

Executive Summary

Emission Estimates

AIR EMISSIONS

The air emission data contained in the analysed basic documents (see Volume 2) are summarised in Table 2. Accordingly, in the 17 countries considered a total annual air emission of about **3,300 g I-TEQ/year** could be inventoried from the available documents.

Contrarily the results of the re-evaluation procedure described in Volume 1 yield a total PCDD/F air emission from the selected most relevant sources of about **5,800 g I-TEQ/year** for all 17 countries as shown in Table 1a/b. Note, the 5,800 g I-TEQ/year represent about 90% of the actual total emissions.

Therefore it can be estimated that an annual PCDD/F air emission of **6,500 g I-TEQ per year** is released by all known sources in the 17 countries considered.

Assuming that the emissions are deposited without any losses on the surface area of the considered countries ($3.6 \cdot 10^9 \text{ m}^2$) an average deposition rate of about 5 pg I-TEQ/m²-day can be calculated from the estimated annual emission.. This value compares quite well with the lower limit of deposition rates estimated to be 5-20 pg/(m²-day) for rural areas in Germany.

According to the inventory presented here the major **industrial emission sources** in Europe accounting for about 62% of the total PCDD/F air emissions probably are:

The remaining 38% are caused by other industrial sources of less relevance but they are

- Incinerators for municipal waste,
- Iron ore sinter plants,
- Incinerators for clinical waste and
- Facilities of the non-ferrous metal industry.

dominated by **non-industrial sources**:

- domestic heating facilities (particularly wood combustion),
- accidental fires and
- traffic (mainly if leaded petrol is used).

WATER/RESIDUES

Apparently, much less is known about PCDD/F emissions through waste water and process residues/wastes. Some of the reviewed national documents contain emission estimates which

amount to a total of 3,500 g I-TEQ per year for residues

and about 20 g I-TEQ per year for waste water (see Table 2 and 3).

Both values must be considered as being uncertain, since no data are available to date from a huge number of emission sources. Apparently, emissions via waste waters seem to be negligible compared to atmospheric emissions and emissions via residual materials. Thus the total emissions into the atmosphere and through residues disposed off in landfills or other reservoirs are assessed to be of the same order of magnitude. Due to the lack of pertinent emission factors and activity rates a recalculation of the emissions via waste water or residues for all countries was impossible.

Data gaps / recommendations:

As indicated by the large emission margins calculated to be about 1,300- 20,000 g I-TEQ/a for air emissions (see Table 1) and 500-9,000 g I-TEQ/a for emissions via residual materials (see Table 4) the overall uncertainty of the inventoried emission estimates is quite high. Moreover, the quality of the information available from the respective national institutions differs widely particularly with respect to the number of sources considered and concerning the extent of measurement results which the estimates are based on. Most data are available concerning air emissions; the data situation is much worse with respect to other pathways of PCDD/F into the environment. In particular, measurements of PCDD/F contents in residual materials are missing frequently; information about the amount and the fate of production wastes is scarce. Further work directed into these questions should be initiated in view of the high annual emission freight via residues.

Regarding the most relevant air emission sources data gaps still exist causing considerable uncertainties of the emission estimates:

- **Municipal waste incineration**

The main data gaps exist concerning the plants located in Spain and Italy. No measurement results were available from there. Additionally, no emission data are available for a large number of small incineration facilities (capacity < 3 t/h) being operated in France. Despite these restrictions the emission estimation is assumed to be quite certain.

- **Iron ore sinter plants**

PCDD/F air emissions from about 10-15 sinter plants had been measured during the recent years and were shown to be more or less similar. However in a few cases unexpectedly increased flue gas concentrations (by a factor 20 at maximum) had been found. Hence there is an urgent need to get emission measurement results from all plants that have not been investigated yet because each single plant with emissions being exceptionally high would influence the European emission balance significantly.

