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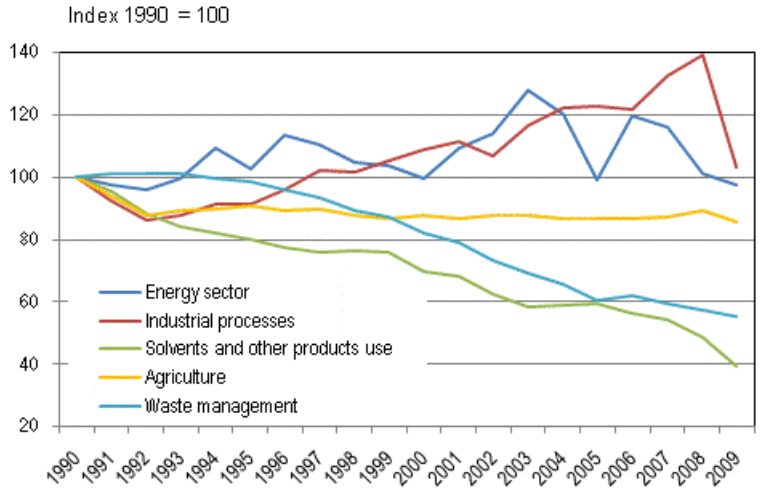
Greenhouse gases 2009

Finland's greenhouse gas emissions in 2009 nearly 7 per cent below the commitment level of the Kyoto Protocol

Greenhouse gas emissions in 2009 amounted to 66.3 million tonnes of carbon dioxide equivalent (t CO2 eq.). The economic downturn was reflected in the greenhouse gas emissions of 2009 in several sectors. Compared with the previous year, emissions decreased by 5.8 per cent. Emissions from energy use of manufacturing diminished most significantly (23%). These data derive from Finland's greenhouse gas inventory delivered by Statistics Finland to the United Nations Framework Convention on Climate Change (UNFCCC) on 15 April 2011.

Development of greenhouse gas emissions by sector in Finland 1990-2009



Greenhouse gas emissions from the energy sector fell by nearly four per cent from 2008. Energy use of manufacturing decreased along with the economic recession and emissions there diminished by 23 per cent. Emissions from electricity and district heat production, however, increased by five per cent as consumption of coal grew in separate production of electricity. The recession was also visible in the decrease in emissions from transport. The use of liquid biofuels also contributed to the five per cent decline in emissions from transport.

Emissions from industrial processes diminished in 2009 by good one quarter from the year before as the production of iron, cement and lime, for instance, contracted along with the recession. The decrease in emissions generated in the production of nitric acid was primarily due to the new emission reduction method implemented in 2009.

Emissions from agriculture have decreased by 14 per cent from 1990. Compared with 2008, the decrease has been around 3.5 per cent. The emissions have diminished due to the decline in nitrogen fertilization, the fallen number of livestock and the intensification of manure treatment.

In the waste sector, the recession had an impact on the amount of waste generated both by municipal waste and those originating from manufacturing. The increase in combustion of waste had a significant effect on the four per cent decline in emissions in the waste sector.

Finland's greenhouse gas emissions without the Land use, Land-Use Change and Forestry (LULUCF) sector (see table below). Emissions as amounts corresponding to million tonnes of CO2

