on emissions of POPs due to the definition of emission limit values for dust.

6.1.7 Waste Incineration Directive (2000/76/EC)

The aim of this directive is to prevent or to limit as far as practicable negative effects on the environment, in particular pollution by emissions into air, soil, surface water and groundwater, and the resulting risks to human health, from the incineration and co-incineration of waste. This aim shall be met by means of stringent operational conditions and technical requirements, through setting emission limit values for waste incineration and co-incineration plants within the Community and also through meeting the requirements of Directive 75/442/EEC.

Annex II lists special provisions for cement kilns, combustion plants and for industrial sectors co-incinerating waste. The POP relevant air emission limit values are listed below (with regard to dust a mixing rule applies in the case of large combustion plants co-incinerating waste).

¹⁸ COM(2007) 844 final

Table 48: Annex II: Emission Limit Values for cement kilns co-incinerating waste (oxygen content: 10%).

Pollutant	Emission limit value (daily average value)
Total dust (mg/Nm ³)	30
Dioxins and Furans (I-TEQ; ng/Nm ³)	0.1

Table 49: Annex II: Emission Limit Values for combustion plants co-incinerating waste (oxygen content: 6% solid fuels and biomass; 3% liquid fuels).

Pollutant	<50 MWth	50–100 MWth	100–300 MWth	>300 MWth
Dust (C _{proc} ; mg/Nm ³)	50	50	30	30
Dioxins and Furans (I-TEQ; ng/Nm ³)	0.1	0.1	0.1	0.1

C_{proc}: Emission limit values for the input into a combustion plant which is not waste; do be used in the mixing rule

Table 50: Annex II: Emission Limit Values for industrial sectors not covered in the above described sectors for co-incineration of waste:

Pollutant	<50 MWth	50–100 MWth	100–300 MWth	>300 MWth
Dioxins and Furans (I-TEQ; ng/Nm ³)	0.1	0.1	0.1	0.1

ANNEX IV gives the Emission Limit Values for discharges of waste water from the cleaning of exhaust gases.

Table 51: Annex IV: Emission Limit Values for discharges of waste water from the cleaning of exhaust gases.

Polluting substances	Emission limit values expressed in mass concentrations for unfiltered samples
Total suspended solids as defined by Directive 91/271/EEC	95%/30 mg/l/100%/45 mg/l
Dioxins and furans (I-TEQ)	0.3 ng/l

ANNEX V defines Emission Limit Values for Waste Incineration Plants (oxygen content: 11%):

Table 52: Annex V: Emission Limit Values for Waste Incineration Plants (oxygen content: 11%).

Pollutant	Daily average value	Half-hourly average value	Half-hourly average value
Dust (mg/Nm ³)	10	30 (100%)	10 (97%)
Dioxins and Furans (I-TEQ; ng/Nm ³)	0.1	0.1	0.1

6.1.8 Air Quality Framework Directive and Daughter Directives 1 and 4

The Council Directive 96/62/EC on ambient air quality assessment and management, the so-called Air Quality Framework Directive (AQ FWD), provides the framework for the EC legislation on air quality. The main objectives of the Directive are to

- define and establish objectives for ambient air quality in the Community that avoid, prevent or reduce harmful effects on human health and the environment as a whole,
- assess the ambient air quality in Member States on the basis of common methods and criteria,
- obtain adequate information on ambient air quality and ensure that it is made available to the public,
- maintain ambient air quality where it is good and improve it in other cases.

The Daughter Directives are dealing with the following pollutants:

- 1st Daughter Directive 1999/30/EC: sulphur dioxide, NO₂ and NO_x, particulate matter and lead;
- 2nd Daughter Directive 2000/69/EC: carbon monoxide and benzene;
- 3rd Daughter Directive 2002/3/EC: ozone
- 4th Daughter Directive 2004/107/EC: arsenic, nickel, cadmium, mercury and PAHs¹⁹.

The Daughter Directives specify limit or target values together with deadlines for meeting these values. In addition obligations are laid down for monitoring these pollutants in ambient air.

As it can be seen from the description above POPs are not addressed directly with the exception of PAH. However, as unintentionally produced POPs are mostly formed during combustion processes and emitted into air either in gaseous form or bound to particles, every measure aiming at the reduction of emissions of particulate matter, metals and CO has the co-benefit of reducing POPs emissions. For Benzo(a)pyrene a target value of 1 ng/m³ has been laid down in the 4th Daughter Directive. From 2013 onwards this target value shall not be exceeded. Member States shall take all necessary measures not entailing disproportionate costs to ensure this.

6.1.9 Water Framework Directive 2000/60/EC

The Water Framework Directive has three major goals:

- prevent deterioration, enhance and restore bodies of surface water, achieve good chemical and ecological status of such water and reduce pollution from discharges and emissions of **hazardous substances**;
- protect, enhance and restore all bodies of groundwater, prevent the pollution and deterioration of groundwater, and ensure a balance between abstraction and recharge of groundwater;
- preserve protected areas.

¹⁹ Environmental targets were defined for Ni, As, Cd and benzo[a]pyrene.

Under this Directive, Member States have to identify all the river basins lying within their national territory and assign them to individual river basin districts. River basins covering the territory of more than one Member State will be assigned to an international river basin district. By December 22, 2003 at the latest, a competent authority had to be designated for each of the river basin districts.

At the latest, four years after the date of entry into force of this Directive, Member States must complete an analysis of the characteristics of each river basin district, a review of the impact of human activity on the water, an economic analysis of water use and a register of areas requiring special protection. All bodies of water used for the abstraction of water intended for human consumption providing more than 10 m³ a day as an average or serving more than 50 persons must be identified.

Nine years after the date of entry into force of the Directive, a management plan and programme of measures must be produced for each river basin district.

The Commission submitted a **list of priority substances** selected amongst those which present a significant risk to or via the aquatic environment (2455/2001 EC). This list forms Annex X to the present Directive. For these priority substances environmental quality standards have been proposed by the Commission (COM(2006)397 final) and measures to control such substances will also be proposed. The aim of such measures is to reduce, stop or eliminate discharges, emissions and losses of priority substances.

In the list of priority hazardous substances the following POPs are listed as “priority substance” and are even identified as “priority hazardous substances”:

- Hexachlorobenzene
- Polyaromatic hydrocarbons (benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, benzo(g,h,i)perylene)

The environmental quality standards for these pollutants as proposed in Annex I of COM(2006)397 final (Common position from November 2007, interinstitutional file 2006/0129 (COD)) are summarised below.

Table 53: Environmental quality standards (EQS) as proposed in the Common Position of a Directive of the European Parliament and of the Council on environmental quality standards in the field of water policy.

Pollutant	AA-EQS*	AA-EQS*	MAC-EQS**	MAC-EQS**
	Inland surface waters	Other surface waters	Inland surface waters	Other surface waters
Hexachlorobenzene	0.01 µg/l	0.01 µg/l	0.05 µg/l	0.05 µg/l
Polyaromatic hydrocarbons (PAH)				
Benzo(a)pyrene	0.05 µg/l	0.05 µg/l	0.1 µg/l	0.1 µg/l
Benzo(b)fluoranthene	Σ=0.03 µg/l	Σ=0.03 µg/l	Not applicable	Not applicable
Benzo(k)fluoranthene				
Benzo(g,h,i)perylene	Σ=0.002 µg/l	Σ=0.002 µg/l	Not applicable	Not applicable
Indeno(1,2,3-cd)-pyrene				

* AA-EQS ... Annual average value for the EQS

** MAC-EQS ... maximum allowable concentration

In 2006 the Directive of the European Parliament and of the Council on the Protection of Groundwater against Pollution and Deterioration (2006/118/EG) was issued. Article 6 describes the measures which shall be established by the Member States in order to achieve the objective of preventing or limiting inputs of pollutants into groundwater.

6.1.10 Sewage sludge Directive (86/278/EEC)

Council Directive 86/278/EEC of 12 June 1986 on the protection of the environment, and in particular of the soil, when sewage sludge is used in agriculture defines limit values for heavy-metals concentrations in sludge for use in agriculture. The revision of the sewage sludge directive is under discussion and the working document for a revised version (3rd draft, april 2000) defines also limit values for concentrations of organic compounds and dioxins in sludge for use on land. In addition to other pollutants PAH, PCB and PCDD/PCDF are regulated.

Limit values for PAH and PCB (mg/kg dry matter, each) and in for PCDD/F (ng I-TEQ/kg dry matter) as proposed by the working document for the revision of the sludge directive are as follows.

Table 54: Limit values for concentrations of organic compounds and dioxins in sludge for use on land, as proposed in the 3rd working document for the revision of directive 86/278/EEC.

Polluting substances	Limit vlaues
PAH Sum of the PAHs: acenaphthene, phenanthrene, fluorene, flouranthene, pyrene, benzo(b+j+k)fluoranthene, benzo(a)pyrene, benzo(ghi)perylene, indeno(1, 2, 3-c,d)pyrene	6 mg/kg dry matter
PCB Sum of the polychlorinated byphenils components number 28, 52, 101, 118, 138, 153, 180	0.8 mg/kg dry matter
PCDD/PCDF	100 ng I-TEQ/kg dry matter

6.1.11 Directives concerning Motor Vehicles

In the transport sector there is no relevant legislation limiting POP emissions from road vehicles or non-road mobile machinery. Emission limits for passenger cars are regulated by the directive 1998/69/EG, Emission limits for heavy duty vehicles are regulated by the directive 2005/55/EG. Both directives include limits for total HC emissions (Passenger cars) respectively total NMHC emissions (Heavy duty vehicles). There are no specific limits for POP emissions.

For non-road mobile machinery there are also no specific limits regulating POP emissions, only emissions limits for total HC emissions.

6.1.12 Directive on Waste Electrical and Electronic Equipment (WEEE)

Directives [2002/95/EC](#) on the restriction of the use of certain hazardous substances in electrical and electronic equipment and [2002/96/EC](#) on waste electrical and electronic equipment are designed to tackle the fast increasing waste stream of electrical and electronic equipment and complements European Union measures on landfill and incineration of waste. Increased recycling of electrical and electronic equipment will limit the total quantity of waste going to final disposal. Producers will be responsible for taking back and recycling electrical and electronic equipment. This will provide incentives to design electrical and electronic equipment in an environmentally more efficient way, which takes waste management aspects fully into account. Consumers will be able to return their equipment free of charge. In order to prevent the generation of hazardous waste, Directive 2002/95/EC requires the substitution of various heavy metals (lead, mercury, cadmium, and hexavalent chromium) and brominated flame retardants (polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE)) in new electrical and electronic equipment put on the market from 1 July 2006.

6.1.13 Directive on the Landfill of Waste

The objective of the European Directive on the landfill of waste (1999/31/EG) is to prevent or reduce as far as possible negative effects on the environment from the landfilling of waste, by introducing stringent technical requirements for waste and landfills.

The Directive is intended to prevent or reduce the adverse effects of the landfill of waste on the environment, in particular on surface water, groundwater, soil, air and human health.

