The Netherlands

Description of the available information

The Dutch government was among the first to commission a comprehensive national study on dioxin emission sources ‹1›. It was performed after a previous inventory of relevant sources ‹2› and first rough estimations of their emissions ‹3› Emission measurements, partly carried out at all installations of a source class, followed. For this reason the Dutch dioxin inventory is a very valuable source of information containing a lot of details about industrial processes, installed abatement technologies and measurement parameters. Furthermore, literature data are added as far as they were available.

The final report on the results was released in 1994; however, the emission estimates were assigned to the year 1991. Already before finishing the program and moreover since publication of the report in 1994 considerable abatement measures had been started, especially regarding municipal waste incineration. Recent measurements (1993/1994) at these installations revealed a further reduction of the emissions from this source category at about 5 % of the past values. In addition, flue gas concentrations less than 0.1 ng I.-TEQ/m^3 were reported for three large installations incinerating hazardous waste. Consequently, these more recent data had to be considered in the present survey. Therefore, a lower total air emission estimate than originally published is reported here. This is in accordance with data mentioned in the most recent publication on air emissions in the Netherlands ‹4›. In addition, the Dutch dioxin inventory gave estimates of emissions to water and via residues if sufficient data were available.

CORINAIR SNAP	ITEM	Emission estimates g I-TEQ/a		
		typ	min	max
	SUM	**88.9**	**22.6**	**408.9**
01	Combustion in Energy Production and Energy Transformation	3.0	0.9	9.4
02	Combustion in Commercial, Residential...	11.3	0.8	190.2
03	Combustion in Industry	33.7	1.7	77.8
04	Production Processes	3.25	0.6	18.0
05	Extraction and Distribution of Fossil Fuels	nd	nd	nd
06	Solvent and Other Product USE	25.1	9.3	93.0
07	Road Transport	2.1	0.7	8.5
08	Other Mobile Sources and Machinery	0.6	0.2	1.9
09	Waste Treatment and Disposal	9.89	8.37	10.1
10	Agriculture, Forestry, Land use change	0.3	nd	nd
11	Nature	nd	nd	nd
12	Fires	nd	nd	nd

NL: Annual PCDD/F AIR emissions (nd: no data available)

Summarising the following data have been obtained during the work for the present report:

	Dioxin Inventory ‹1›			**Report on Emission Data ‹4›**	**Present study**
Year	1991	1993	1994	1995	1991/1994
Air	484	379	144	74	88.9
Water	3	-	-	-	3
Residues	1,055	-	-	-	1,055

NL: Comparison of the total PCDD/F-emissions to various media as reported in different documents

01 01
Public power

General Remark:

Covered here are public power plants burning fossil fuels. In the Dutch report combustion processes are arranged according to the types of fuels rather than to the type of installations. Thus the data originally given in separate chapters had to be combined for the present study.

Considered pathways/media

AIR,

Plant data

There are 5 coal fired power plants in the Netherlands. No information on installations using other fuels is provided.

Measurements

One measurement was performed at a power plant; following results were obtained:

Type	concentrations [ng I-TEQ/m³]
Power plant	0.02

NL: Public power; measurement results

National activity rates

Based on national statistical documents the Dutch inventory reports the following consumption rates to be valid for the year 1990:

fuel	amount [kt]
heavy fuel oil	42
diesel(gas) oil	6.3
coal	8,630

NL: Public power; activity rates 1990 given in the Dutch inventory

01 01

Public power

Emission factors

The following factors are applied in the Dutch inventory to large scale installations (power plants):

fuel	Emission factor [µg I-TEQ/t]
oil	0.001
coal	0.35

NL: Public power; emission factors used in the Dutch inventory

Regarding oil combustion the emission factor applied was derived by comparison with measurement results obtained at mobile sources (ships, passenger cars) and on basis of literature data.With respect to oil burning power plants it is recommended to take this factor as indicative since no findings on dioxin emissions from these facilities existed so far.

For installations firing coal the measured emission factor was used since it was comparable to those found in other countries.

Estimation of uncertainty:

Concerning the data and considerations shown above the following indices are proposed as being appropriate:

	oil	coal
Activity rates	1	0
emission factors	1	1
total uncertainty	**2**	**1**

NL: Public power; indices of uncertainty

Emission estimation

From the data given above the following emission estimation is calculated:

	oil	**coal**	**total**
Annual emission	$< 10^{-4}$	3.0	3
Margin of uncertainty	$< 10^{-3}$	0.9 - 9.4	0.9 - 9.4

NL: Public power; annual PCDD/F emissions

01 03
Petroleum and/or gas refining plants

General Remark:

This source category is covered by the chapter Oil combustion of the Dutch report.

Considered pathways/media

AIR,

Plant data

no information is given

Measurements

no measurement results are quoted in the Dutch report

National activity rates

According to national statistics the 1990 fuel consumption for energy and heat generation in refineries was as follows:

fuel	kt/a
raw petroleum	3530

NL: Petroleum and/or gas refining plants; activity rates

Emission factors

The same emission factor as used for power plants burning oil is applied:

Fuel	Emission factor [µg I-TEQ/t]
raw petroleum	< 0.001

NL: Petroleum and/or gas refining plants; emission factors

Estimation of uncertainty:

see NAP 01 01

01 03

Petroleum and/or gas refining plants

Activity rates	0
emission factors	1
total uncertainty	**1**

NL: Petroleum and/or gas refining plants; indices of uncertainty

Emission estimation

	g I-TEQ/a
Annual emission	< 0.004
Margin of uncertainty	< 0.01

NL: Petroleum and/or gas refining plants; annual PCDD/F emissions

Comment

02 02 05
Other equipments (stoves, fireplaces, cooking...)

General Remark:

In the Dutch inventory no special attention was paid to this source type; emissions from domestic heating facilities were covered by the chapters about oil, coal and wood combustion, resp. The data given in these chapters are combined here.

Considered pathways/media

AIR,

Plant data

Numbers are given for installations burning solid fuels:

type of installation	number
fireplaces	565 000
stoves (incl. built-in stoves)	365 000

NL: Other equipments (stoves, fireplaces, cooking...); numbers of relevant facilities

Concerning oil and gas combustion no relevant data are reported.

Measurements

Measurements were performed at wood-burning stoves (3 measurements) and fireplaces (2 measurements) using clean and dry wood as fuel. For the present report, the results are summarised as follows:

Parameter	fireplace	stove	all inst.
Minimal	0.5	0.12	0.12
Maximal	1.2	0.36	1.2
geom. mean	0.77	0.21	0.38
arithmetic mean	0.85	0.24	0.66

NL: Other equipments (stoves, fireplaces, cooking...); measurement results (wood combustion) [ng I-TEQ/m^3]

02 02 05

Other equipments (stoves, fireplaces, cooking...)

National activity rates

The total fuel consumption is estimated to be about 1050 kt/a; it is estimated, that this value comprises 80% clean wood, 16 % polluted wood (demolition wood, pallets, other) and 4 % other fuels as coal and lignite. Since it is assumed, that about 8 %of the total quantity of pallets and demolition wood is polluted with PCP a fraction of 6% of the burned polluted wood is estimated to contain PCP. Coal and lignite are assumed to be used only in stoves; hence, the following fuel distribution is given:

Type of fuel	fireplaces	stoves	all inst.
clean wood	304	537	841
polluted wood	15	151	166
polluted wood with PCP	1	9	10
coal/lignite	-	42	42

NL: Other equipments (stoves, fireplaces, cooking...); distribution of fuel consumption [kt/a]

Without giving any reference it is further stated that combustion of household waste like papaer pallets, synthetics, milk containers, rubber, leather etc. hardly takes place (less than 1 % of the total fuel input).

Emission factors

Emision factors are given for the three types of wood considered. In the case of clean wood combustion the factors are based on the measurements results shown above; concerning polluted wood, data from a Danish study ‹5› are referred to. The Danish study revealed an 135-fold higher emission factor for clean wood combustion than the the above mentioned Dutch measurements. Using this relationship, the emission factor for PCP containing wood being valid for the Netherlands is „calculated“ by devision of the respective Danish emission factor (6500 µg I-TEQ/t) by 135 giving the reported factor of 50 µg/t. Further, the relationship between stoves and fireplaces when firing clean wood (fireplaces:stoves ≈ 10) is applied to the other fuel types.

For coal and lignite the same emission factors are used as for industrial installations (c.f. 03 01)

The following table of emission factors is obtained:

Type of wood	**fireplaces**	**stoves**
clean	20	2.2
polluted, without PCP	100	10
polluted, with PCP	500	50
coal, lignite	-	1.6

NL: Other equipments (stoves, fireplaces, cooking...); emission factors (wood combustion) [µg I-TEQ/t]

Estimation of uncertainty:

The results concerning clean wood combustion are in good agreement with a German study ‹6› but, as mentioned above, considerably lower than the value found in the Danish study ‹5›. The Danish results are considered by the authors of the Dutch inventory to be not reliable; however, since no other data were available , the Danish values serve as a basis for the estimation of the emission factors applied to the burning of polluted wood.

This means a very high uncertainty (Index „2“) of the emission factor used for burning of polluted wood while an index of „1“ is applied for clean wood combustion. Regarding coal and lignite combustion an index of „1“, as apllied for industrial installations, is proposed, too.

The uncertainty of the activity rates must be considered as high in the case of wood combustion, while the amount of coal is regarded as being well known

Type of fuel	activity rates	emission factors	**total**
clean wood	1	1	**2**
- polluted, without PCP	1	2	**3**
- polluted, with PCP	1	2	**3**
coal, lignite	0	1	**1**

NL: Other equipments (stoves, fireplaces, cooking...); indices of uncertainty;

02 02 05

Other equipments (stoves, fireplaces, cooking...)

