

Greenhouse gases

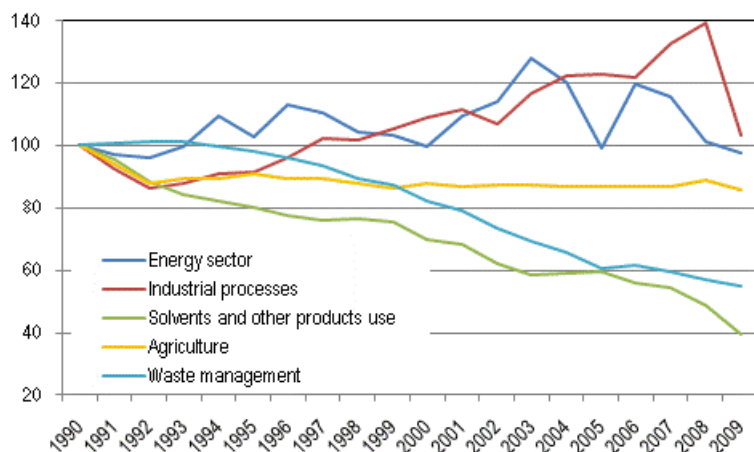
2009, preliminary data

Finland's greenhouse gas emissions 6 per cent below the commitment level of the Kyoto Protocol

According to the preliminary estimate to be submitted to the European Commission on 15 January 2010, greenhouse gas emissions in Finland amounted to 66.4 Mt of CO₂ equivalent in 2009. Compared with the previous year, emissions decreased by six per cent. Decreases took place in all sectors. Decreases were most notable in emissions from industrial processes (26%), use of fuels in industry and construction (23%) and transport (5%). Emissions from agriculture and waste management declined by three to four per cent. The net sink of the Land Use, Land-Use Change and Forestry (LULUCF) sector grew considerably to 40.7 million tonnes. Sinks of the LULUCF sector are not included as full amounts in the commitments under the Kyoto Protocol.

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

Index 1990 = 100



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 | 12.79 | 9.18 | 4.98 | 0.09 | 0.18 | 6.66 | 3.97 | 70.40 |
| 1991 | 18.96 | 12.83 | 12.43 | 8.85 | 4.61 | 0.07 | 0.17 | 6.27 | 4.01 | 68.20 |
| 1992 | 18.73 | 12.30 | 12.35 | 8.97 | 4.35 | 0.04 | 0.16 | 5.86 | 4.03 | 66.78 |
| 1993 | 21.47 | 12.41 | 11.88 | 8.55 | 4.43 | 0.03 | 0.15 | 5.94 | 4.02 | 68.89 |
| 1994 | 26.40 | 12.70 | 12.23 | 8.22 | 4.56 | 0.04 | 0.15 | 5.97 | 3.97 | 74.23 |
| 1995 | 24.12 | 12.14 | 12.03 | 7.78 | 4.54 | 0.10 | 0.14 | 6.05 | 3.91 | 70.81 |
| 1996 | 29.83 | 12.00 | 12.00 | 7.92 | 4.72 | 0.15 | 0.14 | 5.96 | 3.82 | 76.53 |
| 1997 | 27.44 | 12.27 | 12.59 | 7.87 | 4.93 | 0.24 | 0.14 | 5.97 | 3.72 | 75.17 |
| 1998 | 24.18 | 11.94 | 12.74 | 8.14 | 4.87 | 0.30 | 0.14 | 5.85 | 3.55 | 71.70 |
| 1999 | 23.66 | 11.92 | 12.94 | 7.86 | 4.93 | 0.40 | 0.14 | 5.76 | 3.48 | 71.08 |
| 2000 | 22.12 | 11.94 | 12.84 | 7.49 | 4.95 | 0.57 | 0.12 | 5.85 | 3.27 | 69.16 |
| 2001 | 27.51 | 11.48 | 12.96 | 7.73 | 4.94 | 0.72 | 0.12 | 5.77 | 3.14 | 74.38 |
| 2002 | 30.26 | 11.17 | 13.15 | 7.66 | 4.88 | 0.53 | 0.11 | 5.83 | 2.92 | 76.52 |
| 2003 | 37.21 | 11.54 | 13.34 | 7.60 | 5.19 | 0.71 | 0.10 | 5.83 | 2.75 | 84.27 |
| 2004 | 32.97 | 11.63 | 13.68 | 7.28 | 5.47 | 0.74 | 0.11 | 5.77 | 2.61 | 80.26 |
| 2005 | 21.93 | 11.34 | 13.71 | 6.98 | 5.32 | 0.91 | 0.11 | 5.78 | 2.40 | 68.47 |
| 2006 | 32.88 | 11.62 | 13.90 | 6.78 | 5.37 | 0.80 | 0.10 | 5.78 | 2.46 | 79.70 |
| 2007 | 30.83 | 11.46 | 14.27 | 6.61 | 5.77 | 0.95 | 0.10 | 5.79 | 2.37 | 78.14 |
| 2008 | 24.25 | 10.80 | 13.68 | 6.42 | 6.02 | 1.04 | 0.09 | 5.93 | 2.28 | 70.51 |
| 2009 | 25.43 | 8.33 | 13.01 | 6.47 | 4.30 | 0.94 | 0.07 | 5.71 | 2.19 | 66.44 |