It defines the different categories of waste (municipal waste, hazardous waste, non-hazardous waste and inert waste) and applies to all landfills, defined as waste disposal sites for the deposit of waste onto or into land. Landfills are divided into three classes:

- landfills for hazardous waste;
- landfills for non-hazardous waste;
- landfills for inert waste.

A standard waste acceptance procedure is laid down so as to avoid any risks:

- waste must be treated before being landfilled;
- hazardous waste within the meaning of the directive must be assigned to a hazardous waste landfill;
- landfills for non-hazardous waste must be used for municipal waste and for non-hazardous waste;
- landfill sites for inert waste must be used only for inert waste;
- criteria for the acceptance of waste at each landfill class must be adopted by the Commission in accordance with the general principles of Annex II.

According to the Directive on the Landfill of waste, Article 5 (1), Member States shall set up a national strategy for the implementation of the reduction of biodegradable waste going to landfills, not later than two years after the date laid down in Article 18(1) and notify the Commission of this strategy. This strategy should include measures to achieve the targets set out in paragraph 2 by means of in particular, recycling, composting, biogas production or materials/energy recovery.

The European Landfill Directive exerts an indirect influence on POPs emissions, since it requires pre-treatment of waste prior to landfilling to reduce the biodegradable fraction of waste. In many countries this goal is to some extent achieved by incineration, which is a source of POPs releases.

6.1.14 Thematic Strategy on Air (CAFE) – new Air Quality Directive

The European Commission undertook a programme of preparatory work to underpin the thematic strategy on air pollution (COM(2005) 446). This Clean Air For Europe programme (CAFE) had several objectives, including

- the development, collection and validation of scientific information relating to the effects of outdoor air pollution, emission inventories, air quality assessment, emission and air quality projections, cost-effectiveness studies and integrated assessment modelling, leading to the development and updating of air quality and deposition objectives and indicators and identification of the measures required to reduce emissions;
- the support of the implementation and review of the effectiveness of existing legislation, in particular the air quality daughter directives, the decision on exchange of information, and national emission ceilings as set out in recent legislation, to contribute to the review of international protocols, and to develop new proposals as and when necessary.

As a result of the CAFE programme the Commission proposed a revision of the Air Quality Framework Directive and the first three Daughter Directives in September 2005 (COM(2005) 447). The proposal aims at a streamlining of these Directives. In addition, it contains several new elements, including environmental objectives for PM_{2.5}. It is also proposed to keep the current limit values unchanged.

As for the Air Quality Framework Directive and the four Daughter Directives, also the new Air Quality Directive does not address POPs directly but might be of relevance as it covers pollutants associated with combustion processes.

6.1.15 European Pollutant Emission Register (EPER Decision 2000/47/EG)

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)²⁰, the scope is to provide information to the public²¹.

EPER covers 50 pollutants including particulate matter (PM₁₀), NO_x, SO₂, NMVOC, NH₃, CO, heavy metals, PCDD/F, PAH, HCB and other (chlorinated) POPs. However, emissions have to be reported by operators if they exceed certain thresholds, only.

However, since threshold values for POPs are generally high (e.g. PCDD/F has only to be reported, if the emissions exceed a value of 1 g per year), emissions are only reported by a small number of very large industrial activities.

²⁰ http://www.umweltbundesamt.at/fileadmin/site/daten/EPER/EPER_Entscheidung_EK.pdf

²¹ data can be obtained from: <http://www.umweltbundesamt.at/eper/>

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.

Unfortunately, data from EPER could not be used as data source for the national inventory. The EPER report only contains very little information in addition to 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.

6.1.16 Pollutant Release and Transfer Register (PRTR)

The Regulation No. 166/2006(EC) of the European Parliament and of the Council of 18 January 2006 sets up a Pollutant Release and Transfer Register (PRTR) at European Union (EU) level in the form of a publicly accessible electronic database. This database will meet the requirements of the UNECE Protocol on Pollutant Release and Transfer Registers, signed by the Community in May 2003.

The public will be able to access this register free of charge on the internet and will be able to find information using various search criteria (type of pollutant, geographical location, affected environment, source facility, etc.).

The register will contain information on releases of pollutants to air, water and land, as well as transfers of waste and pollutants, where emissions exceed certain threshold values and result from specific activities. The register will also cover releases of pollutants from diffuse sources (such as transport). The UN-ECE Protocol and the European PRTR have the same structure as the EPER but are more comprehensive as they cover a greater number of pollutants and activities as well as releases to land, releases from diffuse sources and off-site transfers.

As the EPER register will become obsolete following the creation of the European PRTR, the Regulation amends the IPPC Directive. It also removes the provisions of the Directive requiring specific information be submitted on hazardous waste.

6.1.17 European Regulations aiming at increased Energy Efficiency

Reduction of the energy demand and increase of the energy efficiency are indirect but very effective tools to minimise fuel consumption and emissions. On an European level the **Action Plan for Energy Efficiency** (SEC(2006) 1173, 1174, 1175) has been published, which outlines a framework of policies and measures with a view to intensify the process of realising the over 20% estimated savings potential in EU annual primary energy consumption by 2020.

The purpose of the **Directive on Energy end-use efficiency and energy services (2006/32/EG)** is to make the end use of energy more economic and efficient. Indicative targets for the increase of the energy efficiency (9% within 9 years; from 2008–2017) are given and Member States are obliged to develop national Energy Action Plans.



The Directive 2002/91/EC on the energy performance of buildings requires Member States to apply minimum requirements as regards the energy performance of new and existing buildings, ensure the certification of their energy performance and require the regular inspection of boilers and air conditioning systems in buildings. The four key points of the Directive are:

- a common methodology for calculating the integrated energy performance of buildings;
- minimum standards on the energy performance of new buildings and existing buildings that are subject to major renovation;
- systems for the energy certification of new and existing buildings and, for public buildings, prominent display of this certification and other relevant information. Certificates must be less than five years old;
- regular inspection of boilers and central air-conditioning systems in buildings and in addition an assessment of heating installations in which the boilers are more than 15 years old.

6.1.18 Waste Framework Directive

Existing directive

Waste was one of the first issues that EU environmental legislation tackled in the 1970. The Waste Framework Directive was adopted in 1975 (Directive 75/442/EEC) and provides the overall framework for waste management in the EU. EU waste policy is based on a concept known as the waste hierarchy, which codifies the different options for managing waste from best to worst.

Meanwhile a codified version of the Directive on waste exists (2006/12/EC).

Planned new directive

The goal of the “Thematic Strategy on Waste Prevention and Recycling” is to make Europe a recycling society that seeks to prevent waste and, where waste cannot be prevented, uses it as a resource. The work on the strategy began 2003, following the 6th Environmental Action Programme (2002–2005).

The European Commission published the Thematic Strategy on Waste Prevention and Recycling and a proposal for a revised Waste Directive (“proposal for a Directive of the European Parliament and of the Council on waste”, COM(2005) 667 final) in December 2005.

Points of discussion are:

- 5 stage hierarchy
- municipal waste incinerators: recovery or disposal?
- Energy efficiency formula – yes or no, which thresholds?
- Targets for waste prevention and recycling
- (no) definition of by-products
- end of waste criteria

6.2 Existing national Legislation

6.2.1 Emission Protection Act for Steam Boilers (Fed. Law Gaz. I No. 2004/150) and Clean Air Ordinance for Steam Boilers (Fed. Law Gaz. No. 1989/19 as amended by Fed. Law Gaz. II 2005/55)

The Emission Protection Act as well as the Clean Air Ordinance for Steam Boilers apply to steam boilers and gas turbines with a rated thermal input of >50 MW. They give the legal environmental framework for operating such plants in the Energy and Industry sector and prescribe emission limit values for a variety of pollutants depending on the fuels used. Emissions of PCDD/F are not regulated directly (however, there is a clause included, that if emissions of PCDD/F are considered possible due to the quality of incinerated wood, bark or wood waste, an emission limit value of 0.1 ng/Nm³ applies. In practise those type of biomass will be regulated by the waste incineration ordinance; refer to 6.2.2.6). However, both documents have some effect on emissions of POPs due to the definition of emission limit values for dust, CO, C_{org} and NO_x.

In case waste is co-incinerated in steam boilers the waste incineration ordinance applies (refer to 6.2.2.6).

6.2.2 Industrial Code 1994 (GewO 1994), Federal Law Gaz. No. 1994/194 and specific Ordinances

The Industrial Code gives the legal framework for a large number of activities in the industrial and trade sector. It stipulates that plants can only be built and operated when a permit is granted by the relevant authority. Furthermore permits can only be issued when the plant is designed and operated according to State of the Art (=Best Available Techniques). For a variety of activities specific ordinances have been put into force prescribing more in detail operating and reporting requirements as well as emission limit values into air for certain pollutants, amongst them POPs. Some of these ordinances are described below:

6.2.2.1 Ordinance on Combustion Plants (Fed. Law Gaz. No. II 1997/331)

This Ordinance applies to combustion installations in the trade sector and describes requirements concerning monitoring of emissions, operating conditions, inspections of installations and emission limit values for certain pollutants depending on the fuels (such as coal, biomass, oil, and gas) used. Emissions of PCDD/F are not regulated directly. However, the ordinance has some effect on emissions of POPs due to the definition of emission limit values for dust and CO.

A draft for an amended ordinance was sent out for comments in October 2007. Relevant modifications with regard to POPs in this draft are new emission limit values for firing straw and cereals and lower emission limit values for dust.



6.2.2.2 Ordinance on Iron and Steel Production (Fed. Law Gaz. II No. 160/1997 as amended by Fed. Law Gaz. II No. 2007/290)

The ordinance covers air emissions from the production of iron and steel in integrated steelworks (without coke oven and sinter plant) and by electric arc furnaces (EAF) and the processing of iron/steel. For PCDD/F the following limit values are set:

- installations for the production of iron and steel, where the formation of PCDD/F can be expected, because of the input materials used: 0.1 ng/Nm³
- installations for the production of steel in electric arc furnaces, induction furnaces and ladle furnaces: 0.1 ng/Nm³

6.2.2.3 Ordinance on Sinter Plants (Fed. Law. Gaz. II No. 1997/163)

The ordinance covers air emissions from sinter plants. For PCDD/F a limit value (0.4 ng/Nm³) is set (referred to measured oxygen content), however this limit value is not applicable for installations, which are permitted before 01/2004. A revision of this ordinance is planned.

6.2.2.4 Ordinance on Non Ferrous and Refractory Metals Production (Fed. Law Gaz II No. 2008/39)

This ordinance covers air emissions from plants producing non ferrous and refractory metals. The mentioned non ferrous metals are aluminium, lead, copper, magnesium, manganese, nickel zinc and tin and their alloys (including ferro-alloys) as well as certain refractory metals.

The ordinance gives emission limit values for dust, organic carbon, benzo(a)pyrene, HCl, HF, chlorine, SO₂, CO, NO_x, heavy metals and dioxins/furans. There will be a general emission limit value of 0.4 ng/Nm³ for PCDD/F; for new installations producing aluminium and ferro-alloys an emission limit value of 0.1 ng/Nm³ has been set. For existing installations for the production of secondary copper and aluminium less stricter emission limit values have been imposed.