- **Clinical waste incineration**

Statistical data on the total production of clinical waste and the fraction being incinerated is incomplete and somehow contradictory. Apparently, only total production data are available without breakdown regarding different compositions. Moreover, no information was available about the number and technological features of the facilities yet operated; however, it is known that in some countries (D, NL) small in-house facilities had been shut down. Emission measurements are few indicating a wide range of emission factors.

Due to these data gaps the uncertainty of the emission estimate is very high. Additional work to improve the statistical and plant related data base is strongly recommended; measurements should be done at least in those countries which have not made any attempt yet to assess the impact of these sources.

- **Non ferrous metal industry**

Among the large number of production facilities in this sector those operated for the recovery of metals from secondary materials generally can be considered as PCDD/F

emission sources. Some of the more important plants may be localised and should be subjected to measurements if this has not been done yet. Mainly this concerns plants in Belgium, France, Spain, Italy and the United Kingdom. It is uncertain if the default emission factors which have been derived predominantly from data gathered in Switzerland, Germany and The Netherlands are applicable to the other countries. Since the emission level may vary considerably with the technology applied (e.g. like in the case of hot and cold cupola furnaces) the use of statistical production data without relation to applied processes introduces additional errors into the emission estimate. Moreover, no information exists in particular about the number of cable recovering facilities. Because these emission sources may have a significant local impact they should be inventoried and measured whenever being suspected for emitting PCDD/Fs.

- **Residential Wood Combustion**

There is an information deficit concerning the amount and the composition of wooden fuels used for room heating and cooking purposes in the European countries. Without knowing details on the fraction of clean and contaminated wood the application of default emission factors causes significant uncertainties. Emission factors measured at test facilities should be checked by field investigations under real operation conditions. The extent of co-combustion of household wastes is almost unknown and should be assessed by empirical studies since this practice may influence considerably the PCDD/F emissions from stoves and fireplaces.

- **Fires**

It is well known that PCDD/F may be formed during accidental fires of buildings, chimneys and vehicles; however, a prediction of the emissions is very uncertain. The presence of halogenated compounds like polyvinyl chloride is not accepted unequivocally to be a pre-requisite for dioxin formation which apparently depends on the particular conditions of combustion. The emission factors derived so far from a few experiments must be regarded as highly uncertain. Fire statistics generally do not contain data about the mass and composition of burnt materials; these data can only roughly be estimated. An improvement of the data situation is regarded to be very difficult and would require large efforts; hence no concrete recommendation can be given in this case.

- **Road traffic**

According to the available data dioxin emissions from road traffic predominantly are caused by combustion of leaded fuels. Therefore they play a role only in countries still using this fuel. On the basis of emission factors derived by various investigations the annual emission could be estimated with an acceptable precision. However, in the scientific literature possible PCDD/F emissions from heavy duty diesel engines are being discussed repeatedly; thus additional laboratory research work seems to be necessary to get more reliable emission data.

Final conclusions

The knowledge on PCDD/F emissions in the European countries certainly has been improved during the last decade. However, the annual emission freights being assessed by national and international investigations appear to be far away from being complete. The European PCDD/F air emissions reported in national dioxin inventories cover only 50% -or even less- of the emission estimate obtained in the present study. It should be stressed that this estimate was made only for emission sources yet identified; thus the situation might be worse if the existence of unknown sources is taken into account.

Nevertheless, even in view of the partly limited basic data it can be concluded that a small number of emission source types (however comprising a large number of facilities) definitely can be identified as being responsible for a major part of the PCDD/F air emissions in Europe. These are: all types of waste incinerators and diverse facilities in the metal production sector, particularly iron ore sinter plants. The actual level of emission is not known accurately due to significant uncertainties which in parts should be overcome by additional research and measurement programs as recommended in this report in order to set priorities for the implementation of abatement technologies and emission guidelines or limit values.