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

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 | -21.20 | 5.42 | 0.63 | 1.01 | -0.95 | -15.08 |
| 1991 | -35.84 | 4.78 | 0.61 | 1.03 | 0.31 | -29.12 |
| 1992 | -29.13 | 4.55 | 0.57 | 1.07 | -0.22 | -23.16 |
| 1993 | -27.24 | 4.77 | 0.55 | 1.09 | -0.09 | -20.93 |
| 1994 | -19.12 | 4.66 | 0.57 | 1.12 | -0.76 | -13.53 |
| 1995 | -19.13 | 4.94 | 0.54 | 1.14 | -0.87 | -13.38 |
| 1996 | -28.42 | 4.94 | 0.53 | 1.17 | -1.05 | -22.83 |
| 1997 | -23.52 | 4.94 | 0.52 | 1.20 | -2.12 | -18.98 |
| 1998 | -22.01 | 4.92 | 0.50 | 1.24 | -1.77 | -17.11 |
| 1999 | -24.57 | 4.88 | 0.51 | 1.26 | -2.04 | -19.97 |
| 2000 | -26.45 | 4.79 | 0.51 | 1.28 | -1.27 | -21.14 |
| 2001 | -30.94 | 4.87 | 0.53 | 1.28 | -0.31 | -24.58 |
| 2002 | -31.16 | 5.01 | 0.53 | 1.26 | -0.44 | -24.79 |
| 2003 | -31.01 | 4.95 | 0.53 | 1.27 | -0.89 | -25.16 |
| 2004 | -31.21 | 5.12 | 0.54 | 1.33 | -0.83 | -25.06 |
| 2005 | -34.55 | 5.32 | 0.54 | 1.31 | -0.34 | -27.71 |
| 2006 | -38.24 | 5.59 | 0.55 | 1.31 | -0.45 | -31.24 |
| 2007 | -29.30 | 5.75 | 0.57 | 1.31 | -1.73 | -23.42 |
| 2008 | -34.59 | 5.94 | 0.57 | 1.31 | -0.31 | -27.07 |
| 2009 | -46.90 | 6.07 | 0.57 | 1.24 | -1.71 | -40.73 |

Contents

Tables

Appendix tables

| | |
|----------------------------------------------------------------------------------|---|
| Appendix table 1. Greenhouse gas emissions in Finland 1990–2009..... | 5 |
| Appendix table 2. Carbon dioxide emissions in Finland 1990, 1995, 2000–2009..... | 6 |
| Appendix table 3. Methane emissions in Finland 1990, 1995–2009..... | 7 |
| Appendix table 4. Nitrous oxide emissions in Finland 1990, 1995–2009..... | 8 |
| Appendix table 5. Emissions of F-gases in Finland 1990–2009..... | 9 |