6.2.2.5 Ordinance on Foundries (Fed. Law Gaz No. 1994/447)

The ordinance gives limit values (mass flow and/ or concentration) for dust and organic substances for different furnace types (steel and cast iron, aluminium, lead, other metals, heat treatment). Limit values are also given for these pollutants for activities as sand regeneration, mould production, cleaning and fettling and core production. Some general limit values are given for special organic substances and heavy metals. There is no general reference oxygen content, in most cases the oxygen content of the exhaust gas is chosen as reference value.

6.2.2.6 Waste Incineration Ordinance (Fed. Law. Gaz. II No. 2002/389)

The Waste Incineration Ordinance requires waste incineration and co-incineration plants (such as large combustion plants, cement kilns and industrial boilers) to be built and operated according to Best Available Techniques (=State of the Art). It defines among others operational requirements (such as minimum temperature for combustion and residence time of flue gas within a given temperature level), re-

requirements for input control of waste, monitoring and reporting obligations and prescribes emission limit values for a variety of pollutants including PCDD/F. In general the ELV for PCDD/F for incineration and co-incineration plants is set to 0.1 ng/nm³ (11% oxygen).

Due to limitation of emissions of dust, CO and C_{org} (and to a certain extent of NO_x) the Waste Incineration Ordinance has also an indirect influence on the reduction of POPs emissions.

Concerning PCDD/F concentrations in wastes from waste incineration or co-incineration plants the ordinance provides for the environmental sound disposal when the total content exceeds a limit value of 100 ng/kg PCDD (I-TEQ).

6.2.3 Austrian Water Act and Specific Ordinances

The basic document for water-related legislation is the Water act from 1959 (Fed. Law Gaz. No. 1959/215). The main starting point from this act was the rapid development in hydropower stations in the Alpine region and along the large rivers. This act was based on several key issues:

- There is general right for everybody to make use of water as long as this does not violate the goals of this water act and the rights of others
- The main goals (§ 30) of the act are to maintain and to protect all water bodies including ground water in order:
 - not to affect negatively human and animal health,
 - to avoid impairments of nature and landscape,
 - to avoid any deterioration of water bodies,
 - to ensure sustainable use of water and
 - to improve the aquatic environment by specific measures.
- Another main goal is the protection of ground and spring water in order to ensure the availability of water for drinking water purposes. According to this act everybody is legally obliged to avoid water pollution which violates the previously mentioned goals (§ 31).

The use of water beyond negligible influence on quality and quantity of waters is bound to a permit issued by water authorities. The permits are based on consent of all parties involved. As long as the permit holder continuously adapts his water infrastructure to the best available technology and strictly follows the legal requirements, permits represents a strong right even beyond the expiration of the permit period.

Two important amendments of the Water Act have to be mentioned: the 1990 and the 2003 amendments.

The 1990 amendment was the consequence of a complete shift from hydropower and agriculture development to water quality management and a great progress in science, technology and political relevance. For the first time morphological aspects of surface waters were introduced into the goal of the act. For the implementation of point source pollution prevention, this amendment introduced the combined approach and urged the responsible Ministry for Agriculture, Forest, Environment and Water to issue emission regulations and receiving water standards. The special emission regulations for each branch of industry increased the legal security of the Austrian industry.

In 2003, the EU Water Framework Directive was introduced into the existing water act. Water administration was basically not changed i.e. it remains organised according to political entities (federal states, districts) and not to river basins. The most important changes are related to the new instrument of river basin management plans which become a guiding role for all permits and also the whole monitoring and reporting requirements according to WFD were introduced into the Water Act whilst previously there was a special act on hydrography.

With the amendments in 2003, the list of priority substances as defined in Annex X of the EU WFD were added to the national Water Act as well as the requirement to define legally binding environmental quality standards for those substances and other pollutants of concern.

Based on this requirement to define environmental quality standards (EQS) codified in §30(a) of the Austrian Water Act the **Ordinance on the determination of the target state for surface waters (Fed. Law Gaz. No. 2006/96)** prescribes environmental quality standards for 72 substances and groups of substances. These EQS determine the criteria for the good chemical status of surface waters and the chemical parameters for the good biological status. Also POPs and POP like substances are included, e.g. hexachlorobenzene, DDT, aldrin, dieldrin, endrin, heptachlor, etc. The EQS for hexachlorobenzene for example is set to 0.03 µg/l.

In order to continuously assess, to monitor and to adapt monitoring programmes to actual necessities the **Ordinance on the monitoring of the status of water bodies (Fed. Law Gaz. II No. 2006/479)** (originally issued in 1991) was amended in 2006. The aim of the monitoring is to assess the status of water bodies. The parameters to be considered by the monitoring programme include all pollutants for which EQS have been defined (e.g. POPs and POP like substances such as HCB, PAH, etc.). Beside surface waters, these pollutants have also to be analysed in lake samples and groundwater samples.

The **Ordinance on Groundwater Threshold Values (Austrian Federal Law Gazette No 1991/502)** which was amended in 1997 and 2002 gives Threshold Values for groundwater in order to establish measures in case the Threshold Values are exceeded according to a certain compliance regime. For various POPs threshold values are listed. For example for PCB the threshold value is set at 0.06 µg/l and for HCH at 0.1 µg/l.

For municipal waste water management an important amendment of the Water Act was made in 1998 regarding the discharges of industry and trade effluents to sewer systems. It was followed by a related regulation for “indirect dischargers”. For most of them private contracts have to be established with the sewer and treatment plant management (permit holder for discharge to surface waters). These private contracts have to obey the existing emission regulations containing standards and monitoring procedures for discharges to sewer systems. (KROISS, 2005; Implementation of the water framework directive and other relevant wastewater related EU directives in Austria)

General provisions and limit values of emissions to water are laid down in the **General Ordinance on Waste Water Emissions (Fed. Law Gaz. No. 1996/186)**. It contains detailed definitions of waste water issues, addresses general principles of handling waste water and waste water components and describes fundamental requirements of water resource management related to waste water treatment according to best available techniques.

In addition to that branch specific waste water emission ordinances have been developed and continue to be enacted. The relevant branch specific waste water emission ordinances are listed below. Most of these branch specific ordinances give a limit value for AOX but not a specific limit value for dioxins. However, AOX is considered a valuable parameter for determining the concentration of the sum of organic substances containing chlorine, but cannot be used for the assessment of single substances such as PCDD/F.

Table 55: AOX in branch specific ordinances on wastewater emissions.

Branch specific Ordinance on Waste Water Emissions limiting AOX	AOX for discharge into body of flowing water	AOX for discharge into public sewer system
Leather Tanneries (Fed. Law Gaz. II No. 1999/10)	0.5 mg/l	0.5 mg/l
Textile finishing and treatment (Fed. Law Gaz. II No. 2003/269)	0.5 or 1.0 mg/l (according to activity)	0.5 or 1.0 mg/l (according to activity)
Landfills (Fed. Law Gaz. No. 1992/613, Fed. Law Gaz. No. 1993/537, Fed. Law Gaz. II No. 2003/263, Fed. Law Gaz. II No. 2005/103)	0.5 mg/l	0.5 mg/l
Industrial rendering (Fed. Law Gaz. No. 1995/891)	0.1 mg/l	0.1 mg/l
Processing, finishing and subsequent processing of iron ores, and iron and steel production and processing (Fed. Law Gaz. II No. 1997/345)	0.1 mg/l	0.1 mg/l
Cooling systems and vapour production (Fed. Law Gaz. II No. 2003/266)	0.15 mg/l (for open circulation cooling systems) 0.5 mg/l (for steam production)	0.15 mg/l (for open circulation cooling systems) 0.5 mg/l (for steam production)
Processing, finishing and subsequent processing of ores containing lead, wolfram or zinc, and the production and processing of metal of aluminium, lead, copper, molybdenum, wolfram or zinc (Fed. Law Gaz. No. 1995/889) ¹⁾	0.5 mg/l (for limiting of emissions of Molybdenum- and Wolfram metal production and processing) 1.0 mg/l (limiting of emissions: Aluminium production and processing)	0.5 mg/l 1.0 mg/l

¹⁾ In this ordinance a limit value for the discharge of HCB is prescribed from secondary aluminium production: ELV = 0.003 mg/l or 0.3 mg/t.

Ordinance on waste water emissions from flue gas treatment (Fed. Law Gaz. II No. 2003/271)

Table 56: Limit values for dioxins and furans in the ordinance on waste water emissions from flue gas treatment (Fed. Law Gaz. II No. 2003/271).

Pollutant	Discharge into body of flowing water	Discharge into public sewer system
Dioxins and Furans	0.3 ng/l	0.3 ng/l



Table 57: Load related emission limitation for dioxins and furans for plants to incinerate waste except municipal solid waste (Fed. Law Gaz. II No. 2003/271).

Pollutant	Per Tone installed capacity for incineration of waste (except municipal solid waste), with an average chloride content >0.75%	Per Tone installed capacity for incineration of waste (except municipal solid waste), with an average chloride content <0.75%
Dioxins and Furans	90 ng/t	12 ng/kg

Table 58: Load related emission limitation for dioxins and furans for waste incineration plants (municipal solid waste) (Fed. Law Gaz. II No. 2003/271).

Pollutant	Per Tone installed capacity for incineration of waste (except municipal solid waste), with an average chloride content > 0.75%
Dioxins and Furans	90 ng/t

Ordinance on waste water emissions from the production of plant protecting agents and crop sprayings (Fed. Law Gaz. No. 1996/668)

Table 59: Limit values for AOX in the ordinance on waste water emissions for the production of plant protecting agents and crop spraying (Fed. Law Gaz. No. 1996/668).

Pollutant	Discharge into body of flowing water	Discharge into public sewer system
AOX	10 mg/l	10 mg/l

In addition to AOX this ordinance limits the following substances for discharging into body of flowing water or into public sewer systems:

Table 60: POP relevant limitation in the ordinance on waste water emissions for the production of plant protecting agents and crop spraying (Fed. Law Gaz. No. 1996/668).

Limit value	HCH	DDT	PCP	Drins	HCB
mg/l	2	0.2	1	0.002	1
g/t*	2	1	23	3	10

*per tone installed capacity of the plant

HCH: Hexachlorcyclohexan (C₆H₆Cl₆)

DDT: Dichlordiphenyltrichlorethan (C₁₄H₉Cl₅)

PCP: Pentachlorphenol (C₆Cl₅OH)

Drins: Sum of Aldrin, Dieldrin, Endrin, Isodrin

HCB: Hexachlorbenzol (C₆Cl₆)

Ordinance on waste water emissions from the processing of coal (Fed. Law Gaz. II No. 1997/346)

Table 61: Limit values for PAH in the ordinance on waste water emissions from the processing of coal (Fed. Law Gaz. II No. 1997/346).