With regard to the data derived in this study for the period 1993-1995 the total annual PCDD/F air emissions could be reduced by about 50 % if the emission from those main sources could be decreased nearly to zero level. Concerning waste incineration this level

could be reached by burning the waste entirely in plants complying to the 0.1 ng I-TEQ/m³ limit value as already set up for hazardous waste incineration plants. The abatement technology required for this purpose is state of the art and may be applied (after modification if needed) to the other important industrial emission sources as well. Techniques leading to complete destruction of dioxin and furans (like catalysts for instance) should be preferred compared to those processes collecting pollutants in wet or solid absorbents which might at least partly cause a shift of emissions to other media and pathways.

It appears to be an important goal to decrease the industrial PCDD/F emissions to a level as low as possible because there also exist considerable emissions of dioxins and furans from non-industrial sources, for instance domestic wood combustion and accidental fires. Since these emissions can be controlled and reduced only to a limited extent they are likely to constitute an unavoidable „background“ level.

This background level most probably will be fed additionally by emissions from so-called secondary sources, for example dioxins disposed off with wastes and sludges. According to the data collected in this study high amounts of PCDD/F are probably being emitted via residual matter which at least is equal to the atmospheric emissions. Hence, even if the transfer rate of dioxins and furans from these reservoirs into the food chain might be low this pathway must not be ignored. Unfortunately, data about these emissions are much more incomplete than information on air emissions. Therefore here again an urgent need for additional research programs is evident.

Likewise it should be noticed that measurement programs performed in the last decade mostly were focused on PCDD/F. Yet more recently a variety of other compounds probably having similar health effects have been identified, e.g. the so-called dioxin-like polychlorinated biphenyls (PCBs). Only the Swedish Dioxin Survey contains already some information on concentrations and emissions of these pollutants; therefore it is impossible to make an assessment of the European emissions. Future research and measurement programs are recommended to include these compounds wherever suitable.

Corinair (Level 1)	01 Comb. in energy prod. and transform.	02 Non-ind. combus- tion plants	03 Comb. in manufac- turing industry	04 Produc- tion pro- cesses	05 Extract. and dis- trib. of foss. fuel	06 Solvent and other product use	07 Road transport	08 Other mobile sources, machin.	09 Waste treat- ment and disposal	10 Agricul- ture and forestry, land use .	11 Nature	12 Fires	ALL			
														typical	min	max.
A	0.1	17.5	11.8						0.2		0.02		30	na	na	
B	2.3	122.2	221.8	8.0		25.0	1.7		343.9	0.1		1.9	727	268	9540	
CH	0.8	0.7	2.7	10.6		2.7	0.8	0.1	154.0			9.1	182	na	na	
D	3.6	14.5	215.0	121.5			3.8		160.7			81.0	600	165	4605	
DK	2.0	1.1	1.5	7.5			0.2		30.3				43	na	na	
E	3.9	43.9	67.5	18.0					0.6				134	na	na	
F			457.5						163.4				621	270	2700	
L			26.8	2.4					0.1				29	na	na	
N			37.3	4.8					2.8				45	na	na	
NL	3.0	11.3	33.7	3.3		25.1	2.1	0.6	9.9	0.3			89	23	408	
S	0.6	5.1	14.3	3.6			0.6	0.8	3.5			7.9	36	13	157	
SF	0.5	1.1	0.5	15.7			3.6		3.2				25	15	41	
UK	10.7	32.0	82.7	12.8		0.3	6.1		568.4		2.2		715	564	2596	
Sum	27.5	249.4	1173.1	208.2	nd	53.1	19.0	1.5	1441.1	0.4	2.2	99.9	3276	1318	20047	

Table 1: Survey on PCDD/F AIR EMISSIONS [g I-TEQ/a] as revealed by the (partly updated) national inventories;
open areas: no data available;
na: not assessable from basic data
nd: no data