Year	Energy				Industrial processes		Solvents and other products use	Agriculture	Waste management	Emissions without LULUCF
	Energy industries	Manufacturing industries and construction (emissions from energy use of fuels)	Transport	Other fuel use[1)]	Other industrial processes	Consumption of F-gases				
1990	19.19	13.36	12.76	9.18	4.98	0.09	0.18	6.66	3.97	70.36
1991	18.96	12.83	12.40	8.85	4.61	0.07	0.17	6.27	4.01	68.17
1992	18.73	12.30	12.32	8.97	4.35	0.04	0.16	5.86	4.03	66.75
1993	21.47	12.41	11.85	8.55	4.43	0.03	0.15	5.94	4.02	68.86
1994	26.40	12.70	12.20	8.22	4.60	0.04	0.15	5.97	3.97	74.24
1995	24.12	12.14	11.99	7.78	4.54	0.10	0.14	6.05	3.91	70.78
1996	29.83	12.00	11.98	7.92	4.72	0.15	0.14	5.96	3.82	76.51
1997	27.44	12.27	12.55	7.87	4.93	0.24	0.14	5.97	3.72	75.13
1998	24.18	11.94	12.70	8.14	4.87	0.30	0.14	5.85	3.55	71.67
1999	23.66	11.92	12.94	7.86	4.96	0.37	0.14	5.76	3.48	71.08
2000	22.12	11.94	12.84	7.49	4.98	0.54	0.12	5.85	3.27	69.16
2001	27.51	11.48	12.96	7.73	4.96	0.70	0.12	5.78	3.14	74.38
2002	30.26	11.17	13.16	7.66	4.89	0.51	0.11	5.83	2.92	76.52
2003	37.21	11.54	13.34	7.60	5.20	0.70	0.10	5.84	2.75	84.28
2004	32.97	11.63	13.69	7.28	5.48	0.73	0.11	5.77	2.61	80.27
2005	21.93	11.33	13.71	6.98	5.33	0.90	0.11	5.78	2.40	68.48
2006	32.88	11.62	13.90	6.79	5.39	0.79	0.10	5.79	2.46	79.71
2007	30.83	11.46	14.26	6.62	5.77	0.94	0.10	5.80	2.37	78.14
2008	24.25	10.80	13.60	6.41	6.04	1.03	0.09	5.93	2.28	70.42
2009	25.43	8.32	12.92	6.44	4.31	0.93	0.07	5.72	2.19	66.34

1) Other fuel use includes subgategories heating of buildings, other fuel use in agriculture, forestry and fisheries, other fuel use and fugitive emissions from fuels

In Finland, the Land Use, Land Use Change and Forestry sector (LULUCF) is a net sink, that is, removals from the atmosphere exceed emissions to the atmosphere. The net sink grew considerably from the year before, to 40.7 million tonnes of CO2 eq. The biggest carbon sink is the net growth of the growing stock. Forest growth has increased steadily in Finland as from the year 1990. Felling volumes have varied according to the annual market situation and demand. In 2009 market fellings collapsed by one fifth from the previous year, to 41 million cubic metres, which increased the net sink of the growing stock into over 49 million tonnes of CO2 eq. In the sector, the most significant emission sources were emissions from the

soil of drained peatlands (in total, 15.4 million tonnes of CO2 eq.). The carbon absorbed by mineral soil amounted to 6.7 million tonnes of CO2 eq. Estimates of carbon stock changes in soil involve great uncertainties.

Emissions and removals of the LULUCF sector in Finland. Emissions and sinks as amounts corresponding to million tonnes of CO2 (emissions are positive figures, removals negative)

Year	Forest land	Cropland	Grassland	Wetlands	Harvested wood products	Land use, land-use change and forestry (LULUCF)
1990	-21.19	5.45	0.57	1.08	-0.95	-15.04
1991	-35.83	4.82	0.55	1.09	0.31	-29.07
1992	-29.13	4.60	0.51	1.14	-0.22	-23.10
1993	-27.24	4.82	0.50	1.16	-0.09	-20.86
1994	-19.11	4.73	0.51	1.19	-0.76	-13.44
1995	-19.12	5.00	0.49	1.21	-0.87	-13.29
1996	-28.40	5.06	0.47	1.24	-1.05	-22.68
1997	-23.49	5.09	0.44	1.27	-2.12	-18.81
1998	-21.97	5.10	0.42	1.31	-1.77	-16.91
1999	-24.53	5.07	0.43	1.32	-2.04	-19.75
2000	-26.41	4.99	0.40	1.35	-1.27	-20.94
2001	-30.89	5.09	0.42	1.35	-0.31	-24.35
2002	-31.12	5.18	0.42	1.32	-0.44	-24.64
2003	-30.99	5.16	0.41	1.31	-0.89	-24.99
2004	-31.21	5.30	0.42	1.37	-0.83	-24.94
2005	-34.55	5.48	0.40	1.35	-0.34	-27.66
2006	-38.25	5.72	0.42	1.34	-0.45	-31.22
2007	-29.35	5.94	0.46	1.35	-1.73	-23.34
2008	-34.83	6.26	0.51	1.36	-0.31	-27.01
2009	-47.19	6.55	0.50	1.30	-1.71	-40.56

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Appendix table 1. Greenhouse gas emissions in Finland 1990–2009

