

Guernsey Annual Greenhouse Gas Bulletin 2008

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Introduction

The Greenhouse Gas Bulletin provides annual updates of Guernsey's greenhouse gas emissions inventory. The data is provided by AEA Technology, a UK based company which calculates greenhouse gas emissions for the UK and British Isles on behalf of the Department of Energy and Climate Change. The inventories for all jurisdictions are released at the same time each year. However, due to the large amounts of information which needs to be compiled by AEA from across the UK, the inventories tend to be released about 15 months after the end of the year which it relates to.

Guernsey has signed up to the Kyoto protocol, which set a target reduction in greenhouse gas emissions of 12.5% by 2008-2012 (average) compared to 1990. This analysis provided in this bulletin uses the 1990 base year for comparison.

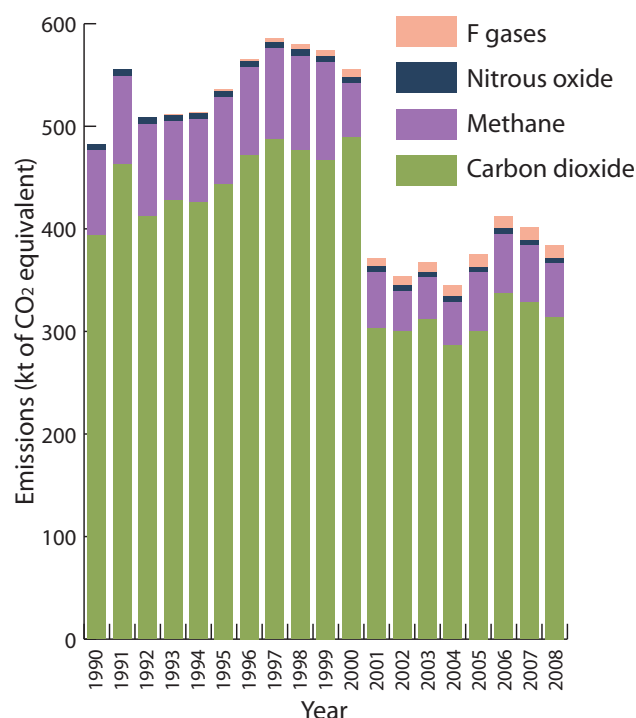
Headlines

- Guernsey's greenhouse gas emissions decreased by 4.4% in 2008, when they totalled 348.0kt of carbon dioxide (CO₂) equivalent, compared to 401.7kt in 2007.
- The cumulative percentage change since 1990 was a decrease of 20.4% (or 98.2kt of CO₂ equivalent), which exceeds the Kyoto Protocol Target of a decrease of 12.5%.
- Power generation contributed the largest proportion (30%) of the greenhouse gases emitted in 2008.
- The majority of the emissions were in the form of carbon dioxide.

Table 1: Key data

Year	Total emissions (kt of CO ₂ equivalent)	Annual % change	Cumulative % change
1990	482.2	n/a	n/a
1991	555.3	15.2	15.2
1992	508.4	-8.5	5.4
1993	511.4	0.6	6.1
1994	513.7	0.5	6.5
1995	536.3	4.4	11.2
1996	565.7	5.5	17.3
1997	585.8	3.6	21.5
1998	579.8	-1.0	20.2
1999	574.3	-1.0	19.1
2000	555.2	-3.3	15.1
2001	371.4	-34.9	-25.1
2002	353.8	-2.1	-26.6
2003	367.6	3.9	-23.8
2004	344.9	-6.2	-28.5
2005	374.8	8.7	-22.3
2006	412.6	10.1	-14.4
2007	401.7	-2.7	-16.7
2008	384.0	-4.4	-20.4