European Dioxin Inventory Executive Summary

SNAP	IEM	Process/material	A	B	CH	D	DK	E	F	GR	I	IRL	L	N	NL	P	S	SF	UK	TOTAL	% of TOTAL	Remark
0202	Res. combustion: Boilers, stoves, fireplaces	wood	67.62	9.13	8.30	27.22	2.90	70.26	323.17	51.57	198.79	0.0	0.0	23.9	14.0	59.2	48.4	28.1	12.4	945.0	16.4	
0202	Res. combustion: Boilers, stoves, fireplaces	coal/lignite	1.20	1.14	0.81	11.30	0.3	3.69	3.99	0.20	0.50	5.0	0.06	0.3	0.11	0.04	0.6	0.3	10.5	40.0	0.7	
0301	Combustion in Industry/boilers, gas turbines, stationary engines		0.43	0.55	0.39	4.45	0.29	2.17	3.16	0.56	3.11	0.19	0.02	0.24	0.84	0.54	0.48	0.28	3.18	20.9	0.4	
30301	Sinter plants		27.20	98.28		254.51		62.00	183.85		128.00		46.0		41.4	4.0	9.6	19.2	136.0	1010.1	17.6	
030308	Secondary zinc production		0.08	1.00		13.52		0.75	0.99		0.35	0.0153		0.795	0	0	0.025	0	2.34	19.9	0.3	
030309	Secondary copper production		2.42	5.14	1.50	31.09	0.00	3.21	6.45	0.00	16.50	0	0	0	2.6	0	1.03	1.25	5.745	76.9	1.3	
030310	Secondary aluminium production		0.99	0.07	0.24	11.98	0.34	2.16	5.15	0.20	7.90	0.0	0.0	0.0	3.4	0.0	0.5	0.6	5.5	39.0	0.7	
30311	Cement		0.74	1.13	0.68	4.88	0.26	3.59	3.08	1.89	0.01	0.23	0.00	0.18	0.50	1.10	0.30	0.17	1.71	20.5	0.4	
030312	Lime																			0.0	0.0	no estimate due to lack of activity data
030326	Other: metal reclamation from cables				0.00		0.13								1.52					1.7	0.0	insufficient data for re-estimation
040207	Electric furnace steel plant		0.43	6.42	8.03	2.43	0.62	13.20	6.15	0.89	26.11	0.27	2.35	0.46	1.30	0.72	2.45	0.70	10.90	83.4	1.5	
040309	Other: Non ferrous metal foundries		0.12	0.76	0.04	0.63	0.03	0.22	0.29	0.06	0.55	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	3.0	0.1	
040309	Other: sintering of special materials and dressing facilities					115.00														115.0	2.0	sinter plant for recycling materials (Germany only)

Table 2a Summary of the PCDD/F air emission rates in g I-TEQ/a gained by re-evaluation using default emission factors and activity data