	Energy sector	Industrial processes	Solvents and other products use	Agriculture	Waste management	Emissions without LULUCF	Land use, land-use change and forestry (LULUCF)[1)]
	million tonnes CO2 eq.						
1990	54.48	5.07	0.18	6.66	3.97	70.36	-15.04
1991	53.05	4.68	0.17	6.27	4.01	68.17	-29.07
1992	52.32	4.38	0.16	5.86	4.03	66.75	-23.10
1993	54.28	4.46	0.15	5.94	4.02	68.86	-20.86
1994	59.52	4.64	0.15	5.97	3.97	74.24	-13.44
1995	56.04	4.64	0.14	6.05	3.91	70.78	-13.29
1996	61.73	4.87	0.14	5.96	3.82	76.51	-22.68
1997	60.13	5.18	0.14	5.97	3.72	75.13	-18.81
1998	56.96	5.17	0.14	5.85	3.55	71.67	-16.91
1999	56.38	5.33	0.14	5.76	3.48	71.08	-19.75
2000	54.40	5.52	0.12	5.85	3.27	69.16	-20.94
2001	59.68	5.66	0.12	5.78	3.14	74.38	-24.35
2002	62.25	5.41	0.11	5.83	2.92	76.52	-24.64
2003	69.69	5.90	0.10	5.84	2.75	84.28	-24.99
2004	65.57	6.21	0.11	5.77	2.61	80.27	-24.94
2005	53.95	6.23	0.11	5.78	2.40	68.48	-27.66
2006	65.19	6.18	0.10	5.79	2.46	79.71	-31.22
2007	63.17	6.71	0.10	5.80	2.37	78.14	-23.34
2008	55.06	7.07	0.09	5.93	2.28	70.42	-27.01
2009	53.11	5.24	0.07	5.72	2.19	66.34	-40.56

1) Emissions are positive figures, removals negative

Appendix table 2. Carbon dioxide emissions in Finland 1990–2009

	Energy industries	Manu-facturing industries and const-ruction (emissions from energy use of fuels)	Trans-port	Heating of buildings, other fuel use in agri-culture, forestry and fisheries	Other fuel use	Fugitive emissions from fuels	Industrial processes	Solvents and other products use	Emissions without LULUCF	Land use, land-use change and forestry (LULUCF)[1)]
	million tonnes CO2 eq.									
1990	19.06	13.17	12.48	7.04	1.19	0.22	3.32	0.12	56.59	-15.16
1991	18.82	12.66	12.13	6.89	1.02	0.21	3.17	0.11	55.01	-29.18
1992	18.58	12.14	12.05	6.99	1.03	0.22	3.04	0.10	54.15	-23.21
1993	21.29	12.23	11.59	6.51	1.03	0.27	3.06	0.09	56.07	-20.97
1994	26.20	12.52	11.94	6.16	1.14	0.17	3.16	0.08	61.36	-13.56
1995	23.92	11.96	11.74	5.70	1.20	0.17	3.07	0.08	57.83	-13.40
1996	29.59	11.82	11.72	5.81	1.22	0.15	3.24	0.08	63.64	-22.80
1997	27.20	12.07	12.30	5.83	1.13	0.20	3.48	0.07	62.28	-18.94
1998	23.95	11.74	12.45	5.92	1.38	0.14	3.48	0.07	59.13	-17.04
1999	23.43	11.72	12.68	5.83	1.23	0.13	3.58	0.07	58.67	-19.87
2000	21.90	11.73	12.59	5.47	1.26	0.13	3.58	0.07	56.73	-21.07
2001	27.23	11.29	12.71	5.69	1.23	0.12	3.64	0.07	61.99	-24.48
2002	29.94	10.98	12.91	5.64	1.22	0.12	3.54	0.07	64.43	-24.77
2003	36.85	11.35	13.10	5.56	1.23	0.12	3.77	0.06	72.04	-25.12
2004	32.63	11.44	13.45	5.43	1.07	0.11	3.96	0.06	68.16	-25.08
2005	21.65	11.15	13.48	5.24	0.98	0.13	3.69	0.06	56.38	-27.80
2006	32.52	11.44	13.67	5.05	0.98	0.11	3.93	0.06	67.76	-31.37
2007	30.47	11.29	14.04	4.94	0.91	0.13	4.28	0.06	66.13	-23.48
2008	23.93	10.64	13.38	4.75	0.92	0.14	4.44	0.05	58.25	-27.17
2009	25.12	8.19	12.71	4.84	0.89	0.12	3.50	0.05	55.41	-40.70

