Guernsey Annual Greenhouse Gas Bulletin

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POLICY COUNCIL
THE STATES OF GUERNSEY

1.1 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.

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

1.2 Headlines

- Guernsey's greenhouse gas emissions increased by 10.9% in 2009, when they totalled 427.4kt of carbon dioxide (CO_2) equivalent, compared to 385.3kt in 2008.
- The cumulative percentage change between 1990 and the 2008 to 2009 average (which was 406.4kt of CO_2 equivalent) was a decrease of 17.9% (or 88.6kt of CO_2 equivalent). This exceeds the Kyoto Protocol target of a decrease of 12.5%.
- Transport contributed the largest proportion (25%) of the greenhouse gases emitted in 2009.
- The majority (83.4%) of the emissions were in the form of carbon dioxide.

Figure 1.2.1: Total emissions

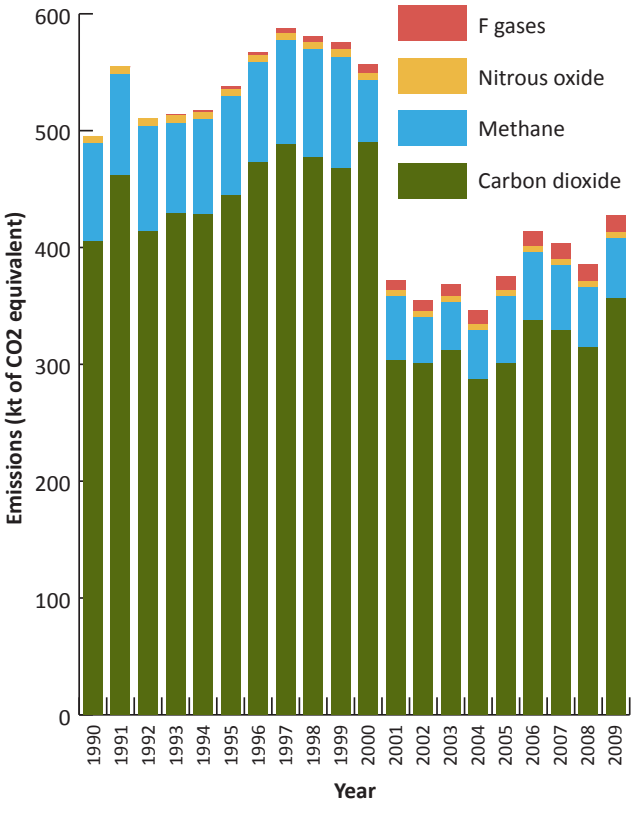


Table 1.2.1: Key data

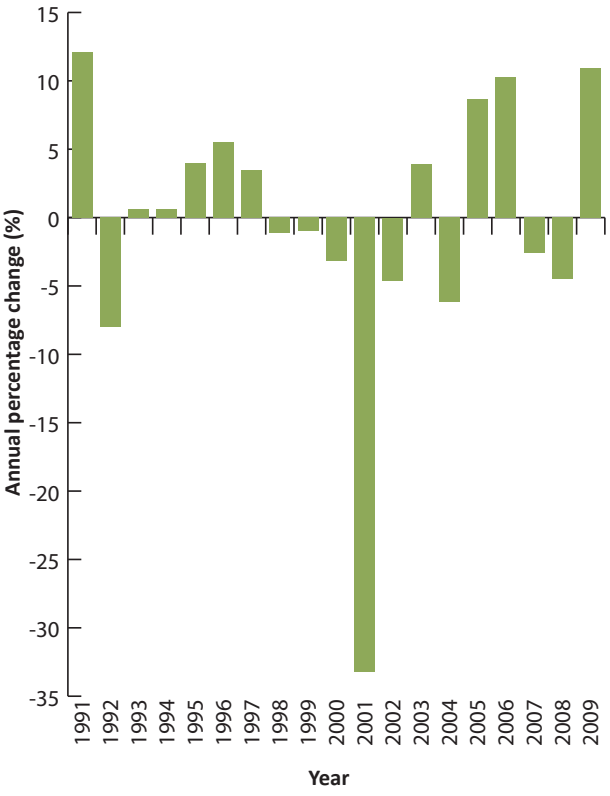
	Total emissions (kt of CO_2 equivalent)	Annual % change	Cumulative % change
1990	494.9	n/a	n/a
1991	554.8	12.1	12.1
1992	510.4	-8.0	3.1
1993	513.6	0.6	3.8
1994	516.9	0.6	4.4
1995	537.7	4.0	8.6
1996	567.2	5.5	14.6
1997	587.3	3.5	18.7
1998	581.0	-1.1	17.4
1999	575.2	-1.0	16.2
2000	556.6	-3.2	12.5
2001	371.9	-33.2	-24.9
2002	354.8	-4.6	-28.3
2003	368.6	3.9	-25.5
2004	345.6	-6.2	-30.2
2005	375.5	8.7	-24.1
2006	414.3	10.3	-16.3
2007	403.5	-2.6	-18.5
2008	385.3	-4.5	-22.2
2009	427.4	10.9	-13.6