European Dioxin Inventory Executive Summary

SNAP	IIEM	Process/material	A	B	CH	D	DK	E	F	GR	I	IRL	L	N	NL	P	S	SF	UK	TOTAL	% of TOTAL	Remark
060406	Preservation of wood		7.92	10.08	7.13	81.34	5.28	39.57	57.75	10.28	56.76	3.5	0.4	4.3	15.4	9.9	8.7	5.1	58.0	381.4	6.7	
0701	Road transport		0.36	2.56	3.31	9.14	1.16	11.27	18.41	4.46	29.86	1.2	0.4	1.3	2.2	3.0	0.5	0.5	21.5	111.1	1.9	
090201	Inc. of Dom. or municipal wastes	legal combustion	0.06	187.00	123.10	157.25	25.00	0.60	161.40	0.00	252.00	0.0	0.1	2.6	6.2	0.0	3.0	3.0	515.7	1437.1	25.1	
090201	Inc. of Dom. or municipal wastes	illegal (domestic) combustion	3.46	4.32	4.57	30.86	3.21	16.42	24.69	3.89	21.60	1.4	0.2	2.5	9.5	3.3	4.0	3.1	37.0	174.0	3.0	
090202	Inc. of Industrial wastes	hazardous waste	0.017	20.9	7	1.3	0.23	nd	2	nd	Nd	nd	nd	0.06	1	0.2	0.007	0.88	3.6	37.2	0.6	very uncertain due to lack of activity data
090207	Inc. of hospital wastes		0.00	95.00	10.00	0.03	5.00	57.50	262.50	37.50	250.00	22.5	0.000	0.1	1.0	35.0	0.00	0.00	39.4	815.5	14.2	
090901	Cremation: Inc. of Corpses		0.10	0.19	0.42	2.10	0.16	1.39	2.17	0.40	2.22	0.1	0.0	0.1	0.2	0.4	0.5	0.2	6.1	16.8	0.3	
12	Fires		7.89	10.04	7.10	81.00	5.26	39.40	57.51	10.24	56.52	3.5	0.4	4.3	15.3	9.8	8.7	5.1	57.8	379.9	6.6	estimation based on German study and per -capita considerations
			121.0	453.7	182.6	840.0	50.2	327.4	1122.7	122.0	1050.8	37.9	49.9	41.1	116.5	127.3	88.8	68.5	927.6	5728.1		
% of total:			2.1	8.4	3.2	14.6	0.9	5.7	19.5	2.1	18.3	0.6	0.9	0.7	2.0	2.2	1.5	1.2	16.1			

Table 2a (cont.): Summary of the PCDD/F air emission rates in g I-TEQ/a gained by re-evaluation using default emission factors and activity data

nd: no data

SNAP	IIEM	Process/ material	A	B	CH	D	DK	E	F	GR	I	IRL	L	N	NL	P	S	SF	UK	TOTAL	% of TOTAL	Remark
090201	Inc. of Dom. or municipal wastes	legal combustion	0.06	187.00	123.10	157.25	25.00	0.60	161.40	0.00	252.00	0.0	0.1	2.6	6.2	0.0	3.0	3.0	515.7	1437.1	25.1	
30301	Sinter plants		27.20	98.28		254.51		62.00	183.85		128.00		46.0		41.4	4.0	9.6	19.2	136.0	1010.1	17.6	
0202	Res. combustion: Boilers, stoves, fireplaces	wood	67.62	9.13	8.30	27.22	2.90	70.26	323.17	51.57	198.79	0.0	0.0	23.9	14.0	59.2	48.4	28.1	12.4	945.0	16.4	
090207	Inc. of hospital wastes		0.001	95	10	0.033	5	57.5	262.5	37.5	250	22.5	0.00003	0.09	1	35	0.002	0.004	39.42	815.5	14.2	
060406	Preservation of wood		7.92	10.08	7.13	81.34	5.28	39.57	57.75	10.28	56.76	3.5	0.4	4.3	15.4	9.9	8.7	5.1	58.0	381.4	6.6	
12	Fires		7.89	10.04	7.10	81.00	5.26	39.40	57.51	10.24	56.52	3.5	0.4	4.3	15.3	9.8	8.7	5.1	57.8	379.8	6.6	estimation based on German study and per -capita considerations
090201	Inc. of Dom. or municipal wastes	illegal (domestic) combustion	3.46	4.32	4.57	30.86	3.21	16.42	24.69	3.89	21.60	1.4	0.2	2.5	9.5	3.3	4.0	3.1	37.0	173.9	3.0	
040309	Other: sintering of special materials and dressing facilities					115.00														115.0	2.0	sinter plant for recycling materials (D) only
0701	Road transport		0.36	2.56	3.31	9.14	1.16	11.27	18.41	4.46	29.86	1.2	0.4	1.3	2.2	3.0	0.5	0.5	21.5	111.1	1.9	
040207	Electric furnace steel plant		0.43	6.42	8.03	2.43	0.62	13.20	6.15	0.89	26.11	0.27	2.35	0.46	1.30	0.72	2.45	0.70	10.90	83.4	1.5	
030309	Secondary copper production		2.42	5.14	1.50	31.09	0.00	3.21	6.45	0.00	16.50	0	0	0	2.6	0	1.03	1.25	5.745	76.9	1.3	
0202	Res. Combustion: Boilers, stoves, fireplaces	coal/lignite	1.20	1.14	0.81	11.30	0.00	3.69	0.09	0.10	0.00	0.4	0.1	0.3	0.1	0.0	0.6	0.3	10.5	40.0	0.7	
030310	Secondary aluminium production		0.99	0.07	0.24	11.98	0.34	2.16	5.15	0.20	7.90	0.0	0.0	0.0	3.4	0.0	0.5	0.6	5.5	39.0	0.7	

