

Guernsey Annual Greenhouse Gas Bulletin

2011 - Issue date 20th February 2013



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. The analysis provided in this bulletin uses 1990 as a base year for comparison.

1.2 Headlines

- Guernsey's greenhouse gas emissions increased by 0.5% in 2011, when they totalled 392.2kt of carbon dioxide (CO₂) equivalent, compared to 390.3kt in 2010.
- The cumulative percentage change between 1990 and the 2008 to 2011 average (which was 402.8kt of CO₂ equivalent) was a decrease of 21.2% (or 108.7kt of CO₂ equivalent). This exceeds the Kyoto Protocol target of a decrease of 12.5%.
- Transport contributed the largest proportion (25.8%) of the greenhouse gases emitted in 2011.
- The majority (82.4%) of the emissions were in the form of carbon dioxide.

Figure 1.2.1: Total emissions

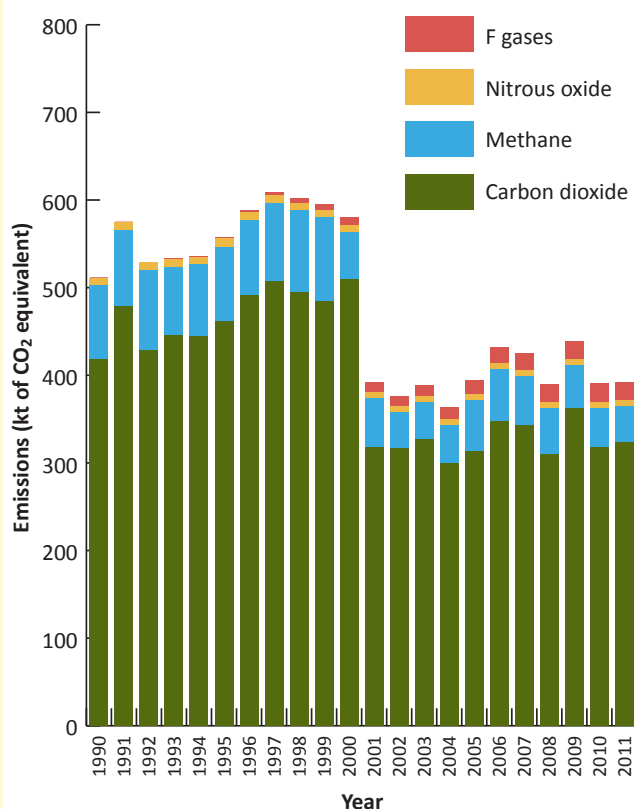


Table 1.2.1: Key data

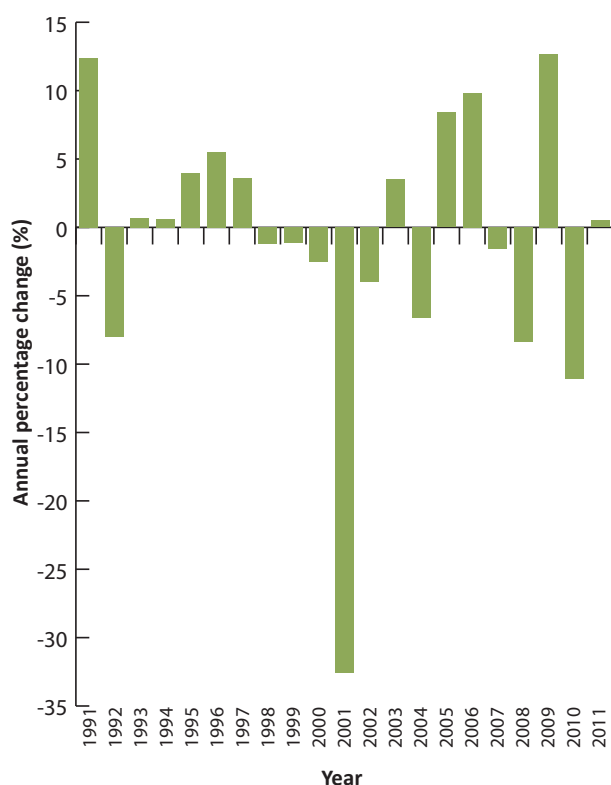
	Total emissions (kt of CO ₂ equivalent)	Annual % change	Cumulative % change
1990	511.4	n/a	n/a
1991	574.9	12.4	12.4
1992	528.9	-8.0	3.4
1993	532.8	0.7	4.2
1994	536.3	0.6	4.9
1995	557.7	4.0	9.0
1996	588.4	5.5	15.1
1997	609.4	3.6	19.2
1998	602.0	-1.2	17.7
1999	595.4	-1.1	16.4
2000	580.6	-2.5	13.5
2001	391.4	-32.6	-23.5
2002	375.7	-4.0	-26.5
2003	388.9	3.5	-24.0
2004	363.3	-6.6	-29.0
2005	393.7	8.4	-23.0
2006	432.1	9.8	-15.5
2007	425.1	-1.6	-16.9
2008	389.5	-8.4	-23.8
2009	439.1	12.7	-14.2
2010	390.3	-11.1	-23.7
2011	392.2	0.5	-23.3