Emission estimation

Type of wood	Annual emission	margin of uncertainty
clean	7.3	0.7 - 70
polluted, without PCP	2.9	0.09 - 90
polluted, with PCP	1.0	0.03 - 30
coal, lignite	0.07	0.02 - 0.2
TOTAL	11.3	0.8 - 190

NL: Other equipments (stoves, fireplaces, cooking...); Annual PCDD/F air emissions

Comment

03 01
Combustion in boilers, gas turbines and stationary engines

General remark

Here industrial installations are covered which use fossil fuels and. wood, straw,used tyres and landfill gas. CORINAIR lists in separate sections the incineration of waste oil (09 02 08), sewage sludge (09 02 05) and residues of the cellulose industry (09 02 02). Covered here are the following fuels:

Coal, oil and lignite

Wood as far as it is used in industrial installations

Landfill gas: This gas is releasd from the organic fraction of landfilled (domestic) waste. It consist mainly of CO_2 and CH_4

Biogas: Biogas here means gas that is being released during the anaerobic sludge digestion in sewage treatment plants.

Incineration of landfill gas without energy utilization takes place in "flares", at which the gas is incinerated in a free flame in the open atmosphere. This process is not covered here (see 09 02 06).

Considered pathways/media:

Air

Plant data:

Unpolluted oil is mainly used in industrial installations (and for domestic heating). No data are given on the number of these facilities. Lignite is used as fuel in some industrial production processes (asphalt, cement).

wood combustion:

There is lot of information available about installations for combustzion of clean wood; considerable less data exist concerning those facilities used for contaminated wood. Following data are given in the Dutch report:

	Clean wood	**Contaminated wood**	
	hand-fired	automatically fired	
number	630	270	several dozens
with flue gas cleaning	-	85	?
without flue gas cleaning	630	185	?
capacity range [MW]	?	0.1 - 1	0.2 - 10
average capacity [MW]	0.05	0.69	
total capacity [MW]	32	186	?

NL: Combustion in boilers, gas turbines and stationary engines; data on wood combustion facilities

The automatic installations can be roughly devided as follows among he various systems (100% ≈ 270 installations)

Type	**% of total**
Pulverized fuel burners with fixed grate:	18
Underfeed stoker	70
Screw conveyor stoker	8
Two-stage combustion	4

NL: Combustion in boilers, gas turbines and stationary engines; distribution of wood burning facilities with respect to different techniques

Landfill gas and biogas are increasingly being collected and incinerated. The reason for this is that the incineration of the gas causes less environmental pollution than when it is emitted without precautions being taken. Incineration in practice takes places with and without energy utilization. Energy utilization often takes place in a reciprocating engine (gas engine), that drives a generator for the production of electicity. In some cases, landfill gas or biogas is used for the production of hotwater or steam, or in a process. No information is given on the number or (thermal) capacity of engines used for landfill gas combustion; at least seven biogas engines were in operation 1990.

Measurements:

Fossil fuels:

While no measurements were performed at installations firing oil or lignite, a green feed drying facility using coal was investigated.

Wood combustion

Measurement results are reported for three automatically fired industrial installations for wood combustion, for a wood burning stove and a fireplace as commonly used in the Netherlands.

Landfill gas:

Measurements were performed at a gas engine and a flare (see 09 02 06). The flue gas concentration was 0.07 ng I-TEQ/m³.

Biogas:

No Dutch measurement data of the incineration of biogas are available.

The PCDD/F concentrations found in the flue gases are listed in the table below:

	coal firing	contaminated wood (without PCP)	landfill gas
minimum	0.16	0.4	0.07
maximum		1	
geom. mean	0.16	0.63	0.07
arithmetic mean	0.16	0.7	0.07

NL: Combustion in boilers, gas turbines and stationary engines; measurement results [ng I-TEQ/m³]

National activity rates:

Fossil fuel combustion:

Type of installation	fuel	consumption rate [kt/a]
small ind. installations/domestic heating	unpolluted oil	560
	coal	508
	lignite	50

NL: Combustion in boilers, gas turbines and stationary engines; activity rates for fosil fuels

In the case of coal combustion, a total of 550 kt/a is reported for industrial and domestic use. In another chapter of the Dutch inventory the amount used for domestic heating is estimated to be 42 kt/a; this value was taken into account here.

03 01

Combustion in boilers, gas turbines and stationary engines

Concerning the consumption of oil and raw petroleum, which totals to approx. 4000 kt according to the data given above, the reported data could not be traced on by comparison with related European statistics ‹497› for instance, the total primary energy consumption is told to be more than 20000 kt of oil (35 499 kt SKE) ‹7 table 121›. Total consumption of light and heavy heating oil in 1990 is reported to have been about 2011 kt and 562 kt, resp. ‹7 table 127›. Obviously, only heavy oil was considered in the Dutch inventory.

However, these discrepancies might be more or less a matter of definition and will be taken into account only with respect to the general uncertainty; in the present report, the activity data given by the Dutch inventory will be applied without correction .

Wood combustion

the activity rates are given separately for three types of wood ; these subgroups are further distinguished for installations with and without flue gas cleaning. It is assumed, that about 6 % of the total polluted wood contains PCP.

Landfill gas:

of the 74 million m³ being extracted 22 million m³ were flared without using the energy content. A total of 52 million m³ was combusted to generate electricity (16 million m³) or process energy (14 million m³). The remaining 22 million m³ were added to the natural gas network after reduction of the content of halogenated hydrocarbons;

Biogas:

On the basis of an inventory conducted in 1990 at seven biogas fired engines it is estimated that approximately 60 million m³ of biogas were combusted in 1991 per year.

Following the fuel consumption rates reported for the year 1991are sumarised:

fuel	specification	flue gas cleaning	rate	dim
wood	clean wood	no	44	[kt/a]
		yes	104	
	contaminated wood	no	4.7	[kt/a]
	without PCP	yes	71	
	contaminated wood	no	0.3	[kt/a]
	with PCP	yes	4	
landfill gas [10^6 m³/yr]			52	[10^6 m³/a]
biogas [10^6 m³/yr]			60	[10^6 m³/a]

NL: Combustion in boilers, gas turbines and stationary engines; activity rates for non-fossil fuels

Emission factors:

Fossil fuels:

Fuel	Installation	emission factor [µg I-TEQ/t]
oil	small scale	0.5
coal	industrial inst.	1.6
lignite		1.6

NL: Combustion in boilers, gas turbines and stationary engines; emission factors for fossil fuels

Regarding oil combustion the emission factor apllied to small scale facilities was derived by comparison with measurement results obtained at mobile sources (ships, passenger cars) and on basis of literature data.

For installations firing coal the measured emission factor was used since it was comparable to those found in other countries. It was assumed, that the factor for lignite combustions is similar to that of coal combustion.

Non-fossil fuels:

From the available measurement data the following emission factors were calculated:

03 01

Combustion in boilers, gas turbines and stationary engines

	contaminated wood (without PCP)	landfill gas
minimum	3	0.5
maximum	7	-
geom. mean	4.6	-
arithmetic mean	5	-
used for estimation	5	0.5

NL: Combustion in boilers, gas turbines and stationary engines; emission factors for diffrent fuels as revealed by the measurements [µg I-TEQ/m³]

In the case of wood combustion, the emission factors valid for combustion of PCP containing wood and clean wood were estimated based on following assumptions:

the emission factors for industrial installations and those found for wood stoves (see 02 01 05) are considered to be equal

installations being equipped with a fle gas cleaning system are assumed to emit 50% less than those without fle gas cleaning.

Thus the following figures are obtained:

Type of wood	without FGC	with FGC
Clean wood	2.2	1
polluted wood, without PCP	10	5 (cf. previous table)
polluted wood, with PCP	50	25

NL: Combustion in boilers, gas turbines and stationary engines; estimated emission factors for wood combustion [µg I-TEQ/t]

Concerning biogas an emission factor equal to that applied to landfill gas is stated based on literature data.

Estimation of uncertainty:

fossil fuels:

see 01 01

wood combustion

In view of the many assumptions made for the estimation of emission factors and concerning the amount of polluted wood used as fuel the index „1“ is assigned to both parameters, emission factors and activity rate

landfill gas:

with the amount of combusted gas being almost exactly known, an uncertainty of 1 decade is estimated here regarding the emission factor , sonce only one measurement was performed.

Biogas:

Since no measurement exists at all, the uncertainty is difficult to assess. Taking into account the similarities between biogas and landfill gas combustion, an index of „1“ is proposed here for the emission factor; the activity rates are considered to be well known (index: „0“).

	oil	coal	lignite	wood	landfill gas	biogas
Activity rates	1	0	0	1	0	0
emission factors	1	1	1	1	1	1
total uncertainty	**2**	**1**	**1**	**2**	**1**	**1**

NL: Combustion in boilers, gas turbines and stationary engines; indices of uncertainty

Estimation of annual emission:

From the data shown above the following emission estimation is derived:

	annual emission	**margin of uncertainty**
oil	0.28	0.03 - 2.8
coal	0.81	0.25 - 2.5
lignite	0.1	0.03 - 0.3
wood	0.7	0.07 - 7
landfill gas	0.03	0.01 - 0.1
biogas	0.03	0.01 - 0.1
TOTAL	1.95	0.4 - 12.8

NL: Combustion in boilers, gas turbines and stationary engines; annual PCDD/F emissions [g I-TEQ/a]

Comment

Additional work is required to improve the knowledge on the amount and composition of polluted wood which is combusted in order to lower the range of uncertainties. uncertainty.