Pollutant	Discharge into body of flowing water	Discharge into public sewer system
PAH	0.1 mg/l	0.1 mg/l
	0.03 g/t	0.03 g/t

Ordinance on indirect discharge of waste waters (Fed. Law Gaz. II No. 1998/222)

This ordinance covers the discharge of waste waters into public and not public sewer systems, which notably diverges in its composition from wastewaters from households. The ordinance for indirect discharge of waste waters does not define any limit emission values, but it defines the obligation to notify the operator of the sewer system of the emission of specific wastewater pollutants. If defined limited charges per day for specific pollutants are exceeded a discharge consent is required. If specific POPs or POP like compounds (as for example HCB) are used and emitted via wastewater, such pollutants have to be included in the analytical control of the indirect discharge.

Ordinance on waste water emissions from the cleaning of discharged air (Fed. Law Gaz. II No. 2000/218)

Table 62: Limit values for AOX and POX within the branch specific ordinance on waste water emissions for cleaning of discharged air (Fed. Law Gaz. II No. 2002/218).

Pollutant	Discharge into body of flowing water	Standard for discharge into public sewer system
AOX	5 mg/l	10 mg/l
Purgeable or bound Halogens POX (calc. as Cl)	0.1 mg/l	0.1 mg/l

Bleached pulp (Fed. Law Gaz. II No. 2000/219)

The limits of emissions are related to the product and per tone installed production capacity for bleached air dried pulp.

Table 63: AOX limit value in the ordinance on waste water emissions for bleached pulp (Fed. Law Gaz. II No. 2000/219).

Pollutant	Unit	Sulphate pulp	Sulphite pulp	Magnefite pulp
AOX (new plants)	kg/t	0.25	0.1	0.1
AOX (existing plants)	kg/t	0.5	0.2	0.2

Paper and board (Fed. Law Gaz. II No. 2000/220)

Table 64: AOX limit value in the ordinance on waste water emissions for paper and board (Fed. Law Gaz. II No. 2000/220).

Pollutant	unit	Limit value
AOX (new plants)	kg/t	0.03–0.01

6.2.4 Ordinance on Landfills (Fed. Law Gaz. II No. 2008/39)

According to the Ordinance on landfills only the disposal of waste with the lowest possible reactivity is to be permitted from 2004 (or, in exceptional cases, from 1 January 2009). A large part of waste materials, among them municipal solid waste, must thus undergo thermal and mechanical-biological pre-treatment before being landfilled.

The landfill ordinance 2008 implements the EU directive 1999/31/EG and the Council Decision 2003/33/EG.

It determines the following classes for landfills:

1. Landfill for excavated soils
2. Landfill for inert waste
3. Landfill for non hazardous waste
 - a.) Landfill for demolition waste
 - b.) Landfill for residual materials
 - c.) Mass waste landfill
4. Landfill for hazardous waste (exclusively underground waste storage)

Annex 1 of the landfill ordinance 2008 gives limit values for the acceptance of different waste streams of landfills. The POP relevant limit values for the landfill classes are listed below. PAH are defined as the sum of 16 substances according to EPA (naphthalene; acenaphthylene; acenaphthene; fluorene; phenanthrene; anthracene; fluoranthene; pyrene; benzo[a]anthracene; chrysene; benzo[b]fluoranthene; benzo[k]fluoranthene; benzo[a]pyrene; dibenzo[a,h]anthracene; indeno[1,2,3-c,d]pyrene; benzo[g,h,i]perylene).

Table 65 Landfill classes and limit values according to annex 1 of the draft landfill ordinance 2007.

Landfill class	Pollutants, POP relevant	Limit value [mg/kg dry matter]
Landfill for excavated soils	PAH	4
	thereof Benzo(a)pyrene	0,4
Landfill for inert waste	PAH	12
	thereof Benzo(a)pyrene	1.2
Landfill for demolition waste	PAH	20
Landfill for residual materials	PAH	300
Landfill for mass waste	PAH	300

6.2.5 Compost Ordinance (Fed. Law Gaz II No. 2001/292)

The compost ordinance refers to:

- Quality standards for composts
- Character and source of the input materials
- Labelling of composts made of waste
- Placing on the market of composts made of waste
- End of waste status of composts

The ordinance defines five different quality levels for compost (compost, quality compost, quality sewage sludge compost, bark compost and waste compost).

Only the quality standards for “waste compost” contain POP relevant emission values (Annex 2, Part 1: Quality Standards for composts).

Table 66: POP relevant limit values for waste compost (Fed. Law Gaz. II No. 2001/292).

Pollutant	Limit value
AOX	500 mg/kg per dry matter
Mineral oil-HC	3,000 mg/kg dry matter
PAK (16)	6 mg/kg dry matter
PCB	1 mg/kg dry matter
Dioxin	50 ng TE/kg dry matter

Producers of composts must analyse the input materials used for the production of compost accordingly. Annex 1 of the Compost Ordinance gives a list containing allowed input materials for the different kinds of composts and quality standards for the input materials. Some of the input materials are relevant for POP emissions and a limit value is given. A POP relevant example is shown in the following table.

Table 67: Example limit values for input material (Fed. Law Gaz. II No. 2001/292).

Input materials	Permitted input materials	Quality standards for input materials and remarks
Organic waste from garden and parks	bark	Only bark which is not treated with lindane (limit value for questionable cases: 0.5 mg/kg dry matter)
Organic residues from commercial, agricultural and industrial production/processing and sale of agricultural and forestry products	bark	Only bark which is not treated with lindane (limit value for questionable cases: 0.5 mg/kg dry matter)

Annex 1 also defines additives for the compost production, the amounts of additives and quality standards for additives.

Additives are substances in small amounts (total amount of additives not more than 15% m/m). These additives shall improve the compost production process. Some of these additives show POP relevant limit values.

Table 68: Additives for the production of compost having a limit value for POPs (Fed. Law Gaz. II No. 292/2001).

Additives	Materials	Quality standards and remarks
Fango sludge and fango soils	Natural fango sludge and fango soil without mixtures and contamination	POP relevant limit value [mg/kg dry matter]: . PAK (16): 2, PCB: 0.2
Ash of incineration plants for biomass	Ash from plant sources	Max. 2% m/m, no particulate matter ashes; particulate matter POP relevant limit values [mg/kg TM]: PCDD/PCDF 100 ng TE/kg dry matter
Excavated soils and soil suspensions	Natural grown, not contaminated soil, washing residues (sludges) from root crops, natural moor sludge and healing soils without additives	Max. 15% m/m, not for the production of waste compost; POP relevant limit value [mg/kg TM]: PAK(16): 2, PCB 0.2

6.2.6 Ordinances on Sewage Sludge and Compost of the Federal Provinces

Each of the nine Austrian provinces has an own ordinance on sewage sludge. They all have slightly different regulations concerning application of sewage sludge and products of sewage sludge (waste compost, mixtures of sewage sludge) on soils. All of them impose limit values for heavy metals.

Several of these ordinances refer to the *Compost Ordinance (Fed. Law Gaz. II No. 2001/292)*.

Burgenland: Sewage Sludge and Waste Compost Ordinance (Bgl. Klärschlamm- und Müllkompostverordnung)

The Sewage Sludge and Waste Compost Ordinance of Burgenland stipulates that sewage sludge must be stabilised prior to agricultural use. Treated sewage sludge to be applied on soil must meet several threshold criteria (mainly for heavy metals).

Carinthia: Carinthian Sewage Sludge and Compost Ordinance (Kärntner Klärschlamm- und Kompostverordnung)

This ordinance lays down the framework for the use of organic waste streams (such as sewage sludge, composts, and residues of fermentation processes) for agricultural and landscaping purposes.

Sewage sludge can only be applied on soils after treatment whereby this treatment has to be accompanied by a sampling and analyses procedure. Beside heavy metals (annex 1) the Carinthian sewage sludge and compost ordinance defines limit concentrations for 4 organic pollutants or substance groups (annex 3). These parameters have to be analysed when suspicion is raised in specific cases and by administrative assignment.



Table 69: POP relevant limit values for sewage sludge in the Carinthian sewage sludge and compost ordinance.

Pollutant	Limit value
AOX	500 mg/kg per dry matter
PAK	6 mg/kg dry matter
PCB	1 mg/kg dry matter
Dioxin	50 mg/kg dry matter

Lower Austria: Sewage Sludge Ordinance (NÖ Klärschlammverordnung)

In Lower Austria sewage sludge to be applied on soil must meet the limit value for heavy metals and AOX.

An official expert opinion is required to determine if the soil in question is suitable for the application of sewage sludge.

Salzburg: Ordinance on Sewage sludge and protection of the soil: Ordinance of the Federal Province Salzburg to protect the soil in case of application of sewage sludge and materials containing sewage sludge (Klärschlamm-Bodenschutzverordnung)

Basically, the application of sewage sludge or mixtures with sewage sludge on soils is prohibited according to this ordinance. However, quality sewage sludge compost which meets certain quality criteria (not including POP relevant substances) as defined in the compost ordinance (§ 12, a, see 6.2.5) is allowed to be used for this purpose.

Styria: Sewage Sludge Ordinance (Klärschlammverordnung)

The Styrian Sewage Sludge Ordinance refers to the application of sewage sludge on agricultural soils.

In addition to other pollutants such as heavy metals, the sewage sludge foreseen for application on agricultural soils has to meet a limit value for degradable organic substances.

Sewage sludge from large waste water treatment plants (capacity larger than 30 000 population equivalent) must additionally be analysed for the content of PAHs and AOX. The parameter PAH includes 16 polycyclic aromatic hydrocarbons and for the sum of these 16 PAHs a limit value of 6 mg/kg dry matter is defined.

Similarly waste compost foreseen for application on soils must be analysed for PAHs and PCBs.

Tyrol: Tyrolean Field Protection Act (Tiroler Feldschutzgesetz 2000)

The Tyrolean Field Protection Act from September 2000 prohibits the application of sewage sludge to agricultural soils.

Upper Austria: Sewage Sludge Ordinance 2006 (OÖ Klärschlammverordnung 2006)

This ordinance gives limit values for sewage sludge to be applied on soil.

In upper Austria, sewage sludge to be applied on soil must meet the limit value for heavy metals and AOX.

This ordinance also defines limit values for heavy metals and pH for the soils where sewage sludge should be applied.

Vienna: Act on prohibition of the application of sewage sludge (Gesetz über das Verbot der Ausbringung von Klärschlamm)

The application of sewage sludge is forbidden in the province of Vienna. Excepted are materials as defined in the Austrian Compost ordinance ((BGBl. II Nr. 2001/292; see 6.2.5).

Vorarlberg: Ordinance concerning the application of Sewage Sludge (Klärschlammgesetz)

Sewage sludge can only be applied as sewage sludge fertiliser. Only stabilised (treated) sewage sludge can be used for the production of sewage sludge fertiliser according to this ordinance.

The sewage sludge from the waste water treatment plants must not exceed the following POP relevant limit values:

Table 70: POP relevant limit values for sewage sludge according to the Ordinance concerning the application of Sewage Sludge.