Figures

Appendix figures

| | |
|-----------------------------------------------------------------------------------------------------------------|----|
| Appendix figure 1: Greenhouse gas emissions in Finland by sectors in 2009 ¹ | 10 |
| Appendix figure 2: Greenhouse gas emissions in Finland in 1990 - 2009..... | 10 |
| Appendix figure 3: Development of emissions in Finland in the energy sector in 1990 - 2009..... | 11 |
| Appendix figure 4: Greenhouse gas emission in Finland in 1990 - 2009 in relation to the Kyoto target level..... | 11 |

Appendix tables

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 | 54.52 | 5.07 | 0.18 | 6.66 | 3.97 | 70.40 | -15.08 |
| 1991 | 53.08 | 4.68 | 0.17 | 6.27 | 4.01 | 68.20 | -29.12 |
| 1992 | 52.36 | 4.38 | 0.16 | 5.86 | 4.03 | 66.78 | -23.16 |
| 1993 | 54.31 | 4.46 | 0.15 | 5.94 | 4.02 | 68.89 | -20.93 |
| 1994 | 59.55 | 4.60 | 0.15 | 5.97 | 3.97 | 74.23 | -13.53 |
| 1995 | 56.07 | 4.64 | 0.14 | 6.05 | 3.91 | 70.81 | -13.38 |
| 1996 | 61.75 | 4.87 | 0.14 | 5.96 | 3.82 | 76.53 | -22.83 |
| 1997 | 60.17 | 5.18 | 0.14 | 5.97 | 3.72 | 75.17 | -18.98 |
| 1998 | 57.00 | 5.17 | 0.14 | 5.85 | 3.55 | 71.70 | -17.11 |
| 1999 | 56.38 | 5.33 | 0.14 | 5.76 | 3.48 | 71.08 | -19.97 |
| 2000 | 54.40 | 5.52 | 0.12 | 5.85 | 3.27 | 69.16 | -21.14 |
| 2001 | 59.68 | 5.66 | 0.12 | 5.77 | 3.14 | 74.38 | -24.58 |
| 2002 | 62.25 | 5.41 | 0.11 | 5.83 | 2.92 | 76.52 | -24.79 |
| 2003 | 69.69 | 5.90 | 0.10 | 5.83 | 2.75 | 84.27 | -25.16 |
| 2004 | 65.57 | 6.21 | 0.11 | 5.77 | 2.61 | 80.26 | -25.06 |
| 2005 | 53.95 | 6.23 | 0.11 | 5.78 | 2.40 | 68.47 | -27.71 |
| 2006 | 65.18 | 6.18 | 0.10 | 5.78 | 2.46 | 79.70 | -31.24 |
| 2007 | 63.16 | 6.71 | 0.10 | 5.79 | 2.37 | 78.14 | -23.42 |
| 2008 | 55.16 | 7.07 | 0.09 | 5.93 | 2.28 | 70.51 | -27.07 |
| 2009 | 53.23 | 5.24 | 0.07 | 5.71 | 2.19 | 66.44 | -40.73 |

