

Annex 3.E

Methodology on CH₄-emission from solid deposited waste are given.

The methodology is a IPCC Tier 2 approach and the model is unchanged since the submission of the NIR2003.

The composition of waste (Table 1) has considerable variation. The composition shown has been kept for all years (1990-2002) reported.

Table 1. Composition of landfilled waste										
Materiale fractions in	Waste food	Card-board	Paper	Wet Card-board and paper	Plastics	Other Combu-stible	Glass	Metal	Other not Combu-stible	Sum
Domestic Waste	0,38	0,02	0,13	0,26	0,07	0,03	0,02	0,05	0,05	1,00
Bulky Waste		0,08	0,23		0,05	0,46	0,09	0,09	0,02	1,00
garden Waste						0,76			0,24	1,00
Commercial & office Waste	0,25	0,31	0,04	0,11	0,05	0,10	0,05	0,05	0,05	1,00
Industrial Waste	0,06	0,02	0,07	0,01	0,01	0,06	0,04	0,18	0,54	1,00
Building & constr. Waste						0,07			0,93	1,00
Sludge						0,29			0,71	1,00
Ash & slag									1,00	1,00

In Table 2 the resulting CH₄ emission factors for the various waste types are shown. The emission factors are based on the assumptions that 50% of the carbon in the landfill is emitted as a gas containing 45% of CH₄.

Table 2. CH₄ emissssionfactors from waste in landfills								
	Domestic Waste	Bulky Waste	Garden Waste	Com-mercial & office Waste	Industrial Waste	Building & cons-truction Waste	Sludge	Ash & slag
Carbon content in %	20	40	25	40	35	40	57	0
Emission factor in kg CH ₄ / ton	54,0	108,0	67,5	108,0	94,5	108,0	153,9	0,0

In Table 3 below the amounts of waste given are given. These data are given as in the official registration of amounts of municipal solid waste deposited at solid waste disposal sites as performed by Danish Environmental Protection Agency. These data for the amounts of waste is used to calculate a potential emission (Table 3) using only emission factors and the amounts of waste for the actual year. Using however, the IPCC Tier 2 method the emissions from waste landfilled the years before are taken into account. A further assumption here is that the half-life of the Carbon in the waste is 10 years, which means that half of Carbon in waste deposited in 10 years time will be converted to CH₄. The result of the calculation of the model is in the column Annual emission of Table 3. The annual emission has to be subtracted the amount of CH₄ collected by the landfill gas plants to result in The Annual net emission. The data for landfill gas plants are according to the Danish Energy Agency.

The total waste amount in Table 3 is taken as the sum of the different waste types. This total is equal to the activity data for the Annual Municipal Solid Waste at Solid Waste Disposal Sites of the CRF table 6.A.

The implied emission factor in the CRF tables reflects an aggregated emission factor for the model. So far this IEF has been increasing from 1990 to 2002 despite the decreasing amount of waste through the time-series. This is due to the time lag of emissions from the waste deposited calculated by the model.

Year	Domestic Waste	Bulky Waste	Garden Waste	Commercial & office Waste	Industrial Waste	Building & construction Waste	Sludge	Ash & slag	Waste Total kt	Potential emission kt CH ₄	Annual emission kt CH ₄	Biogas collected kt CH ₄	Annual net emission kt CH ₄
1990	198,9	250,7	85,2	109,3	822,4	951,4	222,1	535,0	3175,1	85,2	64,0	1,7	62,4
1991	198,7	259,0	70,7	120,0	824,3	804,3	193,3	562,0	3032,3	83,7	65,3	1,7	63,7
1992	198,4	267,3	56,1	130,7	826,2	657,2	164,6	589,0	2889,6	82,2	66,5	1,7	64,8
1993	198,2	275,7	41,6	141,3	828,1	510,1	135,8	616,0	2746,8	80,7	67,4	2,8	64,7
1994	198,0	284,0	27,0	152,0	830,0	363,0	107,0	643,0	2604,0	79,2	68,2	2,8	65,5
1995	190,0	286,0	17,0	128,0	779,0	321,0	101,0	135,0	1957,0	74,7	68,7	6,0	62,7
1996	132,0	275,0	6,0	135,0	822,0	317,0	117,0	703,0	2507,0	71,4	68,8	6,6	62,2
1997	83,0	248,0	6,0	170,0	707,0	264,0	130,0	475,0	2083,0	65,9	68,6	9,4	59,2
1998	98,0	234,0	20,0	161,0	746,0	266,0	124,0	210,0	1859,0	66,3	68,5	10,4	58,1
1999	117,0	239,0	3,0	164,0	582,0	224,0	126,0	12,0	1467,0	63,5	68,2	9,9	58,2
2000	85,0	264,0	7,0	152,0	611,0	269,0	94,0	0,0	1482,0	62,5	67,8	10,3	57,5
2001	50,0	180,0	3,0	150,0	583,0	260,0	64,0	10,0	1300,0	49,9	66,6	10,0	56,6
2002	37,0	161,0	4,0	137,0	520,0	229,0	48,0	38,0	1174,0	43,9	65,1	11,2	53,9