Pollutant	Limit value
Polychlorinated Biphenyls (PCB) No. 28, 52, 101, 138, 153, 180	0.2 mg/kg dry matter for each congener
Polychlorinated Dibenzodioxins/Dibenzofurans (PCDD/PCDF)	100 ng/kg dry matter (I-TEQ)

6.2.7 Ordinance concerning Protection of Soils

In Austria, there are currently no consistent limit values for organic pollutants in soils.

According to Austrian law the federal provinces are responsible for the protection of soils. Some of the provinces have ordinances concerning protection of soils and those include mainly agricultural aspects. In these ordinances are mainly limit values and thresholds for soils where sewage sludge should be applied.

Further the ÖNORM S 2088-2 (Contaminated sites: estimation of danger of soils) gives reference values for PCDD/F (I-TEF), PCB (Σ 6 according to Ballschmitter) and PAH (Σ 16 according to US-EPA) amongst others.

Table 71: Reference values for the use where direct danger by oral uptake of contaminated topsoil (0–20 cm) cannot be excluded (e.g. gardens, childrens' playgrounds, sport fields); ÖNORM S2088-2.

Pollutant	unit	Test value	Threshold for measures
PCDD/F	[ng I-TEQ/kg TM]	10	100
PAH	[mg/kg TM]	1	50
PCB	[mg/kg TM]	0.2	1

Table 72: Reference values for pollutants in the topsoil (0–20 cm) for soils agricultural used or used as garden (ÖN S2088-2).

Pollutant	unit	Test value	Threshold for measures
PCDD/F	[ng I-TEQ/kg TM]	10	to be determined in the specific case
PAH	[mg/kg TM]	1	
PCB	[mg/kg TM]	0.3	

6.2.8 Air Quality Protection Act (Immissionschutzgesetz – Luft, IG-L)

The legal regulations for air quality assessment and management in Austria are stipulated in the Air Quality Protection Act (IG-L; Fed. Law Gaz. I No. 1997/115, as amended, implementing the first and second Daughter Directives, EC Directives 1999/30/EC and 2000/69/EC) and its ordinances. In the case of exceedance of air quality limit values abatement measures have to be applied. As it is the case for the Air Quality Framework Directive and the Daughter Directives (see 6.1.8), the Austrian Air Quality Protection Act does not cover POPs directly, with the exception of Benzo(a)pyrene for which a target value (1 ng/m³) is given (this target value will be a limit value from 31.12.2012 on). However, as unintentionally produced POPs are mostly due to combustion processes, this type of POPs is strongly related to gaseous and particle pollutants for which abatement measures have to be applied in case of exceedances. For Benzo(a)pyrene obligations for monitoring are laid down in an ordinance to the IG-L. From 2007 onwards monitoring is conducted at 15 sites across Austria.

6.2.9 Plans and programmes under Air Quality Framework Directive

In case of an exceedance of the air quality limit value plus margin of tolerance for one or more pollutants, Member States shall take measures to ensure that a plan or programme is prepared or implemented for attaining the limit value within the specific time limit (Air Quality Framework Directive, Article 8 (3)). Plans or programmes have to be sent to the European Commission at latest two years following the year the exceedance has been observed.

Most plans and programmes reported so far to the Commission deal with PM₁₀ and NO₂, some also with SO₂. In most cases, traffic was identified as the main source for PM₁₀ and NO₂ exceedances, followed by industry, commercial and residential sources. The abatement measures foreseen in the plans and programmes therefore also deal with these pollutants.

6.2.10 Residential Combustion Sources

Responsibility for regulating the operation of residential combustion sources lies within the federal provinces. As a consequence requirements concerning product certificates, emission limit values, monitoring of emissions and inspections vary.

An agreement pursuant to Article 15a Federal Constitution Act concerning the placing on the market and the inspection of combustion plants/firing installations should replace the provincial laws in this respect.



A draft of this agreement was sent out for comments in September 2006. This agreement will help to establish uniform requirements for the operation of these types of installations on a federal level and will help to reduce environmental impacts from these sources. It includes requirements concerning

- Placing on the market
- Type tests, conformity tests and labelling
- Emission limit values for dust, NO_x, CO and TOC
- Inspection of combustion installations
- Efficiency requirements
- Requirements on permitted fuels
- Refurbishment
- Advisory service

It is expected that this agreement will come into force in mid 2008.

Another relevant agreement (agreement pursuant to Article 15a Federal Constitution Law concerning the setting of consolidated quality standards to support the establishment and refurbishment of residential buildings for the purpose of the reduction of greenhouse gases) is directed to reduce energy consumption of residential buildings. This reduces fuel consumption and thus emissions from combustion installations in this source category.

6.2.11 Open burning of biogenic materials

The Federal Act concerning the prohibition of burning biogenic materials (Fed. Law Gaz. No. 1993/405 as amended by Fed. Law Gaz. I 2001/108) imposes a ban on open burning of biomass. However, the provincial governor can grant exemptions from this ban in many cases.

6.3 Other measures

6.3.1 Voluntary Self-Commitment of the Cement Industry ('Positive List')

To establish a defined quality of the co-incinerated waste, a 'voluntary self commitment' for incineration of waste was published by the Austrian cement industry. It is not legally binding and comprises a list of waste types, maximum acceptable pollutant concentrations of the waste types and limit values as monthly- and weekly average values for certain waste fractions. Furthermore, relevant issues concerning acceptance of the waste and quality control are described.

Table 73 Limit values for waste types co-incinerated in cement kilns according to the voluntary self-commitment of the cement industry.

	Σ PCB/PCT	PCDD/PCDF	Comments
Other waste (table 1)	50 ppm ¹	1,000 ng I-TE/kg ²	¹ determination necessary if relevant for the type of waste. ² determination necessary upon first delivery and only if relevant for the type of waste
waste oil, solvents, varnish waste (table 2)	100 ppm*	–	*monthly mean value

6.3.2 Paper, paper board and packaging paper

The German Federal Institute for Risk Assessment has published recommendations concerning input, used auxiliary materials, filling agents and additives for paper, paper boards and packaging papers which get in contact with food (BfR-recommendation Nr. XXXVI, Nr. XXXVI/1 and Nr. XXXVI/2). These recommendations comprise a list of materials which can be used for the described purpose together with upper concentration limits of wide range of chemicals. However, annex C POPs are not regulated here.

6.3.3 Biomass plants serving the purpose of centralised district heating

Biomass plants serving the purpose of centralised district heating are funded by the Environmental support schemes when certain requirements with regard to energy efficiency, operating conditions, emissions and reporting of emissions are fulfilled. Plants subject to this funding scheme have to meet ELVs for dust, NO_x, CO and C_{org} depending on their size. However, since most ELVs are the same as prescribed in e.g. the Ordinance on combustion installations (see 6.2.2.1) any additional effect on reduction of POPs emissions is caused by requirements concerning energy efficiency.

6.4 Overview on Monitoring activities and Surveys on federal level

6.4.1 Ambient Air

As described in chapter 6.2.8 monitoring of Benzo(a)pyrene in PM₁₀ is required at 15 monitoring sites at least. At the rural background site Illmitz in addition to Benzo(a)pyrene, Benzo(a)anthracene, Benzo(b)fluoranthene, Benzo(j)fluoranthene, Benzo(k)fluoranthene, Indeno(1,2,3-c,d)pyrene and Dibenz(a,h)anthracene as well as the deposition of Benzo(a)pyrene is monitored. Results of all the monitoring activity are published in an annual air quality report (see e.g. UMWELTBUNDESAMT 2007e). The target value of the 4th Daughter Directive of 1 ng/m³ for Benzo(a)pyrene



was exceeded in the year 2006 mostly in alpine valleys and basins. The reasons for these exceedances are high emissions due to wood burning and adverse dispersion conditions in winter time.

In November 1992 the Federal Environment Agency Austria started a monitoring programme for ambient air concentrations of PCDD/F and PCB (from 1997 onwards) at the conurbations of Linz, Graz and Vienna. This programme was the first systematically approach to assess the situation of ambient air concentrations of dioxins in Austria.

The results of this survey (UMWELTBUNDESAMT 1994, 1996) showed a clear seasonal trend of PCDD/F concentrations with highest concentrations in winter indicating domestic heating as the major source for increasing dioxin levels in air during winter.

The survey of 1992/93 showed rapidly increasing concentrations of PCDD/F in ambient air during stable weather conditions in winter. The observed concentrations were twice to three-times higher than the average winter levels. Owing to these results in winter 1993/94 and 1994/95 respectively the Austrian Federal Environment Agency started two monitoring programmes in the conurbations Graz and Linz to better assess concentration levels during stable weather conditions in winter (UMWELTBUNDESAMT 1995a & 1995b).

It could be shown that stable weather conditions (inversion layers), as known from other air pollutants, lead to elevated PCDD/F levels for this period of specific meteorological conditions.

Based on the results of this initial monitoring programme in 1997 a long lasting monitoring programme started with the objective to observe long term trends of PCDD/F and additionally PCB in the air. The monitoring programme comprises eight sampling sites representing urban, rural, industrial and remote locations. The sampling sites of the initial monitoring programme of 1992/93 are also included (MOCHE & THANNER 2002).

The datasets of 1992/93 compared with those of the monitoring programme since 1997 show a slight decrease of PCDD/F in the air during winter, whereas the summer levels are almost equal. The monitoring programme proved to be a sufficient tool for effectiveness control of abatement measures on a nationwide perspective and therefore it will be continued.

Since 2005 and with the project MONARPOP (see 6.4.6) the concentrations of all POPs of the Stockholm Convention and the POPs protocol and of some emerging POPs in ambient air and deposition at Alpine summits (in Austria: Sonnblick) are monitored. Sampling is carried out continuously and separately according to source regions of the arriving air masses. A continuation of these monitoring activities is planned under a follow-up project. Due to the ambient air monitoring activities for POPs at remote sites, MONARPOP has been included in the “Global Monitoring Plan” for the “Effectiveness Evaluation” of the “Stockholm Convention”.

6.4.2 Emissions

Metallurgical processes

The PCDD/F-Emission Inventory 1994 for Austria revealed that metallurgical processes have become one of the major sources of PCDD/F-emissions. According to this inventory two iron ore sinter plants located in Linz and Donawitz accounted for more than 25% of the total annual PCDD/F emissions in Austria. In summer of 1995 the Federal Environment Agency Austria on behalf of government authorities started an ambient air sampling programme in this area. These measurements showed obviously elevated PCDD/F ambient air levels, compared to average levels in Austrian major conurbations as known from monitoring programmes.

Based on these findings measures have been undertaken resulting in a significant reduction of particulate matter in the atmosphere of this area. In 1999 the Federal Environment Agency started a new survey at this location. The objectives of this new programme was the determination of real annual average ambient air concentrations of PCDD/F and PCBs based on continuous sampling at one station in the vicinity of the steelworks (UMWELTBUNDESAMT 2003b).