1) Emissions are positive figures, removals negative

Appendix table 2. Carbon dioxide emissions in Finland 1990, 1995, 2000–2009

| | 1990 | 1995 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|--------------------------------------------------------------------------------|------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| | million tonnes CO2 eq. | | | | | | | | | | | |
| Energy industries | 19.06 | 23.92 | 21.90 | 27.23 | 29.94 | 36.85 | 32.63 | 21.65 | 32.52 | 30.47 | 23.93 | 25.12 |
| Manufacturing industries and construction (emissions from energy use of fuels) | 13.17 | 11.96 | 11.73 | 11.29 | 10.98 | 11.35 | 11.44 | 11.15 | 11.44 | 11.29 | 10.64 | 8.19 |
| Transport | 12.52 | 11.77 | 12.59 | 12.71 | 12.91 | 13.10 | 13.44 | 13.48 | 13.67 | 14.04 | 13.47 | 12.80 |
| Heating of buildings, other fuel use in agriculture, forestry and fisheries | 7.04 | 5.70 | 5.47 | 5.69 | 5.64 | 5.56 | 5.43 | 5.24 | 5.05 | 4.94 | 4.75 | 4.85 |
| Other fuel use | 1.19 | 1.20 | 1.26 | 1.23 | 1.22 | 1.23 | 1.07 | 0.98 | 0.97 | 0.91 | 0.93 | 0.91 |
| Fugitive emissions from fuels | 0.22 | 0.17 | 0.13 | 0.12 | 0.12 | 0.12 | 0.11 | 0.13 | 0.11 | 0.13 | 0.14 | 0.12 |
| Industrial processes | 3.32 | 3.07 | 3.58 | 3.64 | 3.54 | 3.77 | 3.96 | 3.69 | 3.93 | 4.28 | 4.44 | 3.50 |
| Solvents and other products use | 0.12 | 0.08 | 0.07 | 0.07 | 0.07 | 0.06 | 0.06 | 0.06 | 0.06 | 0.06 | 0.05 | 0.05 |
| Emissions without LULUCF | 56.63 | 57.86 | 56.73 | 61.99 | 64.43 | 72.04 | 68.16 | 56.38 | 67.75 | 66.12 | 58.34 | 55.52 |
| Land use, land-use change and forestry (LULUCF) ¹⁾ | -15.21 | -13.49 | -21.27 | -24.71 | -24.92 | -25.29 | -25.20 | -27.85 | -31.39 | -23.56 | -27.23 | -40.88 |

1) Emissions are positive figures, removals negative

Appendix table 3. Methane emissions in Finland 1990, 1995–2009

| | 1990 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|--------------------------------------------------------------------------------|-------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 1000 tonnes | | | | | | | | | | | | | | | |
| Energy industries | 0.4 | 0.6 | 0.7 | 0.8 | 0.8 | 0.8 | 0.7 | 0.9 | 1.2 | 1.3 | 1.2 | 1.0 | 1.2 | 1.1 | 1.0 | 1.0 |
| Manufacturing industries and construction (emissions from energy use of fuels) | 0.6 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.6 | 0.5 |
| Transport | 4.7 | 3.9 | 3.7 | 3.6 | 3.5 | 3.4 | 3.2 | 3.0 | 2.9 | 2.8 | 2.6 | 2.4 | 2.2 | 2.1 | 1.9 | 1.8 |
| Heating of buildings, other fuel use in agriculture, forestry and fisheries | 8.7 | 8.8 | 9.2 | 9.2 | 9.3 | 9.1 | 8.9 | 9.9 | 10.2 | 10.3 | 10.3 | 10.3 | 10.6 | 10.7 | 10.4 | 11.3 |
| Other fuel use | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 |
| Fugitive emissions from fuels | 0.5 | 3.8 | 3.9 | 3.4 | 3.5 | 2.8 | 2.6 | 3.2 | 2.7 | 2.9 | 2.6 | 3.1 | 2.6 | 2.4 | 2.3 | 2.2 |
| Industrial processes | 0.2 | 0.5 | 0.5 | 0.4 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.4 | 0.5 | 0.4 | 0.4 | 0.4 | 0.4 | 0.4 |
| Enteric fermentation | 92.0 | 80.8 | 81.0 | 81.9 | 80.0 | 78.8 | 78.9 | 77.9 | 78.6 | 77.7 | 76.9 | 76.3 | 76.4 | 75.3 | 74.8 | 75.2 |
| Manure management | 11.8 | 12.9 | 13.0 | 13.8 | 13.5 | 13.3 | 13.6 | 13.1 | 13.7 | 14.2 | 14.2 | 14.6 | 14.6 | 14.5 | 14.7 | 14.0 |
| Field burning of agricultural residues | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Waste management | 181.4 | 178.5 | 174.1 | 169.3 | 161.7 | 158.0 | 148.2 | 141.9 | 131.7 | 123.2 | 116.7 | 106.7 | 109.5 | 105.0 | 100.5 | 96.8 |
| Emissions without LULUCF | 300.7 | 290.6 | 286.9 | 283.3 | 273.6 | 267.4 | 257.4 | 251.2 | 242.3 | 233.7 | 225.7 | 215.6 | 218.3 | 212.4 | 206.9 | 203.3 |
| Land use, land-use change and forestry (LULUCF) | 1.6 | 1.7 | 1.7 | 1.8 | 1.7 | 1.8 | 1.8 | 1.9 | 1.9 | 1.9 | 1.8 | 1.9 | 1.9 | 1.8 | 1.8 | 1.7 |