Table 2b: Data from Table 2a rearranged for relative importance (in decreasing order of percentage of total emission)

SNAP	IEM	Process/ material	A	B	CH	D	DK	E	F	GR	I	IRL	L	N	NL	P	S	SF	UK	TOTAL	% of TOTAL	Remark
090202	Inc. of Industrial wastes	hazardous waste	0.017	20.9	7	1.3	0.23	nd	2	nd	nd	nd	nd	0.06	1	0.2	0.007	0.88	3.6	37.2	0.6	
0301	Combustion in Industry/boilers, gas turbines, stationary engines		0.43	0.55	0.39	4.45	0.29	2.17	3.16	0.56	3.11	0.19	0.02	0.24	0.84	0.54	0.48	0.28	3.18	20.9	0.4	
30311	Cement		0.74	1.13	0.68	4.88	0.26	3.59	3.08	1.89	0.01	0.23	0.00	0.18	0.50	1.10	0.30	0.17	1.71	20.4	0.4	
030308	Secondary zinc production		0.08	1.00		13.52		0.75	0.99		0.35	0.0153		0.795	0	0	0.025	0	2.34	19.9	0.3	
090901	Cremation: Inc. of Corpses		0.10	0.19	0.42	2.10	0.16	1.39	2.17	0.40	2.22	0.1	0.0	0.1	0.2	0.4	0.5	0.2	6.1	16.8	0.3	
040309	Other: Non ferrous metal foundries		0.12	0.76	0.04	0.63	0.03	0.22	0.29	0.06	0.55	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.2	3.0	0.1	
030326	Other: metal reclamation from cables				0.00		0.13								1.52					1.7	0.0	insufficient data to make re-estimation
030312	lime																			0.0	0.0	no estimate due to lack of activity data

Table 2b (cont.): Data from Table 2a rearranged for relative importance (in decreasing order of percentage of total emission)

nd: no data

Corinair SNAP	Item	Process	Country	Concentrations			Emission factors			Annual emissions					Remark
				typical	range	dimension.	typical	range	dimension	Particular value	total typical	min.	max.	Dimension	
03 03 01	Sinter plants		B				0.3		µg/t	(1990) 4.05 (1995) 3.19	3.19			g I- TEQ/a	no measurements. at Belgian sintering plants
03 03 01	Sinter plants		NL							1.5	1.5	0.47	4.7	g I-TEQ/a	
03 03 13	Asphalt mixing installations		NL							< 0.1	0.1	0.03	0.3	g I-TEQ/a	
04 02 01	Coke oven		B				0.063		µg/t	(1990) 0.33 (1995) 0.23	0.23			g I- TEQ/a	EF taken from Dutch study
04 03 01	Aluminium electrolysis		S	2.4		pg NTEQ/l									leach water; annual emissions not assessable
04 04 13	Chlorine production		B				10		mg I-TEQ per plant and Year	0.03	0.03	0.01	0.1	g I- TEQ/a	
04 04 13	Chlorine production		S							0.18				g NTEQ/a	release to water and products
04 05 03-04 03 05	EDC and vinyl chloride production		D				1.8	0.1- 33	µg I- TEQ/ t	2.8		0.15	51	g I-TEQ/a	
04 05 05	1,2 dichloro ethane + vinylchloride		B				0.5		[µg I- TEQ/ t VC]	0.222	0.22	0.07	0.69	g I- TEQ/a	
04 05 24/25	Halogenated hydrocarbons and pesticide production		B				80		mg I-TEQ per plant and Year	*)					*) Evaluation was impossible since no basic data are available
04 06 02	Paper pulp		B				10		µg/t	(1985) 1.18 (1990) 2.18 (1995): 0	-	0.37 0.68	3.7 6.8	g I- TEQ/a	ClO ₂ bleaching since 1993
04 06 02	Paper pulp		S	6.3	2.8- 9.7	pg NTEQ/l	4.3	0.34- 9.7	pg NTEQ/l effluent	2.7				g NTEQ/a	
06 03 12	Textile finishing		D				19	0.05- 369	ng I-TEQ/kg	1.43		0.5	45.9	g I-TEQ/a	concerns PCDD/F release from new textiles during washing in households