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	418.7	83.9	8.7	0.0
1991	478.3	87.6	8.9	0.0
1992	428.9	91.1	8.9	0.1
1993	445.2	78.4	9.0	0.4
1994	444.5	81.8	9.0	1.0
1995	461.3	85.3	9.2	1.9
1996	491.1	86.1	8.2	3.0
1997	507.2	89.5	8.3	4.4
1998	495.0	92.7	8.2	6.1
1999	484.1	96.0	8.1	7.1
2000	509.4	53.9	8.3	9.0
2001	317.9	55.8	7.4	10.3
2002	316.9	40.4	7.1	11.4
2003	327.1	42.0	7.0	12.7
2004	299.4	43.2	6.9	13.7
2005	313.6	58.0	7.1	14.9
2006	347.6	58.7	7.2	18.5
2007	343.0	55.8	7.2	19.1
2008	310.2	51.8	7.0	20.5
2009	362.8	48.1	7.1	21.0
2010	318.1	44.2	7.0	21.0
2011	323.2	41.3	7.0	20.8

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 (CO₂) 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 2011, Guernsey's emissions totalled 392.2kt of CO₂ equivalent, which equates to 6.2 tonnes per capita. The total was 0.5% higher than in 2010 (see [Table 1.2.1](#)) but 23.3% lower than 1990.

The 2008 to 2011 average total, which was 402.8kt of CO₂ equivalent, was 21.2% (or 108.7kt of CO₂ equivalent) lower than the 1990 total.

[Table 2.1.1](#) 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.

The variability in recent years as shown in [Figure 2.1.1](#) is largely due to changes in the amount of power being generated on island.

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 (28.1%) of emissions in 1990, but the third largest in 2011 (17.4%).

Waste emissions was the only other group contribution that decreased during the period, from 13.9% in 1990 to 8.6% in 2011.

Transport, which had contributed the second largest proportion in 1990, contributed the largest proportion (25.8%) in 2011.

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

The contributions from agriculture, land use, land use change and forestry increased by 1.0 percentage points.

F Gases, which contributed less than 0.1% in 1990, contributed 5.3% in 2011.

The changes in terms of emissions by mass, rather than proportions, are given on **pages 5 to 11**.