2.1 Emissions Inventory - type

Table 2.1.1: Emissions by type

	Carbon Dioxide (kt)	Methane (kt of CO_2 equivalent)	Nitrous Oxide (kt of CO_2 equivalent)	F-Gases (kt of CO_2 equivalent)
1990	405.6	83.2	6.2	0.0
1991	461.6	86.8	6.3	0.0
1992	413.7	90.4	6.2	0.0
1993	429.2	77.6	6.4	0.4
1994	428.5	81.1	6.4	0.9
1995	444.7	84.5	6.7	1.8
1996	473.1	85.3	6.1	2.7
1997	488.4	88.7	6.3	3.9
1998	477.5	92.0	6.1	5.4
1999	467.8	95.2	6.1	6.0
2000	489.9	53.1	6.3	7.3
2001	303.1	55.1	5.4	8.3
2002	300.5	39.7	5.2	9.4
2003	312.0	41.3	5.1	10.1
2004	287.0	42.5	5.0	11.2
2005	301.1	57.3	5.1	12.1
2006	337.8	58.0	5.1	13.4
2007	329.2	55.6	5.1	13.6
2008	314.5	51.7	4.9	14.2
2009	356.4	51.7	4.9	14.3

Figure 2.1.1: 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 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.

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 (CO_2) equivalents for ease of comparison.

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). More information on the work of the DECC can be found via their website: ***www.decc.gov.uk***.

In 2009, Guernsey's emissions totalled 427.4kt of CO_2 equivalent, which equates to 6.9 tonnes per capita. The total was 10.9% higher than in 2008 (see ***Table 1.2.1***), but 13.6% lower than 1990.

The 2008 to 2009 average total was 17.9% (or 88.6kt of CO_2 equivalent) lower than the 1990 total, which was 494.9 kt of CO_2 equivalent.

Table 2.1.1 shows that the majority of Guernsey's emissions are in the form of carbon dioxide (CO_2). The main source of these emissions is combustion of fossil fuels for power generation, heating and transport i.e. energy.

3.2 Emissions Inventory - source

Figure 3.2.1 and Figure 3.2.2 show the proportions of emissions contributed by different sources. This data is also provided in ***Table 3.2.1*** overleaf.

Power generation contributed the largest proportion (29%) of emissions in 1990.

Transport, which had contributed the second largest proportion in 1990, contributed the largest proportion (25%) in 2009.

The proportions contributed by commercial and domestic combustion and by industrial combustion both increased during the period.

The contributions from waste and agriculture, land use, land use change and forestry both decreased, by 4 and 0.5 percentage points respectively.

F Gases, which contributed less than 0.1% in 1990, contributed 3.3% in 2009.

The changes in terms of emissions by mass, rather than proportions are given on ***pages 6 to 8***.