Table 3: Waste water PCDD/F emission data contained in the surveyed basic documents (continued on next page)

Corinair SNAP	Item	Process	Country	Concentrations			Emission factors			Annual emissions					Remark	
				typical	range	dimension	typical	range	dimension	Particular value	total typical	min	max.	Dimension		
09 02 01	Incineration of domestic or municipal wastes		B				0.09		µg I- TEQ/l	(1985) 0.03 (1990) 0.05 (1995) 0.06	0.06				g I-TEQ/a	emission into waste water
09 02 01	Incineration of domestic or municipal wastes		NL				1.87	0.79-3.43	pg I-TEQ/l effluent	0.0003					G I-TEQ/a	
09 02 02	Incineration of industrial wastes		B				0.15		µg I- TEQ/t	(1985) 0.0024 (1990) 0.01 (1995) 0.021	0.21				G I-TEQ/a	
09 02 02	Incineration of industrial wastes		NL							0.8	0.8				g I-TEQ/a	(1991)
09 10 02	Waste water treatment in residential and commercial sectors		B				(1985) 0.039 (1990) 0.039 (1995) 0.024		ng I-TEQ/ kg d.s.	(1985) 18.2 (1990) 17.1 (1995) 9.74	9.74	1	100		g I-TEQ/a	values were taken from a German report (see Vol. 1)
09 10 02	Waste water treatment in residential and commercial sectors		NL							<0.1					g I-TEQ/a	
09 10 02	Waste water treatment in residential and commercial sectors		S		0.04-0.52	pg NTEQ/l				0.06- 0.78 0.007- 0.53	0.3	0.07	1.3		g NTEQ/a	outgoing water particle content
12	Fires		B				0.1- 1		µg I- TEQ/ t water	(1985) 0.02 (1990) 0.02 (1995) 0.015	0.015				g I-TEQ/a	
TOTAL											17	2.3	204			

Table 3 (cont.): Waste water PCDD/F emission data contained in the surveyed basic documents