Domestic heating

The Austrian Air Emission Inventory of 1994 also showed that PCDD/F emissions from non-industrial combustion plants accounted to 16 g I-TEQ/year representing 58% of the total PCDD/F emissions in Austria.

The majority of the furnaces used for residential heating are fuelled with wood, whereas in urban areas coal and coke is still used in considerable amounts. The annual consumption of coal and coke in Austrian flats on the basis of data from 1992 was approximately 300,000 t. In 1997 the Federal Environment Agency started a measuring programme on emissions of PCDD/F from the combustion of coal, coke and wood in small household stoves. The first results of that study (UMWELTBUNDESAMT 2002) showed unexpected high concentrations of PCDD/F in the emissions from a small household stove fuelled with coal. The recalculation of the Austrian Air Emission Inventory based on these data would have increased the estimated PCDD/F emissions from the non-industrial combustion plants significantly. In 1999 the Federal Environment Agency continued the study with three different types of household stoves fuelled with coal, coke and wood under real life conditions. The emission factors for coal burning gained from this study confirmed the results of the 1997 study. The emission factors for coke burning were by a factor of ten lower than those from coal burning. The lowest concentrations resulted from wood burning, ranging from 0.09 to 1.96 ng I-TEQ/Nm³.

Road traffic

Since it is well known that incomplete combustion in the presence of chlorine can cause formation of PCDD/F also motor vehicles have to be considered as dioxin emission sources. Beginning in the late 1980'ies several studies have been undertaken to estimate the contribution of road traffic to overall PCDD/F emissions. These studies showed that combustion motors fuelled with unleaded gasoline or diesel could be considerable emission sources for PCDD/Fs. These measurements also showed considerable uncertainty especially for the estimation of emissions for

heavy duty diesel truck resulting in emission factors differing by two orders of magnitude. Beginning in 1995 the Federal Environment Agency – Austria carried out three tunnel experiments to achieve data about PCDD/F emissions from road traffic in Austria. The tunnel experiment approach had been chosen because it offers the sampling of traffic emissions from an average car pool under real world driving conditions. The results of the tunnel experiments (UMWELTBUNDESAMT 1999a) showed that there is still measurable PCDD/F-emission from road traffic, but this emission appears to be a very small contribution to the overall emission in the range of 1 to 3%.

Bonfires

It is known from experiments that uncontrolled combustion of treated wood will lead to significant emissions of PCDD/F. A survey undertaken in the UK during the bonfire night festival, which is seen by some as an (unsanctioned) opportunity to burn domestic and garden waste showed 4 times higher ambient air levels of PCDD/F compared to average levels throughout the rest of the year.

In 1996 the Federal Environment Agency investigated this issue by measuring ambient air concentrations of PCDD/F at three sampling sites in Graz during the bonfires held on the Easter holidays (“Osterfeuer”). The survey (UMWELTBUNDESAMT 1997) could show that magisterial regulations were sufficient to prevent the abuse this bonfires for illegal waste disposal.

6.4.3 Food and Feed monitoring

In 2003 the Federal Environment Agency carried out a first Austrian wide milk monitoring study (THANNER & MOCHE 2004) with the objective to get an overview of average PCDD/F levels in cow’s milk, additionally dioxin-like PCBs, according to WHO, and indicator PCBs, as listed by national regulations, were analysed. The results showed that Austrian milk samples are clearly below the current EC limit value of 3 pg WHO-TEQ/g fat. No significant differences, with respect to PCDD/F and dioxin-like PCB, could be found between milk samples originating from dairy factories and alpine dairies with an regional limited collection area. The differences in the levels of indicator PCBs in cow’s milk are a clear indication for still continuing industrial influence showing significant lower levels for milk samples from remote alpine regions.

Since 2004 the Austrian Agency for Health and Food Safety is carrying out a food monitoring programme in accordance with Commission Recommendation 2004/705/EC. Samples collected from all 9 provinces of Austria covered all components of average Austrian diet. All samples investigated were well below the EC-limits for food. The estimates of dietary intakes of dioxins and furans based on the combination of food consumption data amounts to 209 pg WHO-TEQ/day which on a body weight basis would correspond to approximately 3 pg WHO-TEQ/kg bw/day (HOFSTÄDTER & GROSSGUT 2006). This is within the range of the TDI (TDI: tolerable daily intake) range of 1–4 pg WHO-TEQ/kg bw/day as defined by WHO.

Feed and food monitoring for PCDD/F and dioxinlike-PCBs is an ongoing process in order to fulfill obligations arising from current EC- and national legislation.

6.4.4 Water

6.4.4.1 WATER BODIES

All large surface water bodies are tested for pollutants – including POPs. Analyses are carried out in water and sediments. Some monitoring programmes are accompanied by biomonitoring programmes (accumulation monitoring on fish). The monitoring programmes are constantly updated and focus increasingly on the substances (substances, that describe the ecological and chemical status of the water bodies) listed in the Water Framework Directive and in the respective national implementation (e.g. *Ordinance on the determination of the target state for surface waters, Fed. Law Gaz. II No. 2006/96*). Of the chemicals listed in the Stockholm Convention or the POPs Protocol, the list of priority substances (Annex X of WFD – chemical status) includes HCB, hexachlorocyclohexane and PAHs. In terms of chemicals with POP-like properties, the list includes polybrominated diphenyl ethers, short-chained chlorinated paraffins, pentachlorophenol and hexachlorobutadiene. POPs and POP-like substances must be taken into consideration in evaluating the chemical and the ecological status of a specific water body. The proposal on a directive on environmental quality standards covers HCB, PAH, cyclodiene pesticides (aldrin, dieldrin, endrin and isodrin), DDT and hexachlorocyclohexane.

This monitoring is predominantly based on the *Ordinance on the monitoring of the status of water bodies (Fed. Law Gaz. II No. 2006/479)*. In addition to that several non standard monitoring programmes were performed on behalf of the Austrian Federal Ministry of Agriculture and Forestry, Environment and Water Management in the course of the analysis of the current status in line with art. 5 of the WFD. These non standard monitoring programmes included pollutants such as hexachlorobenzene and PAH, as well as DDT, aldrin, dieldrin endrin, Heptachlor and others.

At present investigations for certain pollutants are carried out as required by Directive 76/464/EEC (Directive 76/464/EEC – Water pollution by discharges of certain dangerous substances). Furthermore, specific substances are analysed as part of measuring obligations prescribed by international river basin commissions (e.g. ICPDR, Joint Danube Survey). The measuring programmes are constantly updated and focus increasingly on the priority substances under the Water Framework Directive.

Concentrations of pollutants in surface water bodies – including a number of substances of the Stockholm Convention – are measured in Austria in the context of various obligations and monitoring programmes and will be available to the public on the Internet [<http://wisa.lebensministerium.at>].

6.4.4.2 Municipal Wastewater Treatment Plants

Currently no continuous monitoring of effluents of municipal wastewater treatment plants for POPs or POP like substances is performed and the database on emissions of these substances from wastewater treatment plants is very poor. In order to improve the knowledge basis and to generate data on those emissions, a monitoring programme is in the course of being implemented in selected Austrian wastewater treatment plants. Results will be available in 2009.

6.4.4.3 Groundwater

In Austria standardised groundwater quality monitoring, based on legal provisions, was established in 1991. Its aim was to ensure the collection of consistent and reliable data to assess the current status of Austrian groundwaters and detect increasing concentrations at an early stage. This information was also to be used as the basis for designing and implementing measures for the protection of groundwater.

The resulting monitoring programme covers groundwater in porous media and in karst and fractured (fissured) rock systems. In total about 2000 groundwater sites are investigated and monitored. Groundwater areas were delineated as monitoring units and the monitoring was carried out on a quarterly basis (four times per year) for the whole of Austria.

To take account of the new requirements of the WFD the Austrian Federal Water Act was amended and provided the basis for a new Ordinance for Water Quality Monitoring (Austrian Federal Law Gazette 479/2006). Consequently the groundwater quality monitoring network in Austria was assessed for compliance with the new requirements and, where necessary, the network was amended accordingly. The most important impact resulted from the introduction of WFD groundwater bodies as groundwater management units.

To comply with the WFD and the Austrian Ordinance on Water Quality groundwater monitoring is carried out according to a 6 years cycle. The cycle starts with an 'initial investigation' under the surveillance monitoring programme. This includes monitoring for an extensive number of parameters.

The parameters monitored in groundwater, which total is about 120, are grouped into two parts:

- Part 1: important inorganic parameters with relevance to the environment, e.g. nitrate, nitrite, ammonium, phosphate, boron, alkali metal and alkaline earth metal (e.g. potassium, calcium, magnesium);
- Part 2: the heavy metal group (e.g. arsenic, mercury, cadmium) and lightly volatile halogenated hydrocarbons (e.g. tetrachloroethylene), the broad group of pesticide substances (e.g. triazine, phenoxy alkane carbon acids) and polycyclic aromatic hydrocarbons (PAHs).

For the following substances of concern PCDD and PCDF, PCBs and PAHs there are no monitoring data available, however there are data on HCB in groundwater available. Most of the values are below the limit of detection and below the limit of quantification. In addition the Monitoring programme includes the following POPs as Aldrin, Chlordan, DDT, Dieldrin, Endrin, Heptachlor and Lindan,

In addition the option for "extra-investigations" exists. This is intended to allow for consideration of chemical parameters not mentioned in the Ordinance on Water Quality Monitoring.

Various elements of quality assurance are integrated in the Monitoring programme to ensure confidence in the analytical results. The implementation of the Austrian Water Quality Monitoring System is a shared responsibility between the Federal and Provincial Authorities.

Results of the monitoring programme are published as bi-annual reports. Access to the data as well as to the reports is available via the webpage of the Federal Environment Agency – <http://www.umweltbundesamt.at/en/umweltschutz/wasser/>.

6.4.5 Soils

There is no common soil monitoring system on organic substances established in Austria. However, several studies were carried out which aim to determine the contents of selected POPs in soil (according to different land uses).

Within the environmental soil surveys of federal provinces in Austria, some organochlorine pesticides and herbicides were partly analysed in 3 federal provinces (Carinthia, Styria, Upper Austria). These studies were carried out in the 1990ies.

In addition, various screening studies had been carried out around potential sources and in industrial conurbations to identify the load of POPs in soils of various uses (e.g. UMWELTBUNDESAMT 1991).

Grassland soils

More up to date data are provided by a recently published study on POPs in grassland soils far away from emission sources. 14 grassland sites under extensive use were selected in 4 federal provinces of Austria. Soil samples were taken at depths of 0–5 cm and 5–10 cm and were analysed for the following substances or groups of substances: organochlorine compounds (aldrin, cis- and trans-chlordane, dieldrin, endrine, mirex, heptachlorine, hexachlorobutadien, endosulfan, DDX, α -, β -, γ -, δ -HCH, HCB), polychlorinated biphenyls (PCBs), dioxins, furans and dl-PCBs, polycyclic aromatic hydrocarbons (PAHs), polybrominated diphenyl ether (PBDE), nonylphenol and bisphenol A, nitrophenols, chlorophenols, phthalates, organotin compounds, hydrocarbon index, inorganic pollutants, general soil parameters (pH value, humus content, texture, carbonate content). On the basis of these results, substances were selected that were also analysed in all the samples from the second depth.