Figure 3.2.1: Percentage contribution of emissions by source in 1990

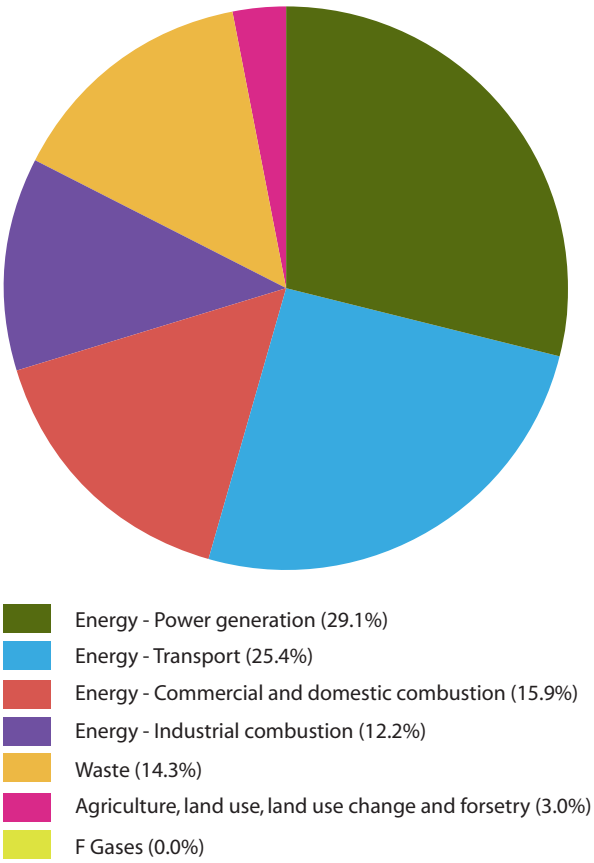
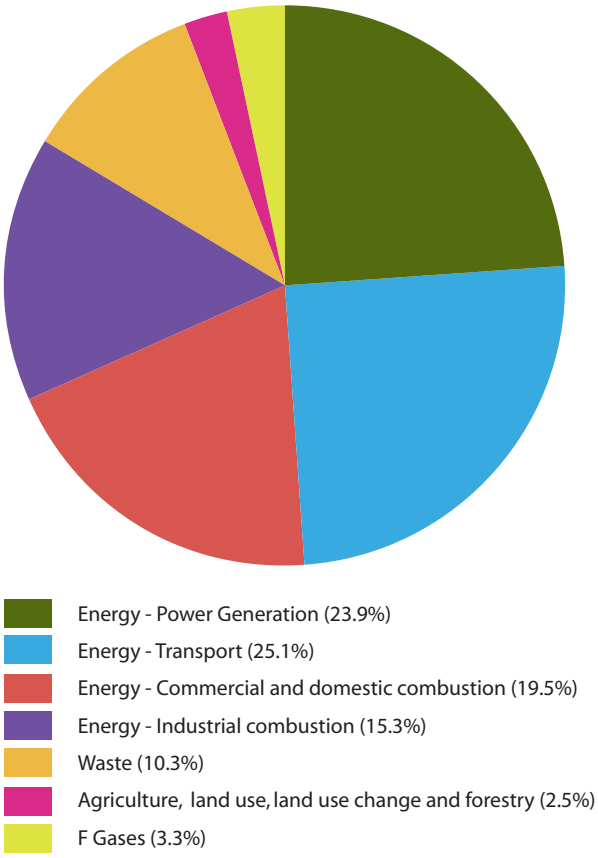


Figure 3.2.2: Percentage contribution of emissions by source in 2009



3.2 Emissions Inventory - source

Table 3.2.1: Percentage contribution of emissions by source

	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	29.1	25.4	15.9	12.2	14.3	3.0	0.0
1991	31.1	22.9	16.8	13.1	13.4	2.7	0.0
1992	28.9	24.6	16.1	12.2	15.3	3.0	0.0
1993	29.9	25.1	16.6	12.6	12.7	2.9	0.1
1994	29.9	24.6	16.4	12.6	13.3	2.9	0.2
1995	30.0	24.2	16.6	12.6	13.5	2.8	0.3
1996	29.3	24.2	17.4	13.1	13.4	2.1	0.5
1997	28.6	25.1	16.9	13.2	13.5	2.0	0.7
1998	30.3	23.9	16.3	12.3	14.2	2.0	0.9
1999	31.3	24.2	15.1	11.3	15.0	2.1	1.1
2000	30.3	27.1	17.5	13.7	7.9	2.1	1.3
2001	10.9	36.5	20.3	14.4	12.7	2.9	2.2
2002	10.1	36.4	22.3	16.6	9.2	2.8	2.6
2003	11.4	35.4	22.1	16.4	9.3	2.7	2.7
2004	10.2	37.3	21.5	14.7	10.3	2.9	3.2
2005	13.7	34.4	19.4	13.3	13.3	2.8	3.2
2006	25.1	29.6	16.6	10.8	12.2	2.5	3.2
2007	18.7	31.6	18.2	13.6	11.8	2.7	3.4
2008	30.3	27.7	14.7	9.3	11.4	2.8	3.7
2009	23.9	25.1	19.5	15.3	10.3	2.5	3.3