1) Emissions are positive figures, removals negative

Appendix table 3. Methane emissions in Finland 1990–2009

	Energy industries	Manu-facturing indust-ries and cons-truction (emis-sions from energy use of fuels)	Trans-port	Heating of buil-dings, other fuel use in agri-culture, forestry and fisheries	Other fuel use	Fugitive emis-sions from fuels	Indust-rial proces-ses	Enteric fermen-tation	Manure manage-ment	Field burning of agri-cultural residues	Waste manage-ment	Emis-sions without LULUCF	Land use, land-use change and forestry (LULUCF)
	1000 tonnes												
1990	0.4	0.6	4.7	8.7	0.1	0.5	0.2	92.0	11.8	0.09	181.4	300.7	1.6
1991	0.4	0.6	4.5	8.7	0.1	2.0	0.2	88.5	11.5	0.01	183.4	299.9	1.5
1992	0.4	0.6	4.4	8.8	0.1	2.7	0.2	85.5	11.6	0.01	184.2	298.5	1.7
1993	0.5	0.6	4.2	8.7	0.1	3.5	0.4	85.6	11.9	0.02	184.1	299.7	1.6
1994	0.6	0.7	4.0	8.8	0.1	3.8	0.5	85.7	12.5	0.01	181.4	298.0	1.7
1995	0.6	0.7	3.9	8.8	0.1	3.8	0.5	80.8	12.9	0.02	178.5	290.6	1.7
1996	0.7	0.7	3.7	9.2	0.1	3.9	0.5	81.0	13.0	0.03	174.1	286.9	1.7
1997	0.8	0.7	3.6	9.2	0.1	3.4	0.4	81.9	13.8	0.02	169.3	283.3	1.8
1998	0.8	0.7	3.5	9.3	0.1	3.5	0.5	80.0	13.5	0.01	161.7	273.6	1.7
1999	0.8	0.7	3.4	9.1	0.1	2.8	0.5	78.8	13.3	0.01	158.0	267.4	1.8
2000	0.7	0.7	3.2	8.9	0.1	2.6	0.5	78.9	13.6	0.04	148.2	257.4	1.8
2001	0.9	0.7	3.0	9.9	0.1	3.2	0.5	77.9	13.1	0.02	141.9	251.2	1.9
2002	1.2	0.7	2.9	10.2	0.1	2.7	0.5	78.6	13.7	0.02	131.7	242.3	1.9
2003	1.3	0.7	2.8	10.3	0.10	2.9	0.4	77.7	14.2	0.02	123.2	233.7	1.9
2004	1.2	0.7	2.6	10.3	0.09	2.6	0.5	76.9	14.2	0.02	116.7	225.7	1.8
2005	1.0	0.7	2.4	10.3	0.08	3.1	0.4	76.3	14.6	0.01	106.7	215.6	1.9
2006	1.2	0.7	2.2	10.6	0.07	2.6	0.4	76.4	14.6	0.02	109.5	218.3	1.9
2007	1.1	0.7	2.1	10.7	0.06	2.4	0.4	75.3	14.5	0.03	105.0	212.4	1.8
2008	1.0	0.6	1.9	10.4	0.07	2.3	0.4	74.8	14.7	0.03	100.5	206.9	1.8
2009	1.0	0.5	1.8	11.3	0.06	2.2	0.4	75.2	14.1	0.02	96.8	203.5	1.7