03 03 01
Sinter Plants

General Remark:

Covered here are sintering processes in the iron and steel industry as well as the production of artificial gravel and phosphate

Considered pathways/media

AIR, WATER

Plant data

Four large scale sintering processes are carried out in the NL:

Product	Input material	Ignition fuel	Flue gas cleaning	Number of installations
Iron ore sinter 1	ore, coke, bentonite	coke-oven gas	wet scrubber	1
Iron ore sinter 2	ore, coke, admixtures	coke-oven gas	cyclone	3
Artificial gravel	fly ash, carbon,	spent oil	fabric filter	1
Phosphate production	ore, clay, return substances	phosphorous oven gas	washer	1

NL: Sinter Plants; plant data

Measurements

Measurements were carried out at four installations covering 3 of the above mentioned processes. The following results are reported:

Product	PCDD/F-concentrations [ng I-TEQ/m³]
Iron ore sinter 1	not measured
Iron ore sinter 2	6.8 / 4.5
Artificial gravel	0.12
Phosphate production	1.8

NL: Sinter Plants; measurement results

National activity rates

no activity rates are given since the emissions are estimated individually for the measured plants.

Emission factors

Since production data are not given, no emission factors are reported consequently. For orientation purpose the following emission factors have been derived for the present study from the reported concenrations and a specific flue gas volume of 2,500 m³/t (typical value, cf. Resuts obtained in the UK):

Product	**PCDD/F emission factors [µg I-TEQ/t]**
Iron ore sinter 2	17 / 11.3
artificial gravel	0.3
phosphate production	4.5

NL: Sinter Plants; calculated emission factors

Estimation of uncertainty:

Only one process has not been subjected to measurements, the uncertainty of the emission estimates can be considered as being low. An overall index of „0“ is therefore applied to the air emission estimates. Concerning emission to water, no measurements are reported in the Dutch inventory. Hence the uncertainty has to be considered higher (index „1“).

	AIR	WATER
Activity rates	-	-
emission factors	-	-
total uncertainty	**0**	**1**

NL: Sinter Plants; indices of uncertainty

Emission estimation

In the Dutch survey the PCDD/F air emissions are estimated on basis of the measured concentrations, flue gas volumes and annual operation time to be about 25 g I-ZTEQ/a. The emission for the remaining installation that had not been measured is reported to be 1 g I-TEQ/a probably.

03 03 01

Sinter Plants

Emissions to water have been evaluated in view of process conditions and with the air emission taking into account.

	AIR	**WATER**
Annual emission	26	1.5
Margin of uncertainty	-	0.47 - 4.7

NL: Sinter Plants; annual PCDD/F emissions

Comment

According to the Dutch survey abatement measures have been initiated at the iron ore sinter installation with the highest emissions stting the goal of decreasing he emission to about 1 g I-TEQ/a. No information was obtained if this goal has been achieved in the meantime.

03 03 03
Gray Iron foundries

General Remark:

The iron and steel foundries are covered in the Durtch inventory by a chapter on „secondary iron and steel industry“. From the information given it is not possible to separate electric furnace steel plants from foundries being heated by electric energy. Hence these faciluities are covered together under SNAP 04 02 07. Here, only cupola furnaces and rotary kilns are considered in detail.

Considered pathways/media

AIR,

Plant data

In 1989, 39 iron and steel foundries were inventoried in NL comprising electric funaces (number unknown), cupola furnaces (6) and one rotary kiln plant with another being under construction that time. Usually fabric filters are used as flue gas cleaning system.

Measurements

Only one measurement at an iron foundry (induction furnace melting scrap iron, engine blocks, brake drums etc.) is quoted which revealed negligible PCDD/F concentrations (< 0,09 ng I-TEQ/m³) in the flue gases.

National activity rates

A total of 360 kt of raw materials were inventoried in NL in 1991, the most being scrap. 230 kt are processed by one electric steel plant being measured (see 04 02 07). Of the remaining 130 kt, 50% , corresponding to 65 kt, are estimated to be involved in processes with similar emissions. These emissions are also covered by SNAP code 04 02 07. Hence, the amount of pig and scrap iron processed in cupola type and other foundries is estimated to be about 65 kt/a.

03 03 03

Gray Iron foundries

Emission factors

According to the quoted measurement result the emission factor is cosidered as neglible.

Estimation of uncertainty:

Both the activity rate and the emission factor must be regarded as being highly uncertain. In view of results obtained in other countries (espcially D) it is not plausible that cupola foundries only have negligible emissions.

Activity rates	1
emission factors	2
total uncertainty	**3**

NL: Gray Iron foundries; indices of uncertainty

Emission estimation

No emissions are assigned specifically to this source type in the Dutch Inventory

Comment

The knowledge on the emissions from iron and steel foundries and other installations of the secondary iron and steel industry should be improved!

03 03 04
Primary lead production

General Remark

According to the Dutch inventory no plants of this category exist in The Netherlands

03 03 05
Primary zinc production

General Remark

According to the Dutch inventory only one plant of this category exist in The Netherlands which is assumed to have negligible emissions due to the low chlorine content of the input materials.

03 03 06
Primary copper production

General Remark

According to the Dutch inventory no plants of this category exist in The Netherlands

03 03 07
Secondary lead production

Considered pathways/media

AIR,

Plant data

There was one plant in operation in The Netherlands in 1991 smelting strongly polluted scrap. The smelter was equipped with lime injection and a fabric filter.

Measurements

According to a confidential report quoted by the Dutch inventory the following measurement results were obtained:

Medium	**concentration**	**dimension**
flue gas	1.3	ng I-TEQ/m³
filter ash	7.7 and 17.8	ng I-TEQ/g

NL: Secondary lead production;

National activity rates

A total of 20 kt scrap was processed by the plant under consideration.

Emission factors

Due to the lack of pertinent data on the amount of filter ash being produced, no emission factor is reported for residue emissions. For the emission estimation the factor derived from measurements at secondary aluminium smelters is used (cf. 03 03 10). With respect to air emissions the emission factor amounts as follows:

Medium	**Emission factor [µg I-TEQ/t]**
AIR	5
RESIDUES	150

NL: Secondary lead production; emission factors

Estimation of uncertainty:

With the only existing plant being measured the overall uncertainty is asessed to be „0"

	AIR	RESIDUES
Activity rates	0	0
emission factors	0	1
total uncertainty	**0**	**1**

NL: Secondary lead production; indices of uncertainty

Emission estimation

	AIR	**RESIDUES**
Annual emission	0.1	3*)
Margin of uncertainty	-	0.9 - 9

NL: Secondary lead production; annual PCDD/F emissions.

***): calculated with emission factor valid for secondary aluminium production**

03 03 08
Secondary zinc production

General Remark

No installation fitting to this category is mentioned in the Dutch inventory

03 03 09
Secondary copper production

Considered pathways/media

AIR,

Plant data

3 Companies are mentioned operating secondary smelters for brass (2) and copper(1). The latter is eqipped with a lime injection/fabric filter system, the other have only fabric filters. Input material processed is considered as „slightly polluted“ (brass) or „strongly polluted“ (copper).

Measurements

No measurements have been performed in NL.

National activity rates

Type of input material	Processed scrap [kt/a]
Brass, slightly polluted	48
Copper/bronze, strongly polluted	1

NL: Secondary copper production; activity rates

Emission factors

In the case of strongly polluted input material the emission factor evaluated for secondary aluminium smelters (cf. 03 03 10) is applied; for less polluted material an emission factor being considerably lower is assumed:

	Emission factor [µg I-TEQ/t]
slightly polluted	5
strongly polluted	35

NL: Secondary copper production; air emission factor

03 03 09

Secondary copper production

Estimation of uncertainty:

In view of the fact that no measurements were performed despite strongly polluted input material is processed, the uncertainty concerning the emission factor must be considered as being considerable. Hence following indices are proposed:

Activity rates	0
emission factors	2
total uncertainty	**2**

NL: Secondary copper production; indices of uncertainty

Emission estimation

Applying the reported emission factors and the proposed uncertainty indices the following emissions are estimated:

	g I-TEQ/a
Annual emission	0.28
Margin of uncertainty	0.03 - 2.8

NL: Secondary copper production; annual PCDD/F emissions

Comment

Additional investigations should be performed on these sources!

03 03 10
Secondary aluminium production

Considered pathways/media

AIR, RESIDUES

Plant data

8 companies are reported in the Dutch inventory to have been in operation, one of them having no flue gas cleaning system, the others being equipped at least with a combination of lime injection/fabric filter.

Measurements

Measurement results are reported for two of the installations processing strongly polluted scrap:

Type of flue gas cleaning	**AIR [ng I-TEQ/m³]**	**RESIDUES [ng I-TEQ/g]**
lime injection/fabric filter	2.9	3 - 4
lime and carbon injection/fabric filter	0.13	not known

NL: Secondary aluminium production; measurement results

National activity rates

Type of flue gas cleaning	**input material**	**processed scrap [kt/a]**
none	slightly polluted	27
lime injection/fabric filter	slightly polluted	35
lime injection/fabric filter or afterburner	strongly polluted	8
lime and carbon injection/fabric filter	strongly polluted	46
TOTAL		116

NL: Secondary aluminium production; activity rates

Emission factors

The following emission factors are applied in the Dutch inventory:

Input material	Type of flue gas cleaning	AIR	RESIDUES	based on
strongly polluted	lime injection/fabric filter	35	0.15	measurement
strongly polluted	lime and carbon injection/fabric filter	1.7	not known	measurement
slightly polluted	lime injection/fabric filter	5	not known	estimation
slightly polluted	none	10	not known	estimation

NL: Secondary aluminium production; emission factors revealed by measurements [µg I-TEQ/t processed scrap]

Estimation of uncertainty:

The activity rates are reported exactly. Since the emissions asscociated with a large part of the total processed scrap have been determined by measurements, an uncertainty index of „1“ seems to be appropriate regarding the emission factors.