Figure 1: Total emissions

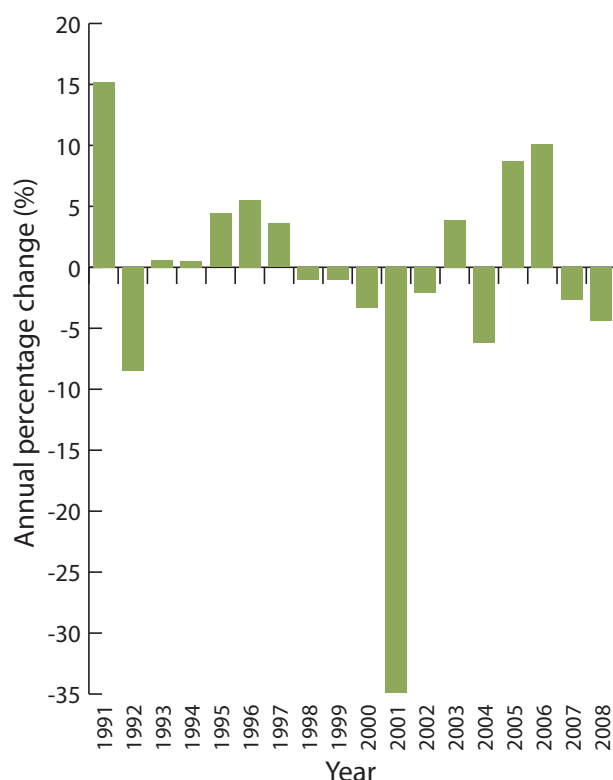


Emissions Inventory

Table 2: Emissions by type

Year	Carbon Dioxide (kt)	Methane (kt of CO ₂ equivalent)	Nitrous Oxide (kt of CO ₂ equivalent)	F-Gases (kt of CO ₂ equivalent)
1990	393.3	83.0	5.9	0.0
1991	462.5	86.7	6.1	0.0
1992	412.0	90.3	6.1	0.0
1993	427.4	77.5	6.2	0.4
1994	425.6	81.0	6.2	0.9
1995	443.6	84.4	6.5	1.7
1996	471.9	85.2	5.9	2.7
1997	487.2	88.6	6.1	3.9
1998	476.6	91.9	5.9	5.3
1999	467.2	95.2	6.0	5.9
2000	488.9	53.1	6.0	7.2
2001	302.6	47.3	3.2	8.2
2002	299.8	39.6	5.0	9.4
2003	311.3	41.3	5.0	10.1
2004	286.4	42.5	4.9	11.1
2005	300.5	57.3	5.0	12.0
2006	337.2	58.0	5.0	12.4
2007	328.3	55.6	4.9	12.8
2008	314.2	51.7	4.9	13.3

Figure 2: Annual percentage change in total emissions



Greenhouse gas emissions need to be calculated in a consistent manner across all jurisdictions to ensure comparability and avoid double counting or omissions.

The Guernsey emissions inventory is compiled by AEA Technology, the company which calculates emissions for the whole of the UK and British Isles on behalf of the Department of Energy and Climate Change (DECC). The DECC was created in 2008 to bring together the work of the Department for Business, Innovation and Skills (BIS) on energy and that of the Department for Environment, Food and Rural Affairs (DEFRA) on climate change. More information on the work of the DECC can be found via their website: www.decc.gov.uk

The content and structure of the inventory is based on the categories defined by the United Nations Economic Commission for Europe (UNECE). See www.unece.org for more information.

The methodology used to calculate the data is refined each year and the whole data set is revised to ensure comparability between one year and the next. As such, the figures published here should not be compared with those previously published.

The latest changes to the categories and methodology have had a significant impact on the Guernsey data set. The most significant changes made were to the transport sector, a change was made to the way in which emissions from shipping were accounted for; and to the methodology used to calculate aviation emissions.

The effect was a sizeable reduction in the emissions from transport. These changes have been applied to the whole time series, so year on year comparisons can be made using the data presented in this bulletin.

Emissions of the greenhouse gases; carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride are all estimated for the inventory. They are all presented in the form of carbon dioxide (CO₂) equivalents for ease of comparison.

Table 2 shows that the majority of Guernsey's emissions are in the form of carbon dioxide (CO₂). The main source of these emissions is combustion of fossil fuels for power generation, heating and transport i.e. energy.

Figure 3 and Figure 4 show the proportions of emissions contributed by different sources.

In both years, power generation contributed a similar proportion to the total. However, the proportion contributed by commercial and domestic combustion increased by just over 9 percentage points during the 18 year period.

The proportion contributed by transport decreased by over five percentage points and the proportion contributed by industrial combustion also decreased by just under four percentage points.