Combustion of fuels for energy (including electricity generation, transport, heating and industrial processes) has contributed the largest proportion of emissions since 1990. The majority of the emissions are in the form of carbon dioxide, but methane and nitrous oxide are also released in the combustion processes.

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.

4.1 Emissions by Source - Energy

Combustion of fuels for energy contributes over 80% of Guernsey's total greenhouse gas emissions (see ***Table 3.2.1***). 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 4.1.1*** and numerically in ***Table 4.2.1*** overleaf.

In 2009, transport contributed the largest proportion (30%) of the energy emissions, followed by power generation, which contributed 29%.

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

Figure 4.1.1: Energy emissions

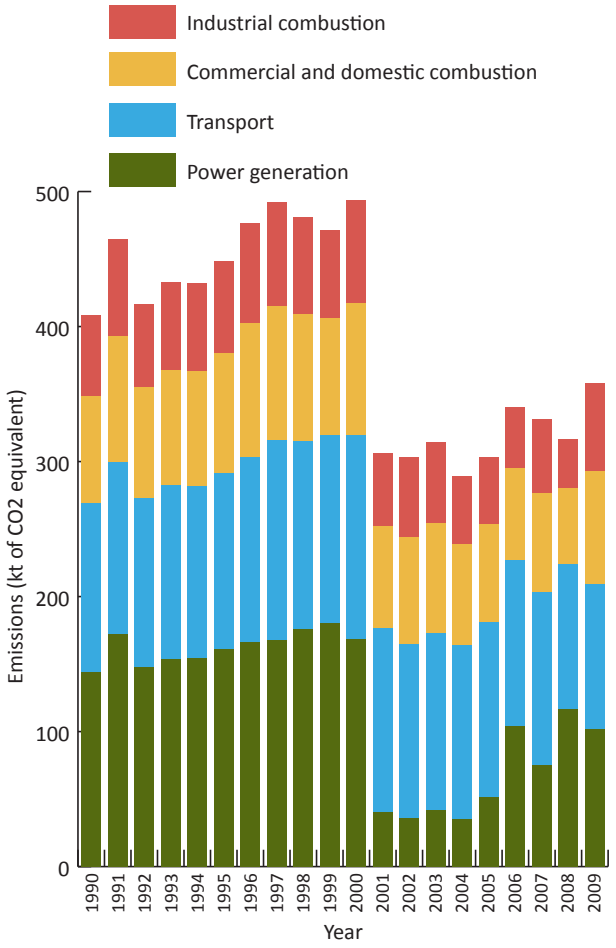


Figure 4.1.2: Annual percentage change in energy emissions

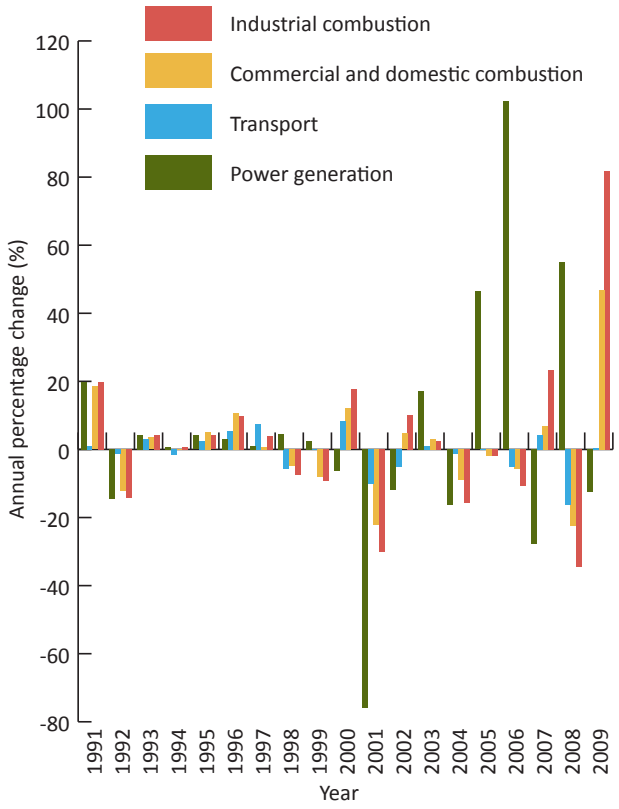


Table 4.2.1: Energy emissions - Power generation

	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
2009	102.2	-12.5

Table 4.2.2: Energy emissions - Transport

	Emissions (kt of CO_2 equivalent)	Annual % change
1990	125.7	n/a
1991	127.0	1.0
1992	125.3	-1.3
1993	129.1	3.1
1994	127.1	-1.6
1995	130.2	2.5
1996	137.3	5.4
1997	147.4	7.4
1998	139.1	-5.6
1999	139.2	0.0
2000	150.9	8.4
2001	135.8	-10.0
2002	129.0	-5.1
2003	130.4	1.1
2004	128.9	-1.2
2005	129.1	0.2
2006	122.5	-5.1
2007	127.5	4.2
2008	106.8	-16.3
2009	107.2	0.4

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 4.2.1***).

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 4.1.2*** on previous page).