Appendix table 4. Nitrous oxide emissions in Finland 1990–2009

	Energy industries	Manu-facturing industries and construction (emissions from energy use of fuels)	Trans-port	Heating of buildings, other fuel use in agri-culture, forestry and fisheries	Other fuel use	Industrial processes	Solvents and other products use	Manure manage-ment	Agri-cultural soils	Waste manage-ment	Emissions without LULUCF[1)]	Land use, land-use change and forestry (LULUCF)
	1000 tonnes											
1990	0.4	0.6	0.6	0.3	1.4	5.3	0.2	1.6	12.9	0.5	23.8	0.3
1991	0.4	0.5	0.6	0.3	1.4	4.6	0.2	1.5	12.0	0.5	21.9	0.3
1992	0.5	0.5	0.6	0.3	1.3	4.2	0.2	1.4	10.9	0.5	20.3	0.2
1993	0.5	0.5	0.6	0.3	1.3	4.4	0.2	1.4	11.1	0.5	20.8	0.2
1994	0.6	0.5	0.6	0.3	1.3	4.6	0.2	1.5	11.1	0.5	21.2	0.3
1995	0.6	0.5	0.6	0.2	1.2	4.7	0.2	1.4	11.7	0.5	21.8	0.2
1996	0.7	0.5	0.6	0.3	1.2	4.7	0.2	1.5	11.4	0.5	21.6	0.3
1997	0.7	0.6	0.6	0.3	1.2	4.7	0.2	1.5	11.3	0.5	21.5	0.3
1998	0.7	0.6	0.6	0.3	1.1	4.4	0.2	1.5	11.1	0.5	20.9	0.3
1999	0.7	0.6	0.6	0.3	1.1	4.3	0.2	1.4	10.9	0.5	20.6	0.3
2000	0.7	0.6	0.6	0.2	1.0	4.4	0.2	1.4	11.2	0.5	20.8	0.3
2001	0.8	0.6	0.6	0.3	1.0	4.2	0.2	1.3	11.1	0.5	20.6	0.3
2002	0.9	0.6	0.6	0.3	1.0	4.3	0.1	1.4	11.2	0.5	20.9	0.3
2003	1.1	0.6	0.6	0.3	1.1	4.5	0.1	1.4	11.2	0.5	21.3	0.3
2004	1.0	0.6	0.6	0.3	1.0	4.8	0.1	1.4	11.1	0.5	21.4	0.3
2005	0.8	0.5	0.6	0.2	0.9	5.2	0.2	1.4	11.1	0.5	21.5	0.3
2006	1.1	0.5	0.6	0.2	0.9	4.6	0.1	1.3	11.2	0.5	21.2	0.3
2007	1.1	0.5	0.6	0.2	0.9	4.8	0.1	1.3	11.3	0.5	21.3	0.3
2008	1.0	0.5	0.6	0.2	0.8	5.1	0.1	1.4	11.7	0.5	21.9	0.4
2009	0.9	0.4	0.6	0.3	0.8	2.6	0.1	1.3	11.1	0.5	18.4	0.4

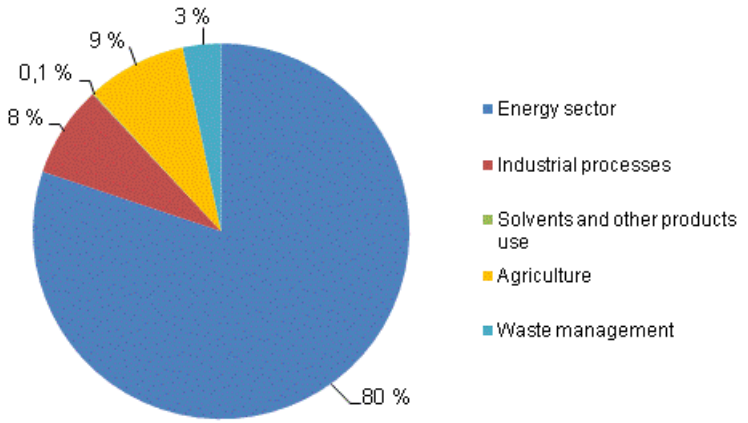
1) Fugitive emissions from fuels and emissions from field burning of agricultural residues included in the total emissions are not presented in this table. Those emissions are annually under 0.005 thousand tonnes