Overview of the results for individual pollutant groups:

Organochlorinated pesticides: Contents of selected organochlorinated pesticides, whose production and use have meanwhile been banned in many countries, are mostly below the chosen detection limits in the sampled grassland sites. Values for HCB fluctuate between <75 and 1100 ng/kg DS, those for pentachlorobenzene between <260 and 2600 ng/kg DS.

Polychlorinated biphenyls (PCBs): Contents of individual PCB congeners are above the chosen limits of determination for all samples. The range for the total content from the sum of the 6 congeners according to Ballschmiter is between 0.85 and 3.52 μ g/kg DS (median: 1.2 μ g/kg DS) and all values can therefore be considered background concentrations.

DL-PCBs: Contents of coplanar and mono-ortho-substituted PCBs were detected in most of the soil samples. They are within the range of a few nanograms. What is noticeable is that either low chlorinated PCBs are found together on a few sites, or higher chlorinated PCBs. Total values from the sum of PCBs TE-WHO for the sampled grassland sites are between 0.01 and 0.74 ngTE WHO/kg.

Polychlorinated dibenzo-p-dioxins and furans (PCDD/Fs): Total contents from the sum of PCDD/Fs in grassland samples range between 12.5 and 148.0 ng/kg DS (median: 46.5 ng/kg DS). In order to take into account the varying toxicity of the congeners, PCDD/F contents are assessed according to international toxicity equivalents (I-TEQs). These are between 0.16 and 9.33 ng I-TEQ/kg DS. The upper values are considered high and need further clarification.

Polycyclic aromatic hydrocarbons (PAHs): Contents of EPA PAHs range between 2.4 and 1818.3 µg/kg DS (median: 82.1 µg/kg DS). On 9 sites, values below 100 µg/kg DS were determined. Although none of the grassland sampling sites used for this study showed PAH contents above international background or intervention values, further clarification appears to be necessary for ΣEPA PAH and BaP contents on three sites. For all other sites, PAH contents can be classified as background values.

Polybrominated diphenyl ether (PBDE): The contents of 25 congeners of the possible 209 PBDE compounds were analysed within the framework of this study. It appears that the verifiability and magnitude of PBDE levels vary considerably in the congeners. Highest levels (above 2000 ng/kg DS) have been found for DecaBDE (BDE-209). The total values from the sum of all 25 analysed PBDEs are between 14.3 and 5284 ng/kg DS.

Nonylphenol and bisphenol A: Contents of nonylphenol and bisphenol A are below the chosen determination limits on more than half of the sites. The maximum contents reach values of 31.5 µg/kg DS for nonylphenol and 2.5 µg/kg DS for bisphenol A.

Chlorophenols: For a large part of the soil samples, no chlorophenol levels could be reliably determined. 59% of the samples were below the detection limit, another 16% below the limit of determination. Total contents from the sum of all mono-, di-, tri-, tetra- and penta-chlorophenols range between 9.4 µg/kg DS and 125.6 µg/kg DS (no results are available for 2,4,6-trichlorophenol).

Nitrophenols: Within the study at hand, 15 congeners of this pollutant group were analysed. With detection limits between 0.8 and 5.5 µg/kg DS (limit of determination: 1.6–11.0 µg/kg DS), no nitrophenol compound could be detected in any of the samples from the uppermost depth.

Phthalates: 6 phthalates were analysed. Quantities of dibutylphthalate (DBT) and diethylhexylphthalate (DEHP) were detected with values between < detection limit and 43.0 µg/kg DS (DBE), and between 15.0 and 100 µg/kg DS (DEHP) in almost all the samples. The values of all other representatives of this group are below the detection and determination limits.

Organotin compounds: The contents of all grassland soil samples from the uppermost depth are below the limit of determination and the detection limit of 4.0 and 2.0 µg/kg DS for the 6 representatives of the analysed organotin compounds.

Hydrocarbon index: The hydrocarbon index at the uppermost depth is below the limit of determination of 100 mg/kg DS on all analysed sites.

The results of this study show that persistent organic pollutants can be detected, occasionally in considerable concentrations (e.g. PCDD/F), even in grassland soils under extensive use. On the one hand the substances concerned are those whose use and production have been banned in many countries for several years or decades (e.g. certain pesticides), and on the other hand these substances are so-called upcoming pollutants (e.g. flame retardants, phthalates, chlorophenols), whose environmental relevance is gaining more and more importance at international level. For three substance groups (nitrophenols, organotin compounds, hydrocarbon index), all soil samples are below the chosen detection limits. Here it will be necessary to consider suitable determinants for future analyses.

The study thus provides an initial overview of the verifiability and magnitudes of the levels of selected organic pollutants. Although a more detailed analysis in the light of a correlation between individual soil parameters, or pollutant groups, has not been possible here, it would be an important next step allowing for a better description of the fate and behaviour of these substances in grassland soils.

Those pollutant groups that were analysed at both depths within the framework of this project suggest that there is no direct connection between pollutant contents and depth distribution in the soil profile. In view of this, the analyses should also be completed for all samples.

In general, the data on organic pollutants in soils are considered incomplete. Only a few pollutant groups such as PAHs, PCBs or PCDD/Fs are well documented in the literature. For many other substances however, hardly any comparable data on background values in soils are available. In other mediums such as sewage sludge, sediments and surface waters, these pollutant groups have already been analysed in several studies.

A follow-up study is currently under development to investigate in more depth the state of grassland soils throughout Austria including a wider range of sampling sites.

Forest soils

Several studies on concentrations of POPs in remote forest ecosystems included also forest soils as sampled matrix (see next chapter)

6.4.6 Bioindication with tree needles and forest ecosystems

Two major earlier studies (UMWELTBUNDESAMT 1998, 2001,) focused on POP concentrations in remote forest ecosystems. The project “MONARPOP”²² investigated POPs in remote forests of the alpine region of Europe (Austria, Germany, Italy, Slovenia, Switzerland) from 2004 to 2007. The studies focused on POP background levels at remote sites. Investigated media were: Norway spruce needles, humus and mineral soil. The investigations provide information about the following compounds – formerly or still – intentionally produced POPs (*organochloropesticides*=OCP, PCB, PBDE, *chloroparaffins*) and unintentionally released organic pollutants (PCDD/F, PAH). Project MONARPOP also includes extensive air and deposition monitoring. The project MONARPOP had been finished by end of December 2007 and a final report will be presented to the public in the beginning of 2008.

A follow-up study to MONARPOP is currently under development. The main goals of this follow-up study will be the continuation of the air and deposition sampling at the high altitude monitoring stations, the investigation of accumulation of POPs in alpine food chains and the inclusion of novel passive sampling techniques. Additionally efforts have been made to include project partners from France and further Italian provinces to cover the western Alps in this study.

Apart from forest ecosystem surveys, POP levels (PAH, PCB, PCDD/F, HCB, PCP) close to local pollution sources were obtained by some bioindication studies in industrial areas or conurbations using Norway spruce needles. The Austrian Umweltbundesamt also holds a perennial archive of spruce needle samples from selected industrial neighbourhoods.

²² <http://www.monarpop.at>



6.5 Monitoring activities on States level

Studies and monitoring programmes on POPs are carried out on Länder level as well. There are several examples of these, however, not all activities are fully known on federal level.

Examples of these projects are:

Analysis of HCB, HCH, PCB, PFOS, PBDE, PAH in alpine lakes²³.

PCBs were further studied in waste water, sewage sludges, sewage sludge fertilisers, soil and biogas slurry (carried out in the states laboratory of Vorarlberg²⁴).

²³ Umweltinstitut des Landes Vorarlberg (2003): Untersuchung schwer abbaubarer Schadstoffe in hochalpinen Regionen Vorarlbergs, Schriftenreihe Lebensraum Vorarlbergs, Band 56

²⁴ see e.g.: Umweltinstitut des Landes Vorarlberg (2005): Klärschlammkompost – Abbauverhalten von Schadstoffen während der Kompostierung; Bericht UI-1/2005

7 EVALUATION OF THE EFFICACY OF NATIONAL LAWS AND POLICIES AND STRATEGIES FOR MEETING THE OBLIGATIONS OF THE STOCKHOLM CONVENTION AND THE EU POP-REGULATION

Considering the results of this report with respect to POPs release inventories, forecast of releases, availability of data, measures already in place or planned measures it can be concluded that Austria complies to a great extent with the provisions of the Stockholm Convention and the EU POP Regulation. Nevertheless, as one of the goals of the Convention is the “continuous reduction of POPs releases” further efforts are necessary.

POP emissions of major (industrial) sources have considerably declined in the past years. Still, if changes in the best available techniques allow for lower or zero emissions from relevant sources policy makers have to react and to adapt the relevant legal provisions (e.g. by laying down stricter emission limit values).

An important target area are small residential combustion plants which hold responsible for 74% of the PCDD/F emissions, 88.7% of the HCB emissions and 73.9% of the PAH emissions into air. All possible measures have to be investigated and exploited to reduce the POP emissions from these sources.

Another set of measures lies in the awareness-raising concerning (prohibited) waste incineration in household stoves or e.g. the use of ashes from these plants for fertilising purposes.

Further, it is important to gain deeper knowledge in fields where reliable data are limited or missing. Concrete studies e.g. with regard to POP concentrations in certain wastes as well as further POP related monitoring activities have been formulated below.

Proposed Measures (according to § 20 (2) Chemicals Act 1996)

Releases of POPs from source categories

The following table contains an overview of the most relevant legislation with regard to the release of POPs and provides a short evaluation of the efficacy including concrete measures for meeting the obligations of the Stockholm Convention and the EU POP-Regulation. A detailed time schedule cannot be established for all measures as some responsibilities lie within the Federal Provinces.

