

Denmark

Description of available information

Despite Denmark becoming aware of the dioxin problem several years ago and starting a measurement program on municipal waste incinerators, today only few informations on dioxin emission sources are available from this country. Concerning municipal waste incineration data were published in 1990 <1> as a first outcome of the „Danish incinerator study“ which refers to measurements dated in 1989. Most probably they do not reflect the present-day emissions. On request at the Danish ministry of environment additional information has been provided on the sectors industrial combustion (e.g. power plants, reference year is unknown) and iron and steel (ref. year 1991). The first is based on emission factors taken from Swedish investigations, the database for the emission data concerning steel industry was not communicated. A total of approx. 60 g N-TEQ emitted to air results from these data.

However, more recently updated information was obtained from the Danish National Environmental Research Institute (NERI) <Dk2 2> The table delivered contains data on emissions to air, water, soil and residues/wastes and is shown on page Dk- 3. Concerning air emissions a total of about 43 g N-TEQ is reported. The distribution of the old and new data to the CORINAIR main SNAPs is shown below. No information on measurements or emission factor is given; however, this might be the case in the yet unpublished basic report <4> the data had been taken from.

Table 15.1: Sources of dioxins in Denmark in 1995 (old figures as N-TEQ in brackets).

Activity/ Process	Emission to				Total emission g I-TEQ/yr.
	Air g I-TEQ/yr.	Water g I-TEQ/yr.	Soil g I-TEQ/yr.	Waste/residue g I-TEQ/yr.	
Chemical industry	-	-	-	-	-
Paper and pulp industry	-	-	-	-	-
Asphalt-mixing industries	0.1	-	-	-	0.1
Steel and metal industry					
- steel reclamation	7.5 (12)	-	-	34 (29)	42 (41)
- shredder plants	?	-	-	?	?
- cable scrap burning	0.13	-	-	-	0.13
Cement industry	0.08-1.5	-	-	-	0.08-1.5
Fossil fuels					
- pit coal	2	-	-	40 (53)	42 (53)
- other	-	-	-	-	-
Burning biofuels					
- straw	0.07-6.6 (0.05)	-	-	-	0.7-6.6 (0.05)
- woods	0.25	-	-	-	0.25
Wood stoves	1.1 (10-50)	-	-	-	1.1 (10-50)
Heating of houses, gas oil	0.02	-	-	-	0.02
Building, landfill and vehicle fires	?	-	-	-	?
Municipal solid waste	20 (34)	-	-	100 (250)	120 (284)
Incineration of hospital/healthcare risk waste	5 (14)	-	-	-	5 (14)
Incineration of hazardous waste					
- hazardous waste + waste oil	0.23 (1.7)	-	-	1.0	1.23 (1.7)
(KK)	0.038 (0.01)	-	-	-	0.038 (0.01)
- waste oil (district heating)					
Emission from crematoria	0.16	-	-	-	0.16
Sewage sludge					
- sludge landfilled	-	-	-	0.19	0.19
- sludge amended to soil	-	-	1.1	-	1.1
- sludge incinerated	0.072 (1.5)	0.108	-	0.036	0.22 (1.5)
Compost	-	-	1-5	-	1-5
Traffic	0.2 (1.0)	-	-	-	0.2 (1.0)
Textile products	-	0.08	-	-	0.08
Air deposition	-	-	120	-	120

Dk: Figures on PCDD/F emissions for 1995 obtained from NERI <2>

CORINAIR SNAP	ITEM	Emission estimates [g I-TEQ/a]	
		old	new
	SUM	60.4	42,6
01	Combustion in Energy Production and Energy Transformation	10.0	2
02	Combustion in Commercial, Residential...	0.4	1.1
03	Combustion in Industry	nd	1.5
04	Production Processes	2.0	7.5
05	Extraction and Distribution of Fossil Fuels	nd	nd
06	Solvent and Other Product USE	nd	nd
07	Road Transport	nd	0.2
08	Other Mobile Sources and Machinery	nd	nd
09	Waste Treatment and Disposal	48.0	30.3
10	Agriculture, Forestry, Land use change	nd	nd
11	Nature	nd	nd
12	Fires	nd	nd

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

Detailed data sorted out by CORINAIR '94 codes

Corinair Snap	Item	measurements ¹⁾	emission factor ¹⁾	Annual emission [g N-TEQ/a]		reference
				Old	new ²⁾	
01 01	Public power plants (coal fired)	none	not reported	10	2	Danish EPA
02 02 05	domestic comb., wood stoves	Yes, average concentration: 0.18 ng NTEQ/m ³	0.0019 µg NTEQ/kg	10-50	1.1	<3>
	oil/gas combustion	-	-		0.02	
03 01	Combustion in Industry, wood	-	-		0.25	
	Combustion in Industry, straw			0.05	0.68 (0.07-6.6)	
03 03 11	cement				0.35 (0.08-1.5)	
03 03 13	asphalt				0.1	
03 03 26	Other, cable scrap burning				0.13	
04 02 05/06/07	steel production	none	not reported	12	7.5	Danish EPA
04 02 10	shredder installations				?	
07	Road transport			1.0	0.2	

Corinair Snap	Item	measurements ¹⁾	emission factor ¹⁾	Annual emission [g N-TEQ/a]		reference
				Old	new ²⁾	
09 02 01	Incineration of MSW	yes (1988); 10 plants,	1.3 mg/t (total PCDD/F), translates to 19.9 µg NTEQ/t	34	25	<1>
09 02 02	Incineration of hazardous waste			1.7	0.23	
09 02 05	Incineration of sewage sludge			1.5	0.072	
09 02 07	Incineration of clinical waste	yes (1987), 2 plants,	53 mg/t (total PCDD/F), translates to 824 µg NTEQ/t	14	5	<1>
09 02 08	Incineration of waste oil			0,01	0.038	
09 09 01	Cremation				0.16	
12	Fires				?	

DK: Information on PCDD/F air emissions available from Denmark; ¹⁾ only partly available for old data; ²⁾ according to NERI valid for 1995

References

- 1 O. H. Manscher, N. Z. Heidam, J. Vikelsoe, P. Nielsen, P. Blinksbjerg, H. Madsen, L. Pallesen, T. O. Tiernan (1990) : The Danish Incinerator Dioxin Study. Part 1.. Chemosphere 20, 1779-1784
- 2 Eric Runge (NERI), personal communication
- 3 Vikelsoe J., Madsen H. Hansen K. (1994) : Emission of Dioxins from Danish Wood-Stoves. Chemosphere 29, 2019-2027
- 4 A. A. Jensen, Dioxins, Report No 50, 1997, 89 pp., DK-Teknik (1997).