Corinair SNAP	Item	Process	Country	Type of res.	Annual emissions					Remark
					particular value	total typ.	min.	max.	dimension	
03 03 03	Grey iron foundries		S	filter dust exhaust dust shake out Filter dust surface swipe from working hall scrubber sludge	0.79 0.02 0.007	0.817			g NTEQ/a g NTEQ/a g NTEQ/a	scrubber sludge sand waste filter dust
03 03 06	Primary copper production	lead kaldo shop clinker plant waste water treatment plant	S	venturi sludge filter dust sludge	0.35	0.35			g NTEQ/a	waste water sludge;- venturi sludge/filter dust are internally recycled
03 03 07	Secondary lead production		D	filter dust	*)					*) Evaluation was impossible since no basic data are available
03 03 08	Secondary zinc production		D	residual matter	*)					*) Evaluation was impossible since no basic data are available
03 03 10	Secondary aluminium production	lime injection fabric filter	NL		17.4	17.4	5.4	54	g I-TEQ/a	
04 02 01	Coke oven (door leakage and extinction)		S		0.31	0.31			g NTEQ/a	
04 02 01	Coke oven (door leakage and extinction)	purification plant	NL		0.04	0.04	0.013	0.13	g I-TEQ/a	
04 02 03	Pig iron tapping		S	slag sludge	0.041	0.041			g NTEQ/a	
04 02 06	Basis oxygen	furnace steel plant	S	scrubber sludge	filter dust	1.53	0.3003	7.8068	g NTEQ/a g NTEQ/a	scrubber sludge filter dust
04 02 07	Electric furnace steel plant		D	dust	0.4- 24	3.1	0.4	24	g I- TEQ/a	
04 02 07	Electric furnace steel plant	electric arc furnace rolling mill	S	slag sludge	0.055- 0.6 19	19.2	0.055	0.6	g NTEQ/a g NTEQ/a	slag/sludge filter dust
04 03 01	Aluminium electrolysis		S	sludge	0.034	0.034			g NTEQ/a	range 0.001- 0.1 g NTEQ/a

Table 4 Residue PCDD/F emission data contained in the surveyed basic documents

SNAP	Item	Process	Country	Type of res.	Annual emissions					Remark
					particular value	total	min.	max.	dimension	
04 04 13	Chlorine production		B		0.3	0.3	0.1	1	g I- TEQ/a	
04 04 13	Chlorine production		S	wastes	3.35	3.35			g NTEQ/a	storage or deposit
04 05 03 - 04 03 05	EDC and vinyl chloride production		D	catalyst sludge	61.8	61.8			g I- TEQ/a	
04 05 05	1,2 -dichloro ethane + vinylchloride		B		1.2- 24	5.4	1.2	24	g I- TEQ/a	
04 05 24/25	Halogenated hydrocarbons and pesticide production		B		*)					*) Evaluation was impossible since no base data are available
04 06 02	Paper pulp		S	pulp sludge	*)					*) no estimation could be made
06 02 02	Dry cleaning		D	distillation residues	3.15	3.15	0.3	31.5	g I- TEQ/a	
09 02 01	MSW incineration	ESP/wet scrubber	B	ESP ash						based on measurements at 18 install.
09 02 01	MSW incineration		B	fly ash	(1985) 334 (1990) 434 (1995) 472	472			g I-TEQ/a g I-TEQ/a g I-TEQ/a	annual PCDD/PCDF emissions into landfills
09 02 01	MSW incineration		S	fly ash	0.6- 2.4	1.2	0.6	2.4		
09 02 01	MSW incineration		NL	ESP ash slags	1038.4	1038.4			g I-TEQ/a	
09 02 02	Incineration of industrial wastes		B	sewage sludge	(1985) 0.142 (1990) 0.164 (1995) 0.298	0.298	0.15	30	g I-TEQ/a g I-TEQ/a g I-TEQ/a	
09 09 01	Cremation				0.02	0.02	0.006	0.06	g I-TEQ/a	
09 10 02	Waste water treatment in residential and commercial sectors		S	sludge	0.27- 6.3	1.3	0.27	6.3	g NTEQ/a	
09 10 03	Sludge spreading		D	sewage sludge	35.4	35.4	11	111	g I- TEQ/a	
09 10 04	Land filling		D	municipal waste	1623	1623	507	5070	g I- TEQ/a	
09 10 05	Compost production from waste		D	compost	13.6	13.6	4.2	42	g I- TEQ/a	
12	Fires		D	residues	deposited soot	220	2.5	4300	g I- TEQ/a g I- TEQ/a	
Total						3522	533	9705		

Table 4 (cont.): Residue PCDD/F emission data contained in the surveyed basic documents