Appendix table 4. Nitrous oxide emissions in Finland 1990, 1995–2009

| | 1990 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 |
|--------------------------------------------------------------------------------|-------------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 1000 tonnes | | | | | | | | | | | | | | | |
| Energy industries | 0.4 | 0.6 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.8 | 0.9 | 1.1 | 1.0 | 0.8 | 1.1 | 1.1 | 1.0 | 0.9 |
| Manufacturing industries and construction (emissions from energy use of fuels) | 0.6 | 0.5 | 0.5 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.5 | 0.5 | 0.5 | 0.5 | 0.4 |
| Transport | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 |
| Heating of buildings, other fuel use in agriculture, forestry and fisheries | 0.3 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 |
| Other fuel use | 1.4 | 1.2 | 1.2 | 1.2 | 1.1 | 1.1 | 1.0 | 1.0 | 1.0 | 1.1 | 1.0 | 0.9 | 0.9 | 0.9 | 0.8 | 0.8 |
| Fugitive emissions from fuels ¹⁾ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Industrial processes | 5.3 | 4.7 | 4.7 | 4.7 | 4.4 | 4.3 | 4.4 | 4.2 | 4.3 | 4.5 | 4.8 | 5.2 | 4.6 | 4.8 | 5.1 | 2.6 |
| Solvents and other products use | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 |
| Manure management | 1.6 | 1.4 | 1.5 | 1.5 | 1.5 | 1.4 | 1.4 | 1.3 | 1.4 | 1.4 | 1.4 | 1.4 | 1.3 | 1.3 | 1.4 | 1.3 |
| Agricultural soils | 12.9 | 11.7 | 11.4 | 11.3 | 11.1 | 10.9 | 11.2 | 11.1 | 11.2 | 11.2 | 11.1 | 11.1 | 11.1 | 11.3 | 11.7 | 11.1 |
| Field burning of agricultural residues ¹⁾ | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Waste management | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |
| Emissions without LULUCF | 23.8 | 21.8 | 21.6 | 21.5 | 20.9 | 20.6 | 20.8 | 20.6 | 20.9 | 21.3 | 21.4 | 21.5 | 21.2 | 21.3 | 21.9 | 18.4 |
| Land use, land-use change and forestry (LULUCF) | 0.3 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.4 | 0.3 |

1) Notation 0.0 means that the value of the quantity is less than 0.05

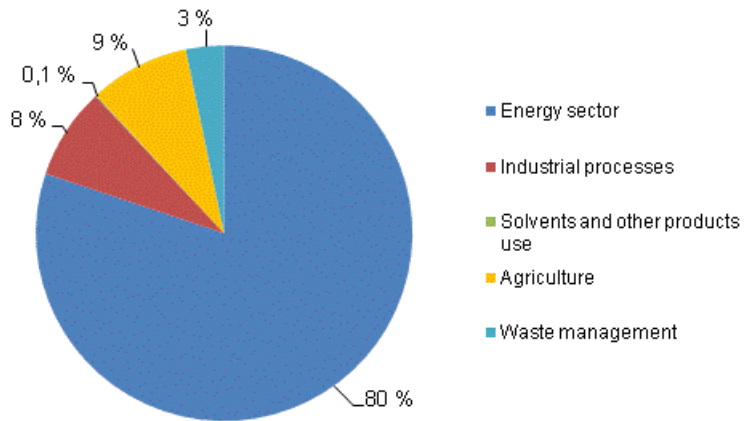
Appendix table 5. Emissions of F-gases in Finland 1990–2009

| | HFC ¹⁾ | PFC | SF6 |
|------|---------------------|------|------|
| | 1000 tonnes CO2 eq. | | |
| 1990 | 0.0 | 0.1 | 94.4 |
| 1991 | 0.1 | 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 | 318.4 | 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 | 693.8 | 12.2 | 33.8 |
| 2005 | 863.5 | 9.9 | 34.8 |
| 2006 | 747.2 | 15.4 | 40.3 |
| 2007 | 903.3 | 8.4 | 36.0 |
| 2008 | 993.2 | 11.2 | 40.4 |
| 2009 | 888.8 | 9.3 | 41.3 |