In total, the emissions from power generation decreased by 29% (or 41.7kt of CO_2 equivalent) between 1990 and 2009.

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 most noticeably on the level of emissions.

In 2009, emissions from power generation were 12.5% (14.6kt of CO_2 equivalent) lower than in 2008.

Emissions from transport also decreased between 1990 and 2009, by 14.7% (18.5kt of CO_2 equivalent) to 107kt of CO_2 equivalent (see ***Table 4.2.2***).

Despite this decrease, emissions from this source constituted the largest proportion of the total in 2009, when it contributed 30% of energy emissions and 25% of total emissions.

Approximately 80% of this portion of emissions resulted from on Island emissions due to road transport in 2009.

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

Commercial and domestic combustion of fuels for heating and hot water in homes and offices etc also contribute a substantial amount of the Island's emissions (20% of the 2009 total).

The 2009 emissions from commercial and domestic combustion were 83.4kt of CO_2 equivalent, which was 5.8% higher than 1990.

The emissions from this source have ranged from under 60kt to over 90kt of CO_2 equivalent over the twenty years covered by the inventory.

Energy emissions also include industrial combustion emissions (relating to building processes, use of generators etc), which increased by 8.2% (or 4.9kt of CO_2 equivalent) between 1990 and 2009 (see ***Table 4.2.4***).

This source was the fourth largest contributor to emissions in 2009, at 65.5kt of CO_2 equivalent (15% of the total).

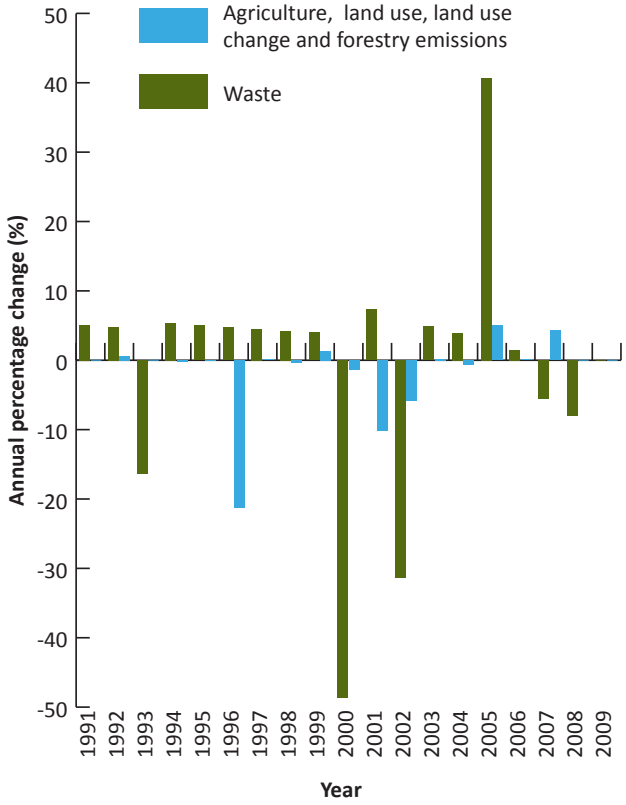
Table 4.2.3: Energy emissions - Commercial and domestic combustion