Activity rates	0
emission factors	1
total uncertainty	**1**

NL: Secondary aluminium production; indices of uncertainty

Emission estimation

Appliying the above mentioned emission factors to the respective activity rates the following emission estimate is obtained:

	Air	Residues
Annual emission	0.81	17.4
Margin of uncertainty	0.25 - 2.5	5.4 - 54

NL: Secondary aluminium production; annual PCDD/F emissions

Comment

03 03 11
Cement

General Remark:

Emisions related to this source type are not covered specifically by the Dutch Inventory. These emissions are considered within a chapter titled „Various high temperature processes" which are considered in the present report under 03 03 26.

03 03 13
Asphalt concrete plants

General remark:

Here the direct emissions from asphalt producing installations are considered. Additionally, emissions occur by wear and tear of asphalt roads, since filter dust from MSW incineration is partly used as filler in asphalt production. This emission is considered under 09 01 01.

Considered pathways/media:

Air, water

Plant data:

In the Netherlands around 75 asphalt mixing installations are reported to have been in operation. Technologies applied are batchwise mixing without (56) and with (12) parallel drum and drum mixing (4); for the remaing installations not being member of the „VBW asfalt association no information is given.

The main fuel used is natural gas, but also liquid fuels are combusted. 6 installations have provisions for lignite-firing.

Measurements:

Mearsurements were conducted at an asphalt- mixing installation of the "batchwise mixing installation with parallel drum" type which recycles old asphalt. The target recycling is 50%. During the measurements, 46 % old asphalt was reused. The installation is equipped with a flue gas cleaning unit, consisting of cyclones and a fabric filter.. The filler used did not contain ESP ash from MSW incinerators. The installation can be fired with oil and natural gas. The dioxin concentration measured to 0.45 ng I-TEQ/m³ converted to 11% O_2.

National activity rates:

Year	**1991**
asphalt production [kton/yr]	7400

NL: Asphalt concrete plants; activity rates

Emission factors:

The dioxin emission of the batchwise mixing installation with parallel drum was 0.047 µg I-TEQ per tonne of asphalt.

As the estimate is based on measurement at a installation that recycles old asphalt, it is a fairly high one. No data is available on the quantities and the dioxin concentrations in fabric filter ash and sludge. It is assumed that the dioxin emission to water is, in any case, less than 0.1 g I-TEQ per year since dioxins are retained in the sludge of a sedimentation basin usually following the wet scrubbers.

Estimation of uncertainty:

The emission factor derived from the measurement results is considered by the authors ofvthe Dutch survey as being „fairly high“. However, since no additional data are provided a considerable uncertainty must be stated and the index „1“ is used here:

Activity rates	0
emission factors	1
total uncertainty	**1**

NL: Asphalt concrete plants; indices of uncertainty

Estimation of annual emission:

	AIR	**WATER**
Annual emission	0.3	<0.1
Margin of uncertainty	0.1 - 1	0.03 - 0.3

NL: Asphalt concrete plants;

03 03 14-17
Glass and glass wool

General Remark:

Emisions related to this source type are not covered specifically by the Dutch Inventory. These emissions are considered within a chapter titled „Various high temperature processes“ which are considered in the present report under 03 03 26

03 03 19
Bricks and tiles

General Remark:

Emisions related to this source type are not covered specifically by the Dutch Inventory. These emissions are considered within a chapter titled „Various high temperature processes“ which are considered in the present report under 03 03 26

03 03 26
Other - burning of cables, electomotors, etc.

General remark:

Burning of cables

Cable burning is the process in which copper and lead are recovered by burning the insulating material from electricity and electronics cables. In this process, all ingredients for the forming of dioxins are present, i.e. carbon (sheath), chlorine (PVC or mould-resistant agents) and a catalyst (copper).

The burning is done batchwise in cimple furnaces. In the furnace, the possibly pre-shredded cables are set afire (using oil or gas). The combustible substances present (grease, oil, paper, jute and the like) then keep the fire going. The lead present melts and is drained off. After the process, the copper core and the steel strip (of cable armouring) are scooped from the furnace with the combustion residue. The gases arising from the burning are incinerated at temperatures of 800° C or higher, and then emitted.

In the one, still operational, legal cable burner (see Chapter 6.3), the burning takes place in a furnace that is lined inside with firebrick. The flue gases are cleaned in a thermal after burner and a wet scrubber.

In the illegal burning of cables, there is usually no installation at issue. The cables are set afire either on the ground or in a cask. By placing the stake on a small elevation or by making holes in the bottom of the cask, the lead can run off and be collected.

Burning of electromotors and the like

Processes related to cable burning are the burning of electromotor windings, the burning of coatings of instruments, the burning of brake blocks, and the like. These processes are also carried out in a furnace at 300 to 400° C, with incineration of the generated gases. The furnace temperature is usually set by a separate burner and not by the burning of the material itself. Particularly in the burning of electromotors, temperature control is important, as the motors should keep their original form. Therefore, the process control of electromotor burning is better monitored than that of cable burning.

03 03 26

Other - burning of cables, electomotors, etc.

Considered pathways/media:

Air

Measurements:

The cable burners measured outside the MOB framework have all closed down. The PCDD/F concentration were measured between 0.6 - 254 ng I-TEQ/m³ converted to 11 % O_2 (cable burner and installation for burning electromotors). Data on the quantities of residues that are released at the burning of cables and such like are not known. The mojority of the residues is released in the illigal burning of cables. At the illegal burning sites, dioxin conzentrations up to 98,000 ng I-TEQ/kg were found in soil material.

National activity rates:

Year	**1991**
Burning of electromotors etc. [tonne/year]	800
legal cable burning [tonne/year]	500
illegal cable burning [tonne/year]	3,000

NL: Other - burning of cables, electomotors, etc.;

Emission factors:

The emission factors found by measurements varied strongly between 4 and 2280 µg/t. As an indication emission factors related to the input of waste were chosen as follows:

Type of installation	**Emission factor [µg I-TEQ/t]**
legal cable burning	40
illegal cable burning	500
burning of electromotors and the like	3.3

NL: Other - burning of cables, electomotors, etc.; emission factors

Estimation of uncertainty:

Both parameters are highly uncertain. Regarding the activity rates, no reliable data are available and an index of „1“ is apllied here consequently. Concerning illegal cable burning the strong variation of the emission factors are reflected by choosing the index

„2“; with the relative modern legal cable burner an index of „1“ seems appropriate. Concerning the burning of elektromotors etc. Both parameters can be set to „0“.

	illegal burning	legal cable burning	burning of elektromotors
Activity rates	1	1	0
emission factors	2	1	0
total uncertainty	**3**	**2**	**0**

NL: Other - burning of cables, electomotors, etc.; indices of uncertainty

Estimation of annual emission:

Applying the estimated activity rates and emission factors the following emission data result:

	illegal burning	**legal cable burning**	**burning of elektromotors**	**TOTAL**
Annual emission	1.5	0.02	< 0.0035	1.52
Margin of uncertainty	0.05 - 50	0.002 - 0.2	-	0.05 - 50.2

NL: Other - burning of cables, electomotors, etc.; annual PCDD/F emissions [g I -TEQ/a]

03 03 26
Other - cement, glass, bricks, mineral wool and special plants

General Remark:

The emissions from sources covered here are considered collectively within a chapter titled „Various high temperature processes“ in order to maintain confidentiality.

Considered pathways/media

AIR,

Plant data

Folowing data on the numbers of plants under consideration are given

Type of plant	Number
Thermal soil cleaning	5
Bricks	3
Fly ash drying	2
cement	1
mineral wool	1
glass, glass fibres, glass wool	9
siliconcarbide manufacturing	1
rubber	1
Total	23

NL: Other - cement, glass, bricks, mineral wool and special plants; type and number of inventoried plants

Measurements

Measurements results are reported for 6 installations without asigning them to the type of plant. For each plant dta on flue gas flow rate, annual operation period and measured PCDD/F concentrations are given as well as additional measurment parameters. Hence, the annual emissions of the considered plants may be calculated directly. In order to serve as a base for the estimation of plants not measured individually the results are summarised as follows:

Parameter	**concentrations [ng I-TEQ/m³]**
Minimal	0.045
Maximal	19.5
geom. mean	0.55
arithmetic mean	3.9

NL: Other - cement, glass, bricks, mineral wool and special plants; measurement results

Addionally, the flue gas concentrations measurmedt at a thermal soil cleaning installation are reported to be 0.020-0.082 ng I-TEQ/m³.

National activity rates

no data on the production rate of the measured installations are reported. Following general data are given:

type of activity	**annual rate [kt/a]**
thermal soil cleaning	350
glass production	980

NL: Other - cement, glass, bricks, mineral wool and special plants; activity rates

Emission factors

Only for the thermal soil plant an emission factor is reported to be 0.07 µg/t.

Estimation of uncertainty:

Concerning thermal soil cleaning facilities, only one of five existing installation have been measured; hence, there is an uncertainty concerning the emission factor to be applied (index „1“ chosen). With respect to the other installations an assessment of the uncertainty is difficult because the basic data are poor. Here also the index „1“ is chosen. The activity rates, as far as reported, are considered to be exact.

03 03 26

Other - cement, glass, bricks, mineral wool and special plants

Activity rates	0
emission factors	1
total uncertainty	**1**

NL: Other - cement, glass, bricks, mineral wool and special plants; indices of uncertainty

Emission estimation

	Thermal soil cleaning	Other installations	Total
Annual emission	0.03	2.7	2.7
Margin of uncertainty	0.01 - 0.1	0.84 - 8.4	0.85 - 8.5

NL: Other - cement, glass, bricks, mineral wool and special plants; annual PCDD/F emissions

04 02 01
Coke oven (door leakage and extinction)

Considered pathways/media

AIR, WATER, RESIDUES

Plant data

Two companies operating three coke plants are reported to exist in the Netherlands. One plant was investigated.