The contribution from waste decreased by just over three percentage points. Agriculture, land use, land use change and forestry also decreased, but decreased by less than one percentage point.

F Gases, which contributed less than 0.1% in 1990, contributed 3.5% in 2008.

Figure 3: Percentage contribution of emissions by source in 1990

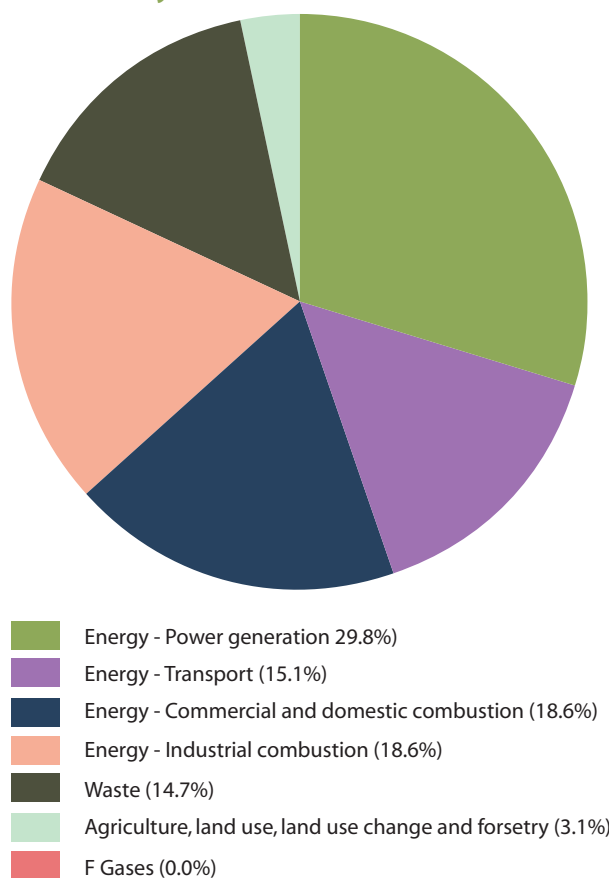
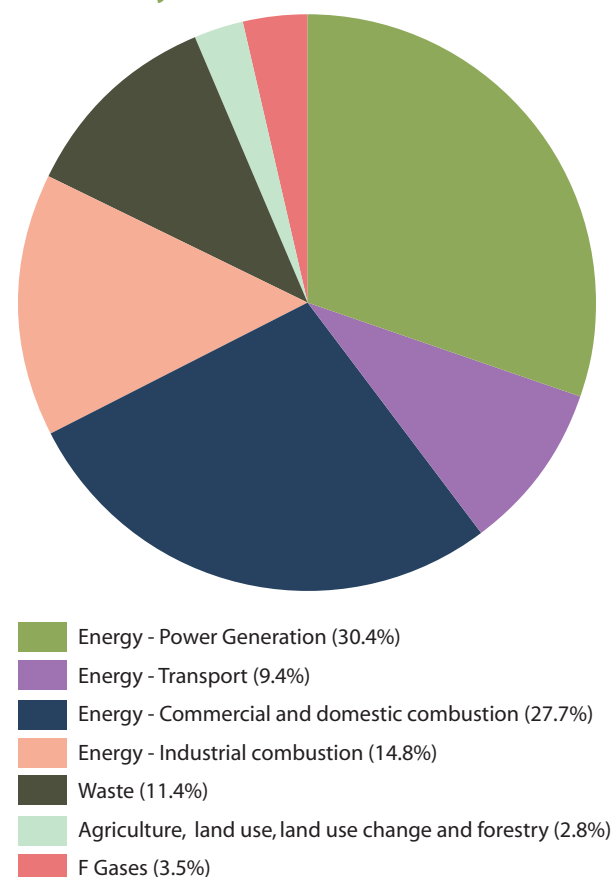