National legislation	Contents with respect to POPs	Timetable/Concrete Steps
Emission Protection Act for Steam Boilers (Fed. Law Gaz. I No. 2004/150) and Clean Air Ordinance for Steam Boilers (Fed. Law Gaz. No. 1989/19 as amended by Fed. Law Gaz. II No. 2005/55)	ELVs for dust, CO, Corg, NO _x	Adaptation to BAT necessary (stricter ELVs for dust) Timetable: as soon as possible (establish conformity with BAT)



National legislation	Contents with respect to POPs	Timetable/Concrete Steps
<i>Industrial Code 1994 and specific ordinances</i>	ELV for various air pollutants	Continuous evaluation with regard to BAT necessary
Ordinance on combustion plants (Fed. Law Gaz No. II 1997/331)	ELVs for dust, CO, Corg, NO _x	Adaptation to BAT necessary (stricter ELVs for dust), Timetable: amendment planned (draft sent out for comments in October 2007)
Ordinance on the production of iron and steel (Fed. Law. Gaz. II No. 1997/160 amended by Fed. Law Gaz. II No. 2007/290)	ELVs for dust, CO, Corg, NO _x , heavy metals, PCDD/F	Adaptation to BAT by amendment in November 2007
Ordinance on sinter plants (Fed. Law. Gaz. II No. 1997/163)	ELVs for dust, CO, Corg, NO _x , heavy metals, PCDD/F	Adaptation to BAT necessary (stricter ELVs for PCDD/F, dust) Timetable: amendment planned
Ordinance on non ferrous metals production (Fed. Law. Gaz. II No. 1998/1 amended by Fed. Law Gaz. II No. 2008/86)	ELVs for dust, CO, Corg, NO _x , heavy metals, PCDD/F, benzo(a)pyrene	Adaptation to BAT by amendment in March 2008
Ordinance on foundries (Fed. Law Gaz. No. 1994/447)	ELVs for dust, CO, Corg, NO _x , VOCs	Continuous evaluation with regard to BAT necessary
Waste incineration ordinance (Fed. Law. Gaz. II No. 2002/389)	ELVs for dust, CO, Corg, NO _x , heavy metals, PCDD/F	stricter ELVs for dust for co-incineration plants
<i>Austrian Water Act and specific Ordinances:</i>	ELVs for AOX and POX in the branch specific ordinances	
Ordinance on limitation of waste water emissions from flue gas treatment (Fed. Law Gaz. II No. 2003/271)	ELVs for PCDD/F	Continuous evaluation with regard to BAT
Ordinance on limitation of waste water emissions from processing of coal (Fed. Law Gaz. II No. 1997/346)	ELVs for PAHs	Continuous evaluation with regard to BAT
Ordinance on limitation of waste water emissions from the production of plant protecting agents and crop sprayings (Fed. Law Gaz. No. 1996/668)	ELVs for AOX and specific POPs	Continuous evaluation with regard to BAT
Ordinance on the determination of the target state for surface waters (Fed. Law Gaz. II No. 2006/96)	Environmental quality standard for HCB	For PAHs community environmental quality standards will be determined (presumably in 2008)
<i>Other relevant legal provisions</i>		
Ordinance on landfills (Fed. Law Gaz. II 2008/39)	Limit values for the content of PAH in wastes	Recently amended
Compost ordinance (Fed. Law Gaz. II No. 2001/292)	Limit values for the content of POPs in composts	Continuous evaluation of the limit values necessary

National legislation	Contents with respect to POPs	Timetable/Concrete Steps
Ordinances on sewage sludge and compost of the Federal Provinces	Limit values for heavy metals	Continuous evaluation of the limit values necessary
Ordinances of the Federal Provinces concerning the protection of soils		Elaboration of target values for organic pollutants (including polybrominated diphenylethers, perfluorinated tensides and pesticides) with the aim to reduce pollution of soils
Air Quality Protection Act (IG-L)	§ 21 IG-L: Legal basis for an ordinance	Timetable: as soon as possible evaluation whether generally binding ELVs for crematoria in an ordinance according to § 21 IG-L are necessary
Laws of the Federal Provinces concerning residential combustion sources		Timetable: Agreement pursuant to Art. 15a Federal Constitution Law concerning the placing on the market and the inspection of combustion installations planned (draft sent out for comments in September 2006); rapid transposition of the requirements of this agreement into the law of the federal provinces (presumably in summer 2008)
Act on open burning of biogenic materials (Fed. Law Gaz. 1993/405)	Prohibition of burning of biogenic materials, many exemptions possible	Timetable: as soon as possible evaluation of the ordinance with respect to the exemptions
Permitting process	Contents with respect to POPs	Comments/Concrete Steps
Landfill sites	Fire protection requirements	Implementation of effective fire protection requirements for landfills and intermediate storage sites for waste

Bearing in mind that the sector **residential combustion** is responsible for 74% of the PCDD/F emissions into air the rapid implementation of the following measures is of utter importance:

- Establish compliance with the requirements of the agreement between the federal provinces pursuant to Article 15a Federal Constitution Law concerning the setting of consolidated quality standards to support the establishment and refurbishment of residential buildings for the purpose of the reduction of greenhouse gases. Timetable: as soon as possible.
- Effective financial funding of the exchange of coal fired small scale firing installations. Timetable: as soon as possible.
- Periodic review and improvement of the criteria for funding biomass plants (including biomass plants operated in the agricultural sector) with respect to operating conditions, energy efficiency (including district heating systems), quality of fuels and emission limit values for dust. Timetable: 2009

- Information campaign with respect to prevention of co-incineration of waste in small scale combustion installations).
- Information campaign with respect to final disposal of ashes/soot from small scale combustion installations (esp. in the sectors households and agriculture).
- Implementation of appropriate measures to support that the target value for Benz(a)pyrene in the ambient air ($1 \mu\text{g}/\text{m}^3$) will be kept. This target value will be transposed into an emission limit value as of 31.12.2012.

For the following sources availability of data is very limited or missing. Therefore, to assess whether releases of POPs are relevant and to improve and complete the Austria Inventories on POPs, the following **concrete steps to improve data quality** are desirable/necessary:

- Air emission measurements from secondary copper production (converter and anode furnace), secondary lead production and production of Nickel (i.a. to check compliance with BAT)
- Emission behaviour of small scale combustion installations (esp. in case of firing straw and cereals)
- Measurement of emissions of motor vehicles and update of emission factors to improve quality of forecasts
- Improvement of data quality with respect to releases of POPs from landfills and abandoned industrial sites and known contaminated sites (e.g. PAH content of landfill gases)
- Assessment of the contamination and treatment of waste and residues in non ferrous metals and secondary steel production as well as in sinter plants
- Determination of POP-concentrations in waste streams from from small scale combustion installations in the sectors residential combustion, services and agriculture which have a high probability to be released into the environment (e.g. bottom ash and fly ash)
- Determination of POP-concentrations in waste streams from fossil fuel fired utility and industrial boilers (including co-incineration of waste) which are recovered in other production processes or which have a high probability to be released into the environment (e.g. fly ash from co-incineration plants)
- Determination of POP-concentrations in waste streams from from biomass fired combustion installations which are recovered in other production processes or which have a high probability to be released into the environment (e.g. bottom ash)
- Determination of concentrations of PCDD/F and relevant precursors especially in bleached (Kraft-)pulp (imported and domestic production), papers (packaging papers, paper boards, paper made from recovered fibres), colours and inks, de-inking sludge
- Quantification of POPs in filter dusts from the clinker process (Austrian cement kilns)
- Quantification of POPs emissions (esp. PCDD/F and PCB) of the Platformer 3 of the OMV refinery in Schwechat

A time schedule for the above activities cannot be given. However, Austria seeks to close all the mentioned data gaps until the revision of the National Action Plan (subject to financial capabilities).

Data availability on POP emissions into the environment

The following table lists concrete measures to improve quality of available data regarding POPs emissions into the environment:

Concrete Steps	Timetable
Improvement of data quality with respect to releases of HCB and PCB into air (e.g. by planning and carrying out measurement programmes for sources with high priority, such as residential combustion sources, industrial processes).	2008 – review of available (literature) data, identification of (suspected) relevant sources
Establishment of monitoring programmes in the neighbourhood of POP relevant emitters	2008 – identification of relevant sites for sampling 2008/09 – sampling and measurements (winter/summer)
Continuation of monitoring programmes using Norway spruce needles close to POP sources	continued sampling and start of analysis in 2008

Data availability on POP concentrations in the environment

The following table lists concrete measures to improve quality of available data regarding POPs concentrations in the environment:

Concrete Steps	Timetable
Continuation of ambient air and deposition monitoring for POPs at Alpine summits (Sonnblick)	Continued sampling
Submission of the application of a follow-up project to MONARPOP with the following additional main targets: Studying POP accumulation across alpine food chains Completion of the regional coverage of the Alps Inclusion of passive sampling techniques and bridge building measures to other monitoring programmes Modelling the POP load of the Alps Various dissemination measures, from international ones (e.g. contributing to control instruments of the Stockholm Convention) to local ones (touring exhibitions)	intended start of project in 2008
Development of transfer factors to improve knowledge of interrelations between POP concentrations in the environment and bioavailable concentrations.	2008 – establishment of scientific panel to elaborate study design
Development and adaptation of passive sampling methods to improve comparability of available data	2008 – Method/Instrument selection and development, pilot study 2009 – evaluation of pilot study and selection of appropriate method
Implementation of a national monitoring programme to investigate distribution of deposited POPs	2008 – selection of sampling sites 2009 – implementation



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ABBREVIATIONS

CORINAIR Core Inventory Air
CORINE Coordination d'information Environnementale
CRF	..... Common Reporting Format
DKDB	..... Dampfkesseldatenbank Austrian annual steam boiler inventory
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
EPER	..... European Pollutant Emission Register
GLOBEMI	..... Globale Modellbildung für Emissions- und Verbrauchsszenarien im Verkehrssektor (Global Modelling for Emission- and Fuel consumption Scenarios of the Transport Sector) see [HAUSBERGER 1998]
GPG	..... Good Practice Guidance (of the IPCC)
HCB	..... Hexachlorobenzene
HM	..... Heavy Metals
IEA	..... International Energy Agency
IEF	..... Implied emission factor
IIR	..... Informative Inventory Report
IPCC	..... Intergovernmental Panel on Climate Change
NACE	..... Nomenclature des activités économiques de la Communauté Européenne
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 UN-ECE/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 Inventur Austrian Air Emission Inventory
PAH	..... Polycyclic Aromatic Hydrocarbons
PCDD/F	..... Polychlorinated Dibenzodioxins and Dibenzofurans
PM	..... Particular Matter
POP	..... Persistent Organic Pollutants
PRTR	..... Pollution Release and Transfer Register
SNAP	..... Selected Nomenclature on Air Pollutants
UNECE/CLRTAP	..... United Nations Economic Commission for Europe. Convention on Long-range Transboundary Air Pollution
UNFCCC United Nations Framework Convention on Climate Change
WFD Waste Framework Directive 2000/60/EC



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Dieser Bericht beschreibt als Grundlage für den nationalen Aktionsplan unter dem Stockholmer Abkommen zu persistenten organischen Schadstoffen (POPs) die aktuelle Emissionssituation in Österreich und eine Prognose für das Jahr 2010. Auf Basis dieser Daten und der Bewertung der Wirksamkeit von Rechtsvorschriften und Politiken wurden Empfehlungen abgeleitet, um POP-Emissionen zukünftig zu reduzieren.

Emissionsmindernde Maßnahmen wie bundesweit einheitliche Qualitätsstandards und der Austausch von Kohle befeuerten Öfen sind vor allem bei Kleinf Feuerungsanlagen erforderlich. In anderen Bereichen, wie bei Emissionen aus Anlagen der Nicht-Eisen-Metallindustrie, Kraftfahrzeugen oder der Konzentration von POPs in Abfällen und Produkten ist eine Verbesserung der Datenlage für die Maßnahmenplanung notwendig. Ebenfalls empfohlen sind zusätzliche Monitoringprogramme.