	Emissions (kt of CO_2 equivalent)	Annual % change
1990	78.8	n/a
1991	93.4	18.5
1992	82.1	-12.1
1993	85.0	3.5
1994	84.9	-0.2
1995	89.2	5.1
1996	98.7	10.7
1997	99.3	0.6
1998	94.5	-4.9
1999	86.9	-8.0
2000	97.4	12.1
2001	75.7	-22.3
2002	79.2	4.7
2003	81.6	3.0
2004	74.2	-9.1
2005	72.7	-2.0
2006	68.6	-5.6
2007	73.4	6.9
2008	56.8	-22.6
2009	83.4	46.9

Table 4.2.4: Energy emissions - Industrial combustion

	Emissions (kt of CO_2 equivalent)	Annual % change
1990	60.5	n/a
1991	72.4	19.7
1992	62.2	-14.2
1993	64.8	4.2
1994	65.2	0.7
1995	67.9	4.1
1996	74.5	9.7
1997	77.5	4.0
1998	71.7	-7.5
1999	65.0	-9.4
2000	76.4	17.6
2001	53.5	-30.0
2002	58.9	10.2
2003	60.4	2.4
2004	50.9	-15.7
2005	49.9	-1.9
2006	44.6	-10.6
2007	55.0	23.4
2008	36.0	-34.6
2009	65.5	81.9

Figure 5.1.1: Annual percentage change in waste and other emissions



Waste is the next largest contributor to Guernsey's total emissions after energy. It contributed 10% (43.9kt of CO_2 equivalent) of the total emissions in 2009.

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.

As a result, relatively small changes in the amount of methane emitted equate to considerably larger changes to emissions in terms of CO_2 equivalents.

There were decreases in the emissions from this source in 2008 and 2009 (see ***Figure 5.1.1*** and ***Table 5.1.1***). The cumulative decrease between 1990 and 2009 was 38.1% (or 27.0kt of CO_2 equivalent), which is the largest percentage decrease by source.

Table 5.1.1: Waste emissions

	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	47.7	-5.6
2008	43.9	-8.0
2009	43.9	0.0

5.1 Emissions by Source - Waste and other

Other emissions include those from agriculture, land use, land use change and forestry, which contributed 2.5% of the total emissions in 2009.

These emissions have been relatively stable since 2001, but have decreased overall (by 28% or 4.1kt of CO_2 equivalent) since 1990 (see ***Figure 5.1.1*** and ***Table 5.1.2***).

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 5.1.2: Agriculture, land use, land use change and forestry emissions

	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	10.6	-10.2
2002	10.0	-5.9
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
2009	10.9	0.0

6.1 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 2009, they contributed 3.3% of the total, compared to less than 0.1% in 1990, an increase of 14.3kt of CO_2 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 6.1.1: F gases emissions

	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	1032.3
1994	0.9	123.5
1995	1.8	89.3
1996	2.7	54.0
1997	3.9	44.2
1998	5.4	38.5
1999	6.0	12.3
2000	7.3	21.1
2001	8.3	12.8
2002	9.4	13.7
2003	10.1	7.8
2004	11.2	10.2
2005	12.1	8.1
2006	13.4	11.5
2007	13.6	1.3
2008	14.2	4.2
2009	14.3	1.0

7.1 Further Information

This bulletin has been compiled by the States of Guernsey Policy and 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.

Policy and Research Unit
Sir Charles Frossard House
La Charroterie
St Peter Port
Guernsey
GY1 1FH

Tel: (01481) 717240
Fax: (01481) 713787

e-mail: ***policy.research@gov.gg***
web: ***www.gov.gg/pru***