Appendix table 5. Emissions of F-gases in Finland 1990–2009

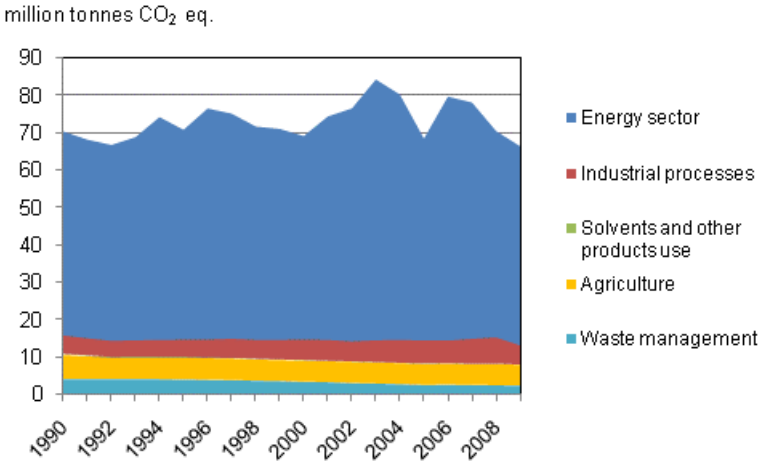
	HFC	PFC	SF6
	1000 tonnes CO2 eq.		
1990	0.02	0.1	94.4
1991	0.05	0.1	67.3
1992	0.1	0.1	36.6
1993	0.1	0.1	33.6
1994	6.5	0.1	34.9
1995	29.3	0.1	68.5
1996	77.3	0.2	72.2
1997	167.8	0.2	76.0
1998	245.2	0.2	53.2
1999	318.3	28.0	52.0
2000	491.8	22.5	51.5
2001	646.4	20.1	55.0
2002	463.2	13.4	51.3
2003	651.3	14.9	48.1
2004	693.7	12.2	33.8
2005	863.5	9.9	34.8
2006	747.2	15.4	40.2
2007	903.3	8.4	36.0
2008	993.2	11.2	40.4
2009	888.8	9.3	41.3

Appendix figures

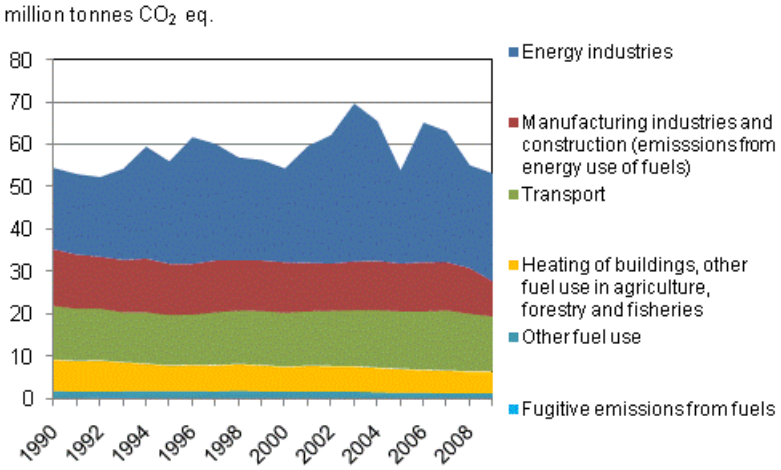
Appendix figure 1: Greenhouse gas emissions in Finland by sectors in 2009



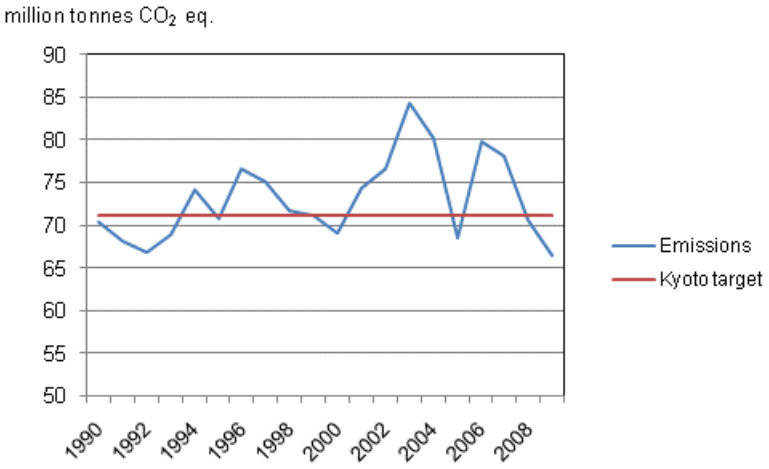
Appendix figure 2: Greenhouse gas emissions in Finland in 1990 - 2009



Appendix figure 3: Development of emissions in Finland in the energy sector in 1990 - 2009



Appendix figure 4: Greenhouse gas emission in Finland in 1990 - 2009 in relation to the Kyoto target level



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