Figure 4: Percentage contribution of emissions by source in 2008



Emissions Inventory

Table 3: Percentage contribution of emissions by source

Year	Energy - Power Generation (%)	Energy - Transport (%)	Energy - Commercial and domestic combustion (%)	Energy - Industrial combustion (%)	Waste (%)	Agriculture, land use, land use change and forestry (%)	F Gases (%)
1990	29.8	15.1	18.6	18.6	14.7	3.1	0.0
1991	31.0	16.1	17.2	19.5	13.4	2.7	0.0
1992	29.0	14.8	19.5	18.4	15.4	3.0	0.0
1993	30.0	15.4	19.7	19.1	12.8	3.0	0.1
1994	30.1	15.4	18.9	19.0	13.4	2.9	0.2
1995	30.0	15.5	18.7	19.2	13.5	2.8	0.3
1996	29.4	16.2	18.2	20.2	13.4	2.1	0.5
1997	28.7	16.4	19.0	19.8	13.5	2.0	0.7
1998	30.3	15.1	18.7	18.7	14.3	2.0	0.9
1999	31.4	13.6	19.8	17.2	15.0	2.1	1.0
2000	30.4	16.9	21.0	20.4	7.9	2.1	1.3
2001	11.0	16.6	32.1	22.4	12.7	2.9	2.2
2002	10.1	19.7	30.4	25.1	9.2	2.8	2.6
2003	11.4	19.4	29.6	24.9	9.3	2.7	2.7
2004	10.2	16.7	33.4	23.3	10.3	2.9	3.2
2005	13.7	14.9	31.1	20.9	13.3	2.8	3.2
2006	25.2	11.8	27.5	17.6	12.3	2.5	3.0
2007	18.7	15.7	27.7	20.1	11.9	2.7	3.2
2008	30.4	9.4	27.7	14.8	11.4	2.8	3.5

Combustion of fuels for energy has contributed the largest proportion of emissions since 1990.

Landfilled waste is the next largest contributor to Guernsey's total emissions. The emissions are mostly in the form of methane gas, which is released by decomposing material.

Agriculture, land use, land use change and forestry combined contribute a small proportion of total emissions. The majority of the emissions are methane released by the digestive processes of cattle.

Comparatively low levels of nitrous dioxide are released as a result of the combustion of fuels for energy and as a result of waste disposal and agricultural processes.

The fluorinated or "F" gases are not estimated by source in the same way as the other three gases mentioned above. They are associated with chemicals used in refrigeration, air-conditioning and heat pump systems and can be released as greenhouse gases if the systems leak or are disposed of improperly.

More detail and analysis of Guernsey emissions by source is provided over the next pages.

Combustion of fuels for energy contributes over 80% of Guernsey's total greenhouse gas emissions (see *Table 3*). The majority of the emissions are in the form of carbon dioxide, but methane and nitrous oxide are also released in the combustion processes.

The emissions inventory is "source based", which means it reflects only emissions released from Guernsey. As such, emissions resulting from the generation of electricity in Europe, which is imported for consumption in Guernsey, are not included.

Electricity has been imported via a cable link to France since 2001, resulting in a significant decrease in the amount of power generated on-Island. The decrease can be seen in the green bars in *Figure 5* and *Table 4* overleaf.

Figure 6 shows that, of the different categories for energy, power generation has been the most volatile source of emissions, particularly since 2001.

More detail and analysis of energy emissions by category is provided on pages 6 and 7.