Measurements

Measurements were taken at one coke plant on the following points:

waste water from the scrubber of the charging car

waste water from the scrubber of the ejection machine

flue gases from the quenching tower

Sample	concentrations [ng I-TEQ/m³]
charging car (10 charges averaged)	81
ejection machine (10 charges averaged)	82
flue gases (37 charges averaged) *)	0.15

NL: Coke oven (door leakage and extinction); measurement results *): not corrected for O_2-concentration

National activity rates

The coal consumption in the three coke plants amounted to the following rate in 1991:

Year	1991
[kt/a]	4090

NL: Coke oven (door leakage and extinction); activity rates

Emission factors

An emission factor of 0.23 µg/t coal was evaluated for the flue gas emissions.

Since the water of the scrubbers is further treated in a water purification plant, negligible emissions to water are assumed.

Based on this assumption and the measured PCDD/F concentrations in water water a total discharge of PCDD/F with residues generated in the purification plant is calculated (see section emission estimation). From this value and the annual activity rate an emission factor of 0.01 µg/ton results.

Estimation of uncertainty:

With only one plant investigated the uncertainty of the emission factor is assigned to the index „1“.

Activity rates	0
emission factors	1
total uncertainty	**1**

NL: Coke oven (door leakage and extinction); indices of uncertainty

Emission estimation

	AIR	**WATER**	**RESIDUES**
Annual emission	0.9	0	0.04
Margin of uncertainty	0.3 - 3	0	0.013 - 0.13

NL: Coke oven (door leakage and extinction); annual PCDD/F emissions

04 02 03/06
Pig iron tapping/Basic oxygen furnace steel plant

General Remark:

Concerning these source categories only confidential measurement results served as basis for the Dutch inventory. The total air emissions are assumed to be in the order of 0.5 g I-TEQ/a. Due to the poor information no uncertainty estimation can be made.

04 02 07
Electric furnace steel plant

General Remark:

In the Dutch inventory these installations are covered together with iron foundries (SNAP 03 03 03) in a chapter about „secondary iron and steel industry".

Considered pathways/media

AIR,

Plant data

The Dutch inventory counts about 30 electric furnace installations (steel plants and foundries); the number actually fitting into the category considered here is unclear (see 03 03 03).

Concerning the input material, a special study is quoted ‹8›. Within this study it appeared that only a few installations actually process metal-cuttings rap containing metal-working liquids (most of this scrap is exported, the target countries are not mentioned).

Measurements

One plant producing high grade steel from iron scrap with an electric (direct-arc) furnace was investigated, the concentration found in the flue gas amounted

0.04 ng I-TEQ/m³

The concentration in the dust collected by the fabric filter was measured to be

0.146 ng I-TEQ/g.

National activity rates

No exact value on the scrap processed annually is given in the report. A total of 360 kt/a raw materials (scrap and pig iron) were inventoried. With the investigated plant processing 230 kt scrap and about additional 65 kt raw material being consumed in electric furnace installations the amount of scrap consumed annually is estimated here to have been 295 kt in 1991.

Emission factors

In the Dutch Inventory an emission factor of 6 µ/t is calculated from the total annual emissions to air and via filter dust and the scrap consumption of the measured plant. However, this emission actor is applied erroneously to calculate the air emissions. Using only the annual air emission rate, which can be calculated on basis of the operating time, flue gas concentration and -flow rate an air emission factor of 4.3 µg/t processed scrap results, which is used in the present study.

Concerning emissions via residues, an emission factor of 1.5 µg/t scrap is calculated for the present report on basis of the Dutch data (2,354 tons of dust collected in 1991)

Estimation of uncertainty:

In view of the considerations mentioned above and under 03 03 03 a considerable uncertainty has to be stated with respect to both the emission factors and the activity rates.

Activity rates	1
emission factors	1
total uncertainty	**2**

NL: Electric furnace steel plant; indices of uncertainty

Emission estimation

	Air	**Residues**
Annual emission	1.3	0.45
Margin of uncertainty	0.13 - 13	0.045 - 4.5

NL: Electric furnace steel plant; annual PCDD/F emissions

04 03 09
Other - foundries in the non ferrous metal industry

General Remark:

45 foundries producing about 18.5 kt/a non ferrous metals were inventoried; because „pig“ input material is used almost entirly instead of scrap, no PCDD/F emission were assumed to occur from these installations.

Comment:

The assumption quoted above should be confirmed by appropriate investigations!

04 05 03
1,2-dichloroethane (except 04 05 05)

General Remark:

Despite 1,2- dichloroethane being one of the major products in the chemical industry, no data are reported on this source type are given except that 700 kt vinyl chloride and 50 kt ethylenediamine are produced annually from 1,2-DCE.

04 05 04
Vinylchloride (except 04 05 05)

General Remark:

The production of aliphatic chlorinated hydrocarbons was inventoried to take place in 16 companies with 6 companies prtoducing more than 95 % of the entire annual amount. The only information given about the specific source category mentioned in the headline is the production rate of VC that has been 700 kt in the year 1988.

04 05 05
1,2-dichlorethane + vinylchloride (balanced process)

General Remark

see 04 05 04

04 05 08
Polyvinylchloride

General Remark:

The production of aliphatic chlorinated hydrocarbons was inverntoried to take place in 16 companies with 6 companies prtoducing more than 95 % of the entire annual amount. The only information given about the specific source category mentioned in the headline is the production rate of PVC and VC co-polymers that has been 375 kt in the year 1988.

04 05 24
Halogenated hydrocarbons production

General Remark:

Considered here are chlorinated compounds which do not fit to one of the other SNAPS assigned to vinyl chloride and POC producion, resp.

Considered pathways/media

AIR,

Plant data

The production of aliphatic chlorinated hydrocarbons was inverntoried to take place in 16 companies with 6 companies producing more than 95 % of the entire annual amount.

Measurements

no measurement results are reported by the Dutch inventory

National activity rates

Following production estimates are given:

Compound	**Production rate [kt/a]**
epichlorhydrin	> 70
HCFK 22	15
ethylenediamine	50
epoxy resins	>50

NL: Halogenated hydrocarbons production; activity rates

Emision factors:

No production-related emission factor is evaluated in the Dutch report

Estimation of uncertainty:

In view of the lacking specific measurements the uncertainty is conservatively assumed to be 2 decades:

Activity rates	0
emission factors	2
total uncertainty	**2**

NL: Halogenated hydrocarbons production; indices of uncertainty

Emission estimation

The Dutch inventory roughly assumes the entire air emissions of all operating companies to be smaller than or equal to those evaluated for companies producing pesticedes

	g I-TEQ/a
Annual emission	0.2
Margin of uncertainty	0.02 - 2

NL: Halogenated hydrocarbons production; annual PCDD/F emissions

Comment:

The authors of the Dutch survay state the necessity of performing additional studies on waste and flue gas flows as well as the ned for measurements. However, the absolute air emission level is quite low compared to other sources even taking into account the probable uncertainties.

04 05 25
Pesticide production

General Remark:

Covered here is the production of chlorobenzenes and ist derivatives as well as chorophenols as far thes compounds are used as intermediates during the production of pesticedes or crop protection agents. The production and use of these compounds for other purposes is considered under 04 05 26.

Considered pathways/media

AIR,

Plant data

Three plants are known in the Netherlands producing pesticides.

Measurements

Measurement results of flue gas concentrations are reported for two of the mentioned plants both being equipped with gas scrubbers (flue gas flows: 260 and 6,500 m³/h):

Parameter	**concentrations [ng I-TEQ/m³]**	**O_2 concentration [%]**
Minimal	0.02	20.7
Maximal	7.2	1*)
geom. mean	0.38	
arithmetic mean	3.6	

NL: Pesticide production; measurement results. *) company statement

National activity rates

No data on the annual production rates are given in the Dutch report.

Emission factors

No production-related emission factor is evaluated in the Dutch report; instead, the total annual emissions are estimated on basis of a plant specific estimate which is derived from the calculated average annual emissions from the investigated installations for pesticide production which is 0.007 g I-TEQ/plant and year.

Estimation of uncertainty:

Since two of three operating plants were investigated, the the estimated emission factor is assumed to be precise enough to be applied to the remaining plant.

Activity rates	-
emission factors	0
total uncertainty	**0**

NL: Pesticide production; indices of uncertainty

Emission estimation

	g I-TEQ/a
Annual emission	0.21
Margin of uncertainty	-

NL: Pesticide production; annual PCDD/F emissions

Comment:

Concerning emissions to water and via residues it is stated, that these are negligible since waste water mostly is purified by the companies befor releasing it and sludges or residues are due to incineration. However, no information is given with respect to contamination of the products (pesticides) themselves.

04 05 26
Production of persistent organic compounds

General Remark:

Covered here is the production and use of Chlorobenzenes, ist derivatives and of chlorophenols as raw materials in various chemical processes. About 20 companies were inventoried fitting to this criterion. The total annual air emission associated with these processes is estimated on basis of the plant related emission factor given under 04 05 25 to be 0.14 g I-TEQ/a

06 03 12
Textile finishing

General Remark:

Covered here is the treatment of textiles with fungicides, e.g. Pentachlorophenylaurate (PCPL)

Considered pathways/media

AIR,

Plant data

PCPL was used in the Netherlands until 1992 when ist use was banned. It was particularly applied in products of medium lifetimes (tents, sunblinds, sponges).

Measurements

No measurement data are reported; reference is taken to the „working document“ ‹9›

National activity rates

No data on production or consumption of PCPL iare given.

Emission factors

The emission of PCDD/F is calculated using the estimated annual emission of PCPL and its average contamination with dioxins (3 mg I-TEQ/kg)

Estimation of uncertainty:

The data given are insufficient to make an estimation of the uncertainty range.