1) Notation 0.0 means that the value of the quantity is less than 0.05

Appendix figures

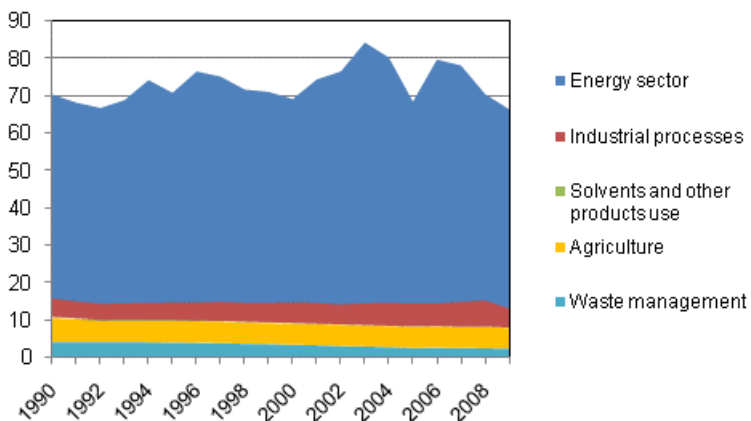
Appendix figure 1: Greenhouse gas emissions in Finland by sectors in 2009¹



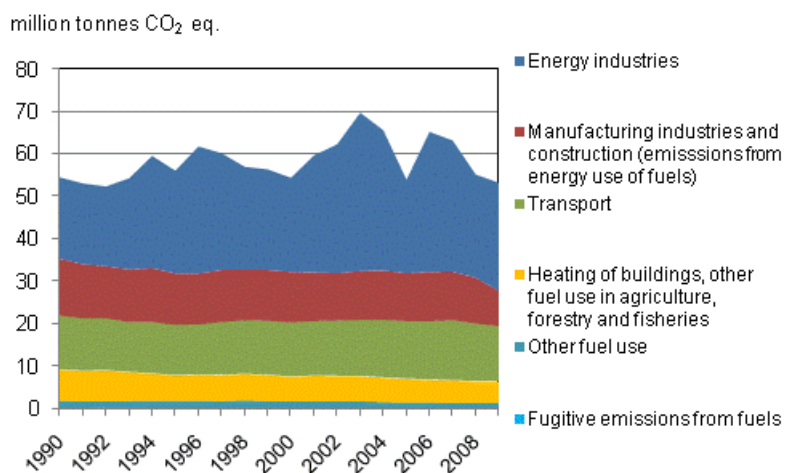
¹ Correction 13.12.2010: Percentages of the figure corrected. (Incorrect percentages were: 78, 10, 0, 8 and 3.)

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

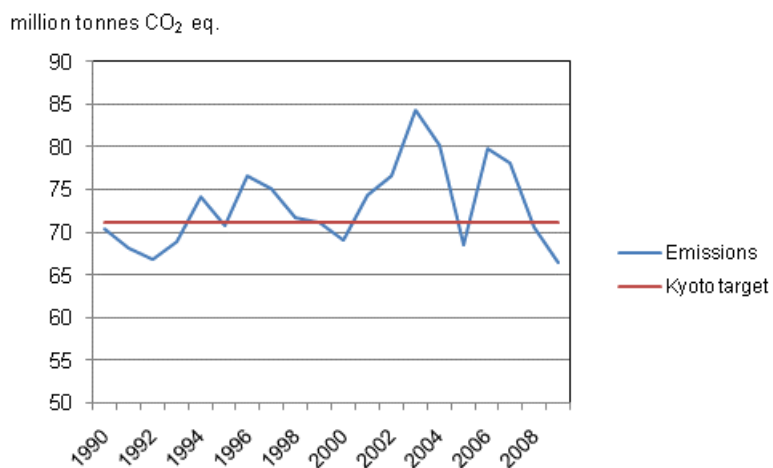
million tonnes CO₂ eq.



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



Suomen virallinen tilasto
Finlands officiella statistik
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Source: Greenhouse gas inventory unit, Statistics Finland