Figure 5: Energy emissions

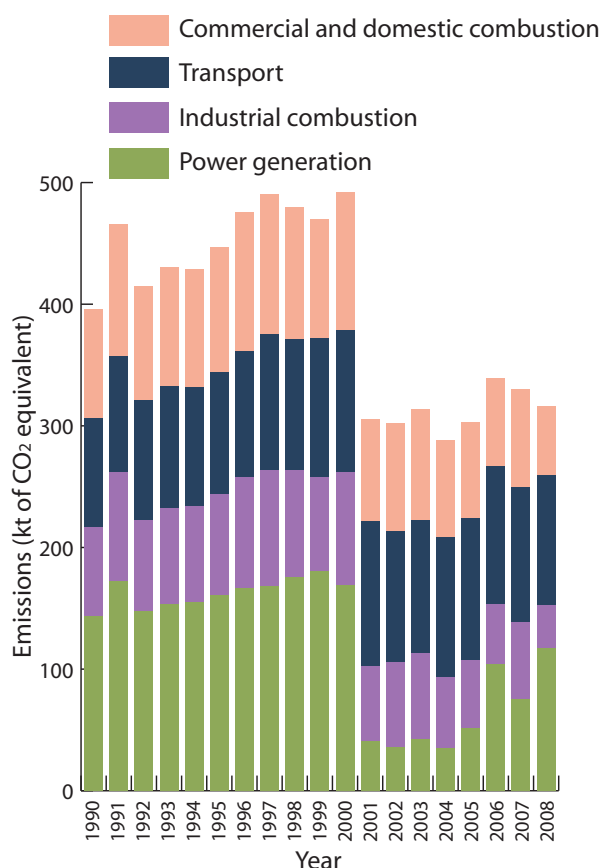
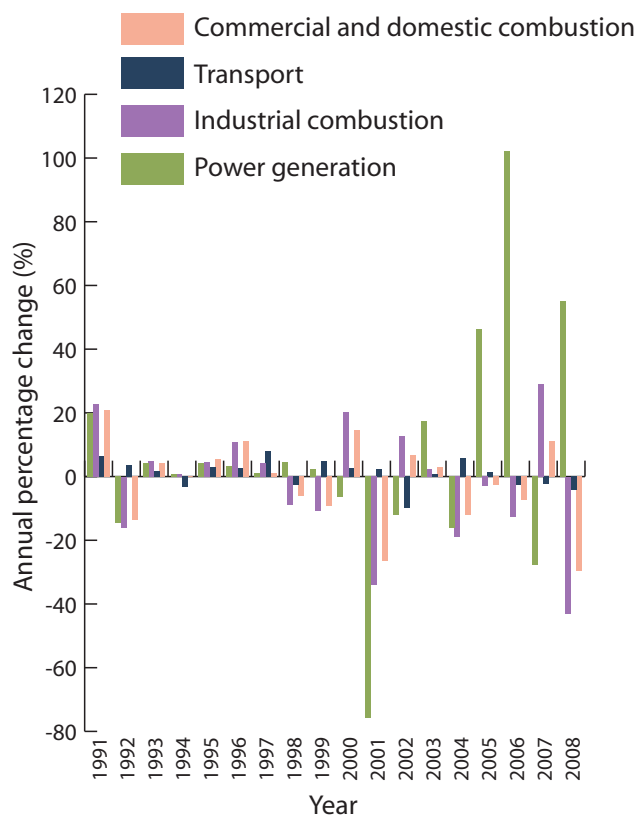


Figure 6: Annual percentage change in energy emissions



Emissions by Source - Energy

Table 4: Energy emissions - Power generation

Year	Emissions (kt of CO ₂ equivalent)	Annual % change
1990	143.8	n/a
1991	172.3	19.8
1992	147.4	-14.5
1993	153.6	4.2
1994	154.7	0.7
1995	161.1	4.1
1996	166.2	3.2
1997	168.0	1.1
1998	175.8	4.6
1999	180.1	2.5
2000	168.7	-6.4
2001	40.7	-75.9
2002	35.8	-12.0
2003	42.0	17.3
2004	35.2	-16.2
2005	51.5	46.4
2006	104.1	102.2
2007	75.3	-27.7
2008	116.8	55.1

Electricity has been imported via a cable link to France since 2001, reflected by a 76% decrease in power generation emissions between 2000 and 2001 (see *Table 4*). Excepting this large decrease, levels of greenhouse gas emitted from Guernsey as a result of fuel combusted for power generation have generally been trending upwards since 1990 (see *Figure 4*).

In total, the emissions from power generation decreased by 19% (or 27kt of CO₂ equivalent) between 1990 and 2008.

Prior to 2000, when all of Guernsey's electricity was generated on island, power generation was the single largest component contributor to Guernsey's total emissions. Some electricity is still generated on Island and it is this amount which impacts on the level of emissions. In 2008, power generation again contributed the largest proportion (albeit less than pre 2000, at 37%) of the total (see *Figure 3*).

Table 5: Energy emissions - Industrial combustion

Year	Emissions (kt of CO ₂ equivalent)	Annual % change
1990	72.7	n/a
1991	89.3	22.7
1992	75.0	-16.0
1993	78.7	4.9
1994	79.3	0.8
1995	83.0	4.7
1996	91.9	10.7
1997	95.8	4.3
1998	87.3	-8.9
1999	77.9	-10.8
2000	93.7	20.3
2001	61.8	-34.0
2002	69.6	12.7
2003	71.3	2.4
2004	57.7	-19.0
2005	56.0	-3.0
2006	48.9	-12.7
2007	63.1	29.1
2008	36.0	-43.0

Industrial combustion (relating to building processes, use of generators etc) decreased by 50% (or 36.7kt of CO₂ equivalent) between 1990 and 2008 (see *Table 5*).