Emission estimation

The emission values estimated for 1989 in the working document are considered as being valid for 1991, too. A slight decrease might have been occurred since then due to the ban of the application of PCPL.

06 03 12

Textile finishing

	AIR	WATER	SOIL	Residues *)
Annual emission	0.06	0.09	0.15	6.7
Margin of uncertainty	-	-	-	

NL: Textile finishing; annual PCDD/F emissions [g I-TEQ/a]

***) These wastes may be considered as a reservoir source;**

leaching, however, is deemed improbable.

06 04 06
Preservation of wood

General Remark:

This chapter specifically covers the result of a Dutch study on the PCDD/F emissions from Pentachlorophenol, PCP (and its sodium salt, Na-PCP) used for wood preservation

Considered pathways/media

AIR,

Plant data

not applicable

Measurements

no measurements were done in the Netherlands. PCDD/F concentrations in PCP were taken from the scientific literature (as quoted in the so-called „working document“ ‹9› of the Dutch inventory); the following averages are considered:

Type of product	concentrations [mg I-TEQ/kg]
PCP	3
Na-PCP	0.3

NL: Preservation of wood; measurement results concerning PCDD/F content of PCP and Na-PCP

National activity rates

From PCP consumption and import data it is estimated that 1,176 t of these compounds had been spreaded in NL in impregnated wood since 1955. With the mentioned average concentrations this corresponds to 3,525 g I-TEQ PCDD/F serving as the reservoir source for dioxin emissions.

06 04 06

Preservation of wood

Emission factors

The PCDD/F emission from impregnated wood is estimated on the basis of the following assumptions:

1. The annual PCDD/F loss through evaporation from contaminated wood rate is estimated to be 0.45 %.

2. Replacement of contaminated wood takes place at rates varying with the age of the wood (10 - 20 years: 1%, 20 - 30 y.: 2%, 30 - 40 y.: 3%, >49y.: 4%).

Estimation of uncertainty:

It is not possible to estimate an uncertainty range in terms of activity rates and emission factors here.By comparison with the estimated dioxin emission of 125 g I-TEQ/a which was calculated from the PCP:PCDD/F relation of indoor concentrations ($5*10^{-6}$) ‹10 › , the authors of the Dutch inventory conclude that a maximum overall uncertainty of 1 decade may exist.

Emission estimation

	g I-TEQ/a
Annual emission	25
Margin of uncertainty	9.3 - 93

NL: Preservation of wood; annual PCDD/F emissions

Comment

If the estimation prove to be reliable evaporation of dioxins will become the most important source in The Netherlands after abatement measures have been successfull implemented at industrial installations like MSW incineration and sinter plants. However, due to the poor experimental data basis the emission estimation seems to be highly questionable.

07
Road Transport

Considered pathways/media

AIR

Plant data

not applicable

Measurements

No measurements were made in the Netherlands

National activity rates

The following fuel consumption data are given in the Dutch survey:

Type of fuel	Application	Quantity [Million litres]
leaded		1817
unleaded	without catalyst	1076
	with catalyst	1627
Diesel	road traffic	4070
	mobile machines	1050

NL: Road Transport; activity rates

The total distance covered by road traffic was $98.2*10^9$ km; $20.6*10^9$ km of this was covered by cars driving on leaded petrol.

Emission factors

Inorder to evaluate the possible emissions from road traffic the results obtained by foreign studies are quoted ‹11›, ‹12›. Following data are used:

Type of fuel	emiossion factors [pg I-TEQ/l]
leaded	1,080
unleaded, without catalyst	51
unleaded, with catalyst	7
Diesel	24

NL: Road Transport; emission factors used according to ‹11›

07

Road Transport

From a Belgian tunnel study an emission factor 65 pg/km ‹12› is quoted for comparison.

Estimation of uncertainty:

There is a considerable difference between the emission estimates resulting from application of the various emission factors. Hence an indication with „1" is chosen here.

Activity rates	0
emission factors	1
total uncertainty	**1**

NL: Road Transport; indices of uncertainty

Emission estimation

In the Dutch survey, the maximum emission is estimated to be 6 g I-TEQ based on the tunnel study results. With the chosen uncertainty range the following figures are obtained:

	g I-TEQ/a
Annual emission	2.1
Margin of uncertainty	0.67 - 6

NL: Road Transport; annual PCDD/F emissions

Comment

No additional effort is recommended by the authors of the Dutch survey since only liitle result and improvement of the overall situation is expected. However, contrdictory results concerning emission from heavy duty diesel engines from other countries (e. g. from the U.S.A.) are not regarded.

08
Other Mobile Sources and Machinery

General Remark:

On-land sources assigned to this SNAP are covered by the chapter about traffic in the Dutch report. Without giving further details, the emissions are estimated to be at maximum

1 g I-TEQ/a

08 03
Inland waterways

General Remark:

Covered here are emissions from ships using inland waterways (like Rhine barges and container ships). Furthermore, emissions from ocean going vessels in port are considered .In the Dutch report these emissions are evaluated within the chapter on oil combustion.

Considered pathways/media

AIR,

Plant data

not applicable

Measurements

Results of emission measurments are reported for a ferry firing heavy fuel oil , further for a Rhine barge and a container ship using gas oil, all under operational conditions. Broken down according to the fuel type the following summary can be given:

Parameter	**concentrations [ng I-TEQ/m³]**	
	gas oil	heavy fuel oil
Minimal	0.002	0.1
Maximal	0.2	0.2
geom. mean	0.02	0.14
arithmetic mean	0.1	0.15

NL: Inland waterways; measurement results

National activity rates

Following fuel consumption rates are reported for the year 1991:

Fuel type	**fuel consumption [kt/a]**
heavy fuel oil]	30.4
gas oil	531

NL: Inland waterways; activity rates

Emission factors

Emission factors as shown in the table below are reported. The factor for heavy fuel oil is based on a specific flue gas volume of 10,000 - 12,000 m³/t of oil at the measured oxygen content (about 13 to 14 %).

Parameter	**emission factors [µg I-TEQ/t]**	
	gas oil	heavy fuel oil
Minimal	not given	3.2
Maximal	not given	6.5
geom. mean	not determined	4.56
arithmetic mean	1	4.8

NL: Inland waterways; emission factors

Estimation of uncertainty:

Regarding emissions from gas oil combustion there is a considerable uncertainty because of large fluctuations of the measured flue gas concentrations (2 decades). From the few data available the reasons for this cannot be determined. For the present report, an index of „1“ is assumed to be appropriate with respect to the emission factors.

Activity rates	0
emission factors	1
total uncertainty	**1**

NL: Inland waterways; indices of uncertainty

Emission estimation

	g I-TEQ/a
Annual emission	0.6
Margin of uncertainty	0.19 - 1.9

NL: Inland waterways; annual PCDD/F emissions

09 02 01
Incineration of domestic or municipal waste

General remark:

Incineration of municipal solid waste (MSW) was found as an important source of dioxins. These dioxins leave the installation together with the flue gases and the residues (slag, ESP ash, flue gas cleaning residue, effluent).

Within the framework of a general investigation of dioxins in the Netherlands, TNO was commissioned by VROM to carry out an investigation in which the emissions via the stack gases of all Dutch MSW incinerators (1990) were measured. The stack gas emissions mentioned in the Dutch Dioxin Inventory were derived from the results of this investigation.

However, updated air emission results have become available meanwhile. Since flue gas cleaning systems have been installed at most of the facilities, the newer measurement results are much lower than those reported in the survey considered here. As these data more accurately reflect the situation for the period under consideration they are quoted in the present report.

The dioxin emissions via the residues were determined on the basis of data from the literature and recently reported results of measurements on residues of Dutch MSW incinerators.

Considered pathways/media:

Air, Water, Wastes

Plant data:

The most actual list of plants comprises 7 facilities for MSW combustion and two installations using refuse-derived fuel. The capacities range from 18 up to 960 kt waste per year; the total capacity amounts to 3,155 kt/a. All installations are equipped with secondary flue gas cleaning systems, partly with dioxin adsorption/destruction devices.

Measurements:

The emission data which have been derived from the emission investigation held at MSW incinerators in 1990 showed the dioxin concentration of the stack gases to range between 1 and 92 ng I-TEQ/m³ (ind. 11% O_2). The more recent data considered here may be summarized as follows:

Parameter	**concentrations [ng I-TEQ/m³]**
Minimal	0.01
Maximal	4
geom. mean	0.21
arithmetic mean	0.88

NL: Incineration of domestic or municipal waste; measurement results 1994

It should be noticed that the maximum concentration was found in 1991 at a RDF combustion plant; no information was given about abatement measures performed in the meantime.

Beside the flue gases emittet through the stack, solid residues ar being relased during the incineration of domestic waste in the form of slags and ESP ash. Further purification of the stack gases results in flue gas purification residues (sludge from wet scrubber) and possible effluent of the wash water. Many of the dioxins are bound to these residues and discharged with them. Concerning these pathways another study ‹ 13› is quoted by the Dutch survey; the following concentration ranges are given:

Parameter	**Effluent**	**Flue gas cleaning residues**	**ESP ash**	**Slags**
	pg I-TEQ/l	ng I-TEQ/g dm	ng I-TEQ/g dm	pg I-TEQ/g dm
Minimal	0.79	3.2	0.53	5
Maximal	3.43	69	24	31
arithmetic mean	1.87	12.2	12.2	17.3

NL: Incineration of domestic or municipal waste; measured concentrations in residues and effluent water ‹13›

National activity rates:

For 1991 the following rates are reported:

09 02 01

Incineration of domestic or municipal waste

Type	kt/a
Waste througput	2,760
Slag production	490
ESP ash prod.	83.2
wet scrubber sludge	0.851
effluent water [1000 m³/a]	175

NL: Incineration of domestic or municipal waste; activity rates 1991

Emission factors:

In 1990 the dioxin emission of the stack gases of the MSW incinerators ranged between 7 and 277µg I-TEQ/tonne thus covering nearly three decades. From the 1994 measurements a similar range can be derived with the absolute emission factors shifted towards lower values:

Parameter	Emission factor [µg I-TEQ/t]
Minimal	0.06
Maximal	20
geom. mean	1.1
arithmetric mean	5

NL: Incineration of domestic or municipal waste; emission factors for air emissions

Estimation of uncertainty:

Since measurements have been performed at all operating plants, their specific emission factors are well known. This means that the uncertainty concerning the emission factors for each plant would probably be below one decade in spite of the huge range covered by all facilities together. Concerning the activity rate a slight increase may be assumed compared to the values given for 1991; however, for the present study this does not give rise to a considerable uncertainty. Hence, a total index of „0“ is applied.