In 2008, industrial combustion contributed an approximately equivalent amount to total emissions as waste did (11.4%). The unrounded figures show that the contribution from industrial combustion was slightly lower, making it the fifth largest contributor to total emissions in 2008.

Transport was the second largest contributor to emissions after power generation in 2008, when it contributed 33% of total emissions.

The general trend in transport emissions has been upwards over the eighteen years ending in 2008. The total increase was 18% (16.5kt of CO₂ equivalent) over the period (see *Table 6*).

The majority of greenhouse gas emissions resulting from transport are carbon dioxide. However, other non-greenhouse gas air pollutants, such as nitrogen dioxide, sulphur dioxide are also present in vehicle exhaust emissions.

More information on air pollution is available in the Facts and Figures booklet.

Commercial and domestic combustion of fuels for heating and hot water in homes and offices etc also contribute a substantial amount of emissions. However, the trend has generally been downward over the eighteen year period. The total decrease was 37% between 1990 and 2008.

Despite the decrease, this category contributed 18% of total emissions in 2008 and was the third largest contributor.

Table 6: Energy emissions - Transport

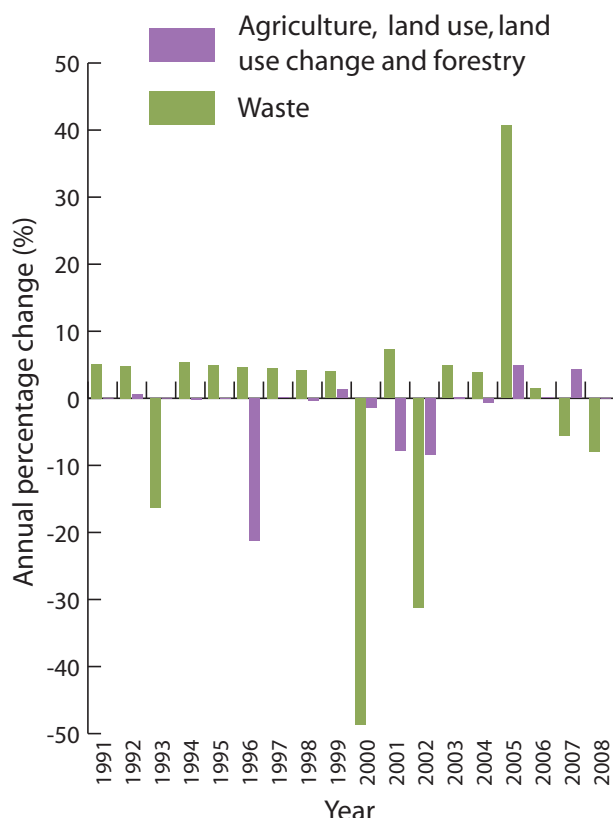
Year	Emissions (kt of CO ₂ equivalent)	Annual % change
1990	89.8	n/a
1991	95.6	6.4
1992	98.9	3.5
1993	100.6	1.7
1994	97.3	-3.3
1995	100.2	3.0
1996	102.8	2.6
1997	111.2	8.1
1998	108.3	-2.6
1999	113.7	5.0
2000	116.7	2.6
2001	119.3	2.2
2002	107.7	-9.8
2003	108.7	0.9
2004	115.1	5.9
2005	116.7	1.4
2006	113.6	-2.6
2007	111.1	-2.2
2008	106.3	-4.3

Table 6: Energy emissions - Commercial and domestic combustion

Year	Emissions (kt of CO ₂ equivalent)	Annual % change
1990	89.8	n/a
1991	108.5	20.8
1992	93.6	-13.7
1993	97.5	4.1
1994	97.5	0.0
1995	102.7	5.4
1996	114.3	11.2
1997	115.7	1.2
1998	108.5	-6.2
1999	98.5	-9.2
2000	113.0	14.7
2001	83.2	-26.4
2002	88.8	6.8
2003	91.4	2.9
2004	80.4	-12.1
2005	78.2	-2.7
2006	72.5	-7.3
2007	80.7	11.3
2008	56.8	-29.6

Emissions by Source - Waste and other

Figure 7: Annual percentage change in waste and other emissions



Waste is the next largest contributor to Guernsey's total emissions after energy. It contributed 11.4% of the total emissions in 2008.

The change in waste emissions has generally been upwards since 1990, but with some large decreases (see *Figure 7* and *Table 7*), resulting in a total decrease of 38% (or 27.1kt of CO₂ equivalent).

The emissions are mostly in the form of methane gas, which is released as landfilled matter decomposes. In a weight for weight comparison, methane has a twenty one times higher global warming potential than carbon dioxide i.e. one kilotonne of methane is equivalent to 21 kilotonnes of carbon dioxide.

Table 7: Waste emissions

Year	Emissions (kt of CO ₂ equivalent)	Annual % change
1990	71.0	n/a
1991	74.6	5.1
1992	78.2	4.8
1993	65.5	-16.3
1994	69.0	5.4
1995	72.5	5.0
1996	75.9	4.7
1997	79.3	4.5
1998	82.7	4.2
1999	86.0	4.0
2000	44.1	-48.7
2001	47.3	7.3
2002	32.5	-31.3
2003	34.1	4.9
2004	35.4	3.9
2005	49.9	40.7
2006	50.6	1.5
2007	47.8	-5.6
2008	43.9	-8.0

Emissions by Source - Waste and other

Other emissions include those from agriculture, land use, land use change and forestry, which in total contributed 2.8% of the emissions in 2008.

These emissions have been relatively stable since 2001, but have decreased overall (by 27% or 4.1kt of CO₂ equivalent) since 1990 (see *Figure 7* and *Table 8*).

The majority of the emissions are methane released by the digestive processes of cattle. There was a decrease in the number of cattle on the Island in 2001, when the milk quota was reduced, resulting in a reduction in emissions.

Table 8: Agriculture, land use, land use change and forestry emissions

Year	Emissions (kt of CO ₂ equivalent)	Annual % change
1990	15.0	n/a
1991	15.0	0.0
1992	15.1	0.6
1993	15.1	0.0
1994	15.1	-0.2
1995	15.1	-0.1
1996	11.9	-21.2
1997	11.9	0.1
1998	11.9	-0.4
1999	12.0	1.3
2000	11.8	-1.4
2001	10.9	-7.8
2002	10.0	-8.4
2003	10.0	0.2
2004	9.9	-0.7
2005	10.4	5.0
2006	10.5	0.1
2007	10.9	4.3
2008	10.9	0.0

Emissions - F Gases

Fluorinated or “F” gases are not estimated by source in the same way as the other three gases mentioned above, but are included in the total greenhouse gas emissions.

F gases can be released by refrigeration, air-conditioning and heat pump systems if they leak or are disposed of improperly. They contribute a relatively small, but increasing amount of total emissions.

In 2008, they contributed 3.8% of the total, compared to less than 0.1% in 1990, an increase of 13.3kt of CO₂ equivalent.

F gases have very high global warming potentials compared to carbon dioxide. As such, amounts in the region of one gram in weight, could have the same effect as one tonne of carbon dioxide being released into the atmosphere. The result of this is a highly volatile trend in terms of percentage changes.

Table 9: F gases emissions

Year	Emissions (kt of CO ₂ equivalent)	Annual % change
1990	0.0	n/a
1991	0.0	-0.2
1992	0.0	3.0
1993	0.4	1013.4
1994	0.9	125.0
1995	1.7	88.5
1996	2.7	54.6
1997	3.9	45.3
1998	5.3	37.8
1999	5.9	11.2
2000	7.2	21.7
2001	8.2	13.2
2002	9.4	14.3
2003	10.1	7.8
2004	11.1	10.2
2005	12.0	8.4
2006	12.4	2.9
2007	12.8	3.2
2008	13.3	3.6

Further Information

This bulletin has been compiled by the States of Guernsey Policy & Research Unit. The emissions inventory is calculated by AEA Technology, using data collated from a variety of sources.

Please contact Helen Walton (Senior Research Officer) for further information.

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