Activity rates	0
emission factors	0
total uncertainty	**0**

NL: Incineration of domestic or municipal waste; indices of uncertainty

Estimation of annual emission:

The Dutch survey estimates the air emissions to be 382 g I-TEQ/a in 1991and thus being the main source of PCDD/F in the Netherlands. However, based on the capacities of the operating plants and on the more recently measured emission factors a maximum air emission of only 5.6 g I-TEQ is reported for 1994.

It could not be traced on whether the abated air emissions resulted in higher loads of the residues produced by flue gas cleaning systems or whether the dioxins and furans are destructed actually; therefore, regarding the other pathways, the 1991 data are taken as valid.

As mentioned before (see 03 03 13) filter ash is used as filler in asphalt production. From the quantities used for this purpose it can be calculated that abou 350 g I-TEQ end up in road pavements. Remobilisation of the dioxin content by wear and tear of asphalt roads amounts to 13.5 kt/a and leads to an additional emission of about 0.6 g I-TEQ/a.

	Air	**Water**	**Residues**
MSW incinerators	5.6	0.0003	1038.4
asphalt roads	0.6	-	-
margin of uncertainty	-	-	-

NL: Incineration of domestic or municipal waste; emission estimation for 1994

09 02 02
Incineration of industrial wastes (hazardous waste)

General remark:

"Hazardous waste" includes:

- Any substance that has been designated as such according to the Chemical Waste Act. In contrast to what is stated in that Act, no exeption is made here for substances that are processed within the company itself.
- Chlorine containing gasous waste streams, such as process and ventilation gases.

Considered pathways/media:

air, water

Plant data:

The furnaces that are used in the Netherlands for incinerating hazardous wastes can be categorized into:

- rotary kilns
- liquid- injection furnaces
- thermal after burner
- fluid bed furnaces
- fixed grate furnaces

The following table gives a survey of the 28 installations, arranged according to furnace typ.

Furnace type	number of installations	Waste [kt/a]	Remarks
Rotary kiln	3	92	90 kt/a in two installations
Liquid-injection	5	54	44 kt/a in three installations, for HCI recovery
Fluid bed	1	1.4	-
Fixed grate	5	7	5.5 kt/ in one installation
Thermal after burner	14	not known	-

NL: Incineration of industrial wastes (hazardous waste);number of installations and incinerated quantities of chlorine cotaining hazardous wastes per furnace type

The large-scale incineration of hospital waste takes place in the incineration plants of AVR-Chemie. The dioxin emission as a result of this incineration of hospital waste is therefore included in this part.

Measurements:

In the Dutch surveymeasurement results are reported for 13 installations. The PCDD/F concentration were measured to lie between 0.04 and 26.8 ng I- TEQ/m³ (ind. 11% O_2) in the flue gases. The maximum concentrations were found at the large scale rotary kiln incinerators. However, more recent results obtained at the three rotary kiln plants located at AVR Chemie actually revealed lower emissions (< 0.1 ng I-TEQ/m³). This leads to the following concentration range for all investigated plants :

Parameter	concentrations [ng I-TEQ/m³]
Minimal	0.04
Maximal	9.7
geom. mean	0.11
arithmetic mean	1.56

NL: Incineration of industrial wastes (hazardous waste); air emission measurement results

National activity rates:

Tha activity rate for 14 facilities is given as follows:

The Netherlands

09 02 02

Incineration of industrial wastes (hazardous waste)

Year	**1991**
waste throughput [kt/a]	154

NL: Incineration of industrial wastes (hazardous waste); activity rates

No values are given for the waste treated in the remaining 14 plants which are thermal after burners for the incineration of gaseous waste.

Emission factors:

Emission factors are not given directly in the Dutch survey. From the annual PCDD/F emission reported for some of the measured plants and the corresponding capacities the following emission factor data could be clculated:

Parameter	**Emission factor [µg I-TEQ/t]**
Minimal	0.1
Maximal	310.0
geom. mean	3.5
arithmetic mean	47.4

NL: Incineration of industrial wastes (hazardous waste); emission factors calculated from reported data

Estimation of uncertainty:

Since the emissions of the large scale incineration facilities are well known the remaining uncertainties concerning the thermal after burners and some other installations are considered to be negligible. Thus a total index of „0“ may be applied.

Activity rates	0
emission factors	0
total uncertainty	**0**

NL: Incineration of industrial wastes (hazardous waste);

Estimation of annual emission:

For a part of the measured installations the annual emissions are given in the survey. Put together, these plants are responsible for more than 90% of the emissions from all facilities known. The emissions caused by the remaining plants is estimated based on results obtained at comparable installations. For the year 1991, a total emission of 16 g I-TEQ/a results; considering the decreased emissions from the AVR rotary kilns as revealed by the more recent results, the probable emission will actually be as shown in the following table.

Emissions associated with water effluents are also estimated in the Dutch survey on the basis of confidential data.

Medium	**1991**	**1994**
air	16	2.05
water	0.8	

NL: Incineration of industrial wastes (hazardous waste); annual PCDD/F emissions [g I-TEQ/a]

09 02 05
Incineration of sludges from waste water treatment

General remark:

Industrial sludge coming from sewage treatment plants.

Considered pathways/media:

Air

Plant data:

In the Netherlands, the incineration of (chlorine containing) industrial sludge takes place mainly in two installations with capacities of 7.85 kt/a and 45 kt/a (papaer mill sludge), resp. Both installations are equipped with fluid bed funaces. Two additional smaller furnaces burn together about 0.1 kt/a.

Measurements:

Measurements were taken at one fluid bed furnace. Additionally, measurement results for incineration of sludge from a paper mill are available. The PCDD/F concentration of the stack gases ranged between 0.4 and 0.6 ng I-TEQ/m³ (ind. 11 % O_2).

National activity rates:

Year	**1991**
Industrial sludge [kt (d.m.)/a]	52.86

NL: Incineration of sludges from waste water treatment;

Emission factors:

An average emission of the stack gases of about 4µg I- TEQ per tonne was calculated for sludge incineration.

Estimation of uncertainty:

Since the main installations covering more than 99% of the incinerated industrial sludge were measured, an overall index of „0“ can be applied.

Estimation of annual emission:

The emissions from the two main incinerators were calculated directly to be 0.205 g I-TEQ/a. Using the derived emission factor, an emission of 0.0004 g I-TEQ/a is estimated for the two small installations. Summarising, the following data are obtained:

	g I-TEQ/a
annual emission	0.21
margin of uncertainty	-

NL: Incineration of sludges from waste water treatment; annual PCDD/F emission

09 02 07
Incineration of hospital wastes

General remark:

Hospital waste can be distinguished into "specific hospital waste" and "other hospital waste". Specific hospital waste includes human anatomic remains and organ parts, waste contaminated with bacteria, viruses and fungi, and larger quantities of blood. Specific hospital waste has been designated as hazardous waste in the Dutch „Indication Decree on Hazardous Wastes“ (BACA), starting 1 March 1992. Other hospital waste includes non-contaminated waste that is similar to domestic waste.

Most of the specific hospital waste released in the Netherlands is incinerated on a large scale in a furnace for hazardous waste incineration, and in a special installation for hospital waste incineration. Other hospital waste is usually discharged as industrial waste.

A number of hospitals incinerate hospital waste in their own incinerators. This chapter will only discuss the emissions of these installations. The emissions released at the above-mentioned large-scale installations have been included in 09 02 02.

Considered pathways/media:

Air

Plant data:

The dioxin emissions of four hospital waste incinerators, including the two largest installations, were established from November 1990 to May 1991 (Bremmer et al., in preparation). Following the results of that investigation, seven hospitals closed down their waste incinerators, including the installations at which measurements were conducted.

On 31 December 1991, 18 hospital waste incinerators were still operating.

- Two hospitals incinerate a total of 650 tonnes per year of specific waste, combined with other hospital waste;

- Sixteen hospitals incinerate a total of 25 tonnes of specific hospital waste, with quantities varying per installation form 40 kg to 2.5 tonnes per year.

Measurements:

Measurements into the dioxin emissions were conducted at the incinerators of four hospitals, 2 being medium sized (waste throughput 19 and 82 t/a, resp.), the other being the large facilities mentioned above, which burned 2,000 and 1,500 t/a . The results obtained can be summarised as follows:

Parameter	**concentrations * [ng I-TEQ/m³]**
Minimal	70
Maximal	460
geom. mean	167
arithmetic mean	222

NL: Incineration of hospital wastes

*** refers to dry flue gases under standard conditions, converted to 11% O_2.**

On an average, about 3 times higher emissions were observed for medium-sized installations than for the large facilities.

National activity rates:

To evaluate the PCDD/F emission for 1991, the amount of waste incinerated at the end of 1991 was considered which was considerably less than the throughput at the time the measurements had been performed (August 1991):

Year	**1991**
medium sized installations	0.650
small installations	0.025

NL: Incineration of hospital wastes; activity rates

Emission factors:

From the measured concentrations, flue gas flows and annual operation times the annual PCDD/F emissions of the investigated facilioties were calculated. Relating these totals to the annual waste throughput as mentioned above revealed average dioxin emission factors which ranged between 3,000 µg I-TEQ per tonne of waste (medium- sized installations) and 800 µg I-TEQ per tonne of waste (large installations). Since the large plants were closed down, only the factor evaluated for the medium-sized facilities is applied to estimate the emissions from the two remaining facilities. Regarding the small installations, an estimated factor of 5,000 µg/t is used.

Estimation of uncertainty:

Since the measurements were done only during the steady state operation without regarding start-up and cooling periods, the emission factors are considered to be low indicators of the real situation. Hence, the the estimated emission factors will be considered here as the lower end of the margin of uncertainty which is assigned to an index of „1“. The same index applies to the activity rates, too; thus the following figures are obtained:

Activity rates	1
emission factors	1
total uncertainty	**2**

NL: Incineration of hospital wastes; indices of uncertainty

Estimation of annual emission:

With the uncertainties taken into account the tyoical emission in 1991 is estimated here to have been ten times higher than reported in the Dutch survey. However, the Dutch inventory contains information about the 1993 situation. At this time, only one large and several small installations were still in operation. The PCDD/F emissions from these facilities are estimated to have been only 1 g I-TEQ/a.

	1991			**1993**
	medium-sized	small	all	all installations
annual emission	20	1	21	1**)
margin of uncertainty	2 - 200	0.1 - 10	2.1*) - 210	0.1 - 10

NL: Incineration of hospital wastes; annual PCDD/F emissions to the air

***) this value is reported in the Dutch survey;**

****) used in the present report**

09 02 08
Incineration of waste oil

General Remark:

Covered here is the use of unprocessed spent oil in industrial combustion installations or production processes.

Considered pathways/media

AIR,

Measurements

Spent oil:

Measurements were conducted at three combustion installations and at a ferry which possibly used blended heavy fuel oil. The results are summarised in the next table:

Parameter	concentrations [ng I-TEQ/m³]
Minimal	0.1
Maximal	0.3
geom. mean	0.17
arithmetic mean	0.2

NL: Incineration of waste oil; measurement results

National activity rates

About 55 kt of spent oil was processed into substitute fuel being partly used (11 kt) in several industries (service stations, market gardeners, brickyards, asphalt mxing installations, dry cleaners, machine works). 44 kt were blended with heavy fuel oil and used for shipping (ocean going); this part is covered by SNAP 08 04.

Additionally, a total quantity of 13 kt of waste oil was combusted without previous processing; it is estimated that the fraction being combusted illegally amounts about 10 kt

09 02 08

Incineration of waste oil

type of oil	consumption [kt/a]
processed	11
unprocessed	13

NL: Incineration of waste oil; activity rates

Emission factors

From the measurement results the following emission factors were derived:

Parameter	Emission factor [µg I-TEQ/t]
Minimal	2
Maximal	6.5
geom. mean	2.9
arithmetic mean	4.25
used for estimation	4

NL: Incineration of waste oil; emission factors

Estimation of uncertainty:

Some uncertainty exists concerning the amount of oil being incinerated illegally and the fraction used in blended fuel for ocean vessels, hence the index „1“ is assumed to be appropriate. Since the measured flue gas concentrations of the various kinds of combustion processes are quite similar, the index „0“ is applied to the emission factors here:

Activity rates	1
emission factors	0
total uncertainty	**1**

NL: Incineration of waste oil; indices of uncertainty

Emission estimation

With the data shown above the folowing emission estimation is obtained:

	g I-TEQ/a
Annual emission	0.1
Margin of uncertainty	0.03 - 0.3

NL: Incineration of waste oil; annual PCDD/F emissions

09 09 01
Incineration of corpses

Considered pathways/media

AIR, RESIDUES

Plant data

43 Crematoria were inventoried, 25% being of the cold type consisting of a burner-equipped combustion chamber which is preheated to about 300 °C. Rhe main part of the installations are of the warm type without burner being indirectly heated to 800 - 900°C. Flue gases are usually treted by an afterburner only; in 5 installations fabric filteres are used additionally.

Measurements

Measurement were made at each one cold and warm type installation. The sampling time comprised about 4 cremations. Following results were obtained:

type	flue gas concentrations [ng I-TEQ/m³]
cold	1.6
warm	3.3
geom. mean	2.3
arithmetic mean	2.5

NL: Incineration of corpses; measurement results

No data on the dioxin concentrations of filter ash (concerning the installations using fabric filter) was available.

National activity rates

59,143 cremations were registered in 1991; no distributionto the different type of installations is given.

09 09 01

Incineration of corpses

Emission factors

Parameter	Emission factor [µg I-TEQ/cremation]
Minimal (cold type)	2.4
Maximal (warm type)	4.9
geom. mean	3.4
arithmetric mean	3.65

NL: Incineration of corpses; emission factors

It is assumed in the Dutch report that the air emissions will be lowered to less than 1 µg/cremation by application of fabric filters. With 75 g/cremation of filter dust the dioxin concentration in the filter dust should be at least about (3.6-1)/75 µg/g = 35 ng/g.

In the Dutch report, however, the concentration is assumed to be comparable with values found at non ferrous metal works, e.g. 17.8 ng I-TEQ/g at maximum.

Estimation of uncertainty:

Due to the small number of measurements there is a considerable uncertainty concerning the emission factors; hence an indes of „1“ is chosen here.

Activity rates	0
emission factors	1
total uncertainty	**1**

NL: Incineration of corpses; indices of uncertainty

Emission estimation

	Air	Residues
Annual emission	0.2	0.02
Margin of uncertainty	0.06 - 0.6	0.006 - 0.06

NL: Incineration of corpses; annual PCDD/F emissions

Comment

The concentrations measured are somewhat lower than found in other countries (B, D)

09 10 02
Waste water treatment in residential and commercial sectors

General remark:

In the Netherlands, serwage sludge is incinerated in three installations. On of them is connected to the MSW incinerator in Dordrecht (the dioxin emission has been included in 09 02 01). The other two installations are fluid bed furnaces, one equipped with an electrostatic precipitator and the other with a wet scrubber for flue gas cleaning.

Considered pathways/media:

air, water, waste

Measurements:

Measurement data is available for the incineration of sewage sludge in one of the two fluid bed furnaces. The PCDD/F concentration of the stack gases ranged between 0.11 and 0.18 ng I-TEQ/m³. Data of PCDD/F emissions to water is no available.

National activity rates:

Year	**1991**
sewage sludge [kt (d.m.)/a]	6,000

NL: Waste water treatment in residential and commercial sectors; activity rates

Emission factors:

An average emission factor of about 5 µg I- TEQ per tonne sewage sludge was calculatet.

Estimation of uncertainty

The uncertainty indices can be set to „0“ in view of the data provided in the Dutch inventory

09 10 02

Waste water treatment in residential and commercial sectors

Estimation of annual emission:

The air emissions are calculated using the derived emission factors.

In view of the measured emissions into the air and of the process conditions, it is likely that the emission to water is no more than 0.1 g (?) I- TEQ per year (incineration of landfill gas, biogas and sludge).

Nothing is known on the PCDD/F content in incineration residues. The dioxin concentrations are assumed to be lower than those found in the ESP ash of MSW incinerators.

Year	AIR	WATER
Annual emission	**0.03**	**<0.1**
Margin of uncertainty	-	-

NL: Waste water treatment in residential and commercial sectors; [g I-TEQ/yr]

(incineration of landfill gas, biogas and sludge)

09 10 09
Other (Regeneration processes (activated carbon, catalysts))

Considered pathways/media

AIR,

Plant data

In The Netherlands, six installations for catalyst regeneration and one facility for carbon regeneration exist, the latter being equipped with an after burner.

Measurements

The emissions of one of the inventoried installations was measured. This plant was equipped with a gas scrubber and had a flue gas flow of 260 m³/h. A PCDD/F concentration of 8 ng I-TEQ/m³ was found at 1 vol % oxygen concentration.

National activity rates

no data reported

Emission factors

no emission factors can be derived from the reported data due to lack of specific input/output information.

Estimation of uncertainty:

According to the authors of the Dutch inventory the emissions of the remaining catalyst regeneration installation should be lower than that of the measured facility. Because this is only a plausibility conclusion, an overall uncertainty index of „1“ is assumed to be apprpriate here.

Activity rates	-
emission factors	-
total uncertainty	**1**

NL: Other (Regeneration processes (activated carbon, catalysts)); indices of uncertainty

09 10 09

Other (Regeneration processes (activated carbon, catalysts))

Emission estimation

On basis of plausibility considerations the entire air emission from all plants is estimated as follows:

	g I-TEQ/a
Annual emission	0.1
Margin of uncertainty	0.03 - 0.3

NL: Other (Regeneration processes (activated carbon, catalysts)); annual PCDD/F emissions

10 06
Use of Pesticides

General Remark:

The Dutch Inventory takes reference here to the so-called „working document"‹9› being based on 1989 information. In this document the total PCDD/F emission to the environment, i.e. soil, was estimated to be 0.6 g I-TEQ/a based on consumption data for chlorinated pesticedes and a number of determinations of the dioxin concentration in pesticides. Due to improvements in the production processes the 1991 emissions are estimated to amount to 0.3 g I-TEQ/a.

12
Fires

General Remark:

In the Dutch survey no emission estimate is reported concerning fires due to insufficient data on related emission factors and concentrations. Some statistical data on the occurence of fires in the Netherlands are given as well as literature information about measured emission and immission concentrations Additional investigations concerning this potentiol source of PCDD/F .are recommended by the authors of the Dutch survey.

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