Figure 3.2.1: Percentage contribution of emissions by source in 1990

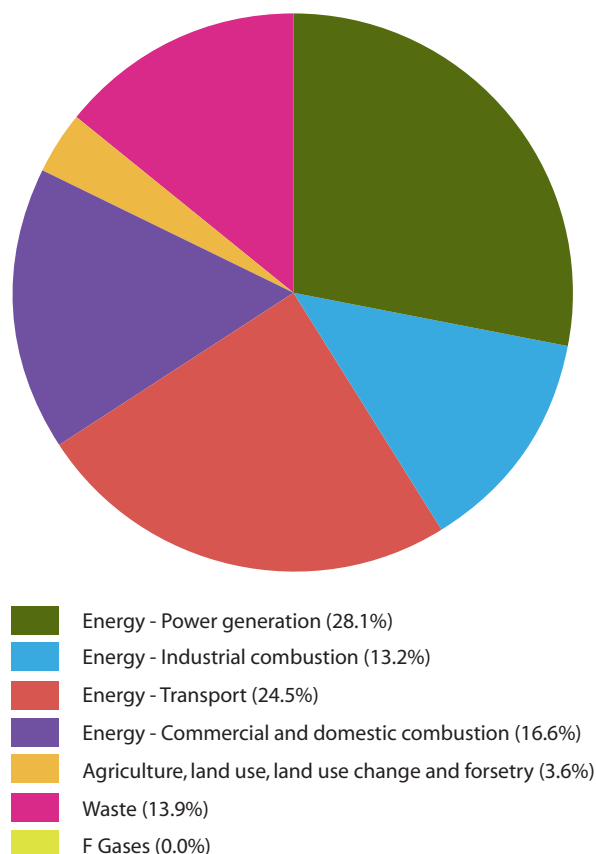
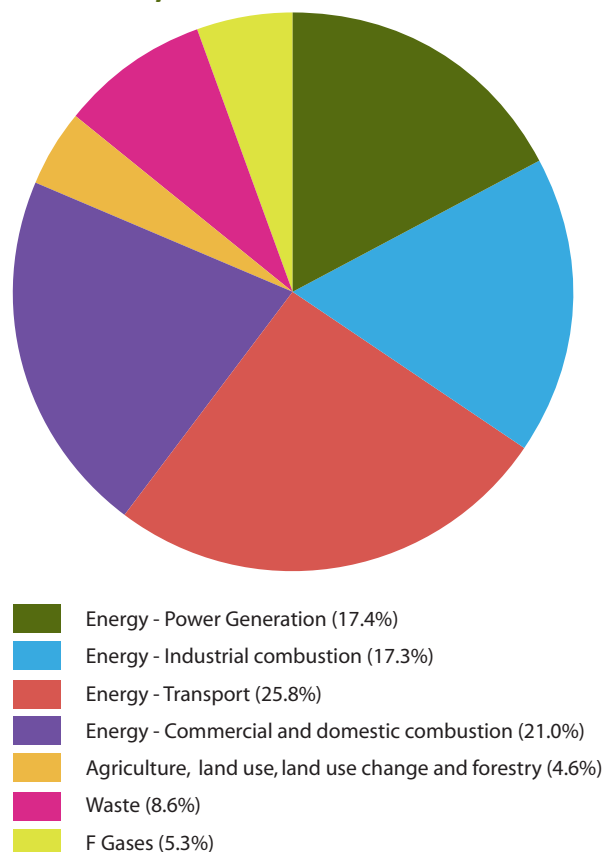


Figure 3.2.2: Percentage contribution of emissions by source in 2011



3.2 Emissions Inventory - Source

Table 3.2.1: Percentage contribution of emissions by source

	Energy - Power generation (%)	Energy - Industrial combustion (%)	Energy - Transport (%)	Energy - Commercial and domestic combustion (%)	Agriculture, land use, land use change and forestry (%)	Waste (%)	F gases (%)
1990	28.1	13.2	24.5	16.6	3.6	13.9	0.0
1991	30.0	14.0	22.2	17.5	3.2	13.0	0.0
1992	27.9	13.1	24.0	16.7	3.5	14.8	0.0
1993	28.8	13.6	24.5	17.2	3.5	12.3	0.1
1994	28.8	13.6	24.0	17.1	3.5	12.9	0.2
1995	28.9	13.6	23.6	17.2	3.3	13.0	0.3
1996	28.2	14.1	23.6	18.1	2.6	12.9	0.5
1997	27.6	14.2	24.5	17.6	2.5	13.0	0.7
1998	29.2	13.3	23.4	16.9	2.5	13.7	1.0
1999	30.3	12.2	23.7	15.7	2.5	14.4	1.2
2000	29.1	14.7	26.3	18.1	2.7	7.6	1.5
2001	10.4	15.2	35.2	20.7	3.7	12.1	2.6
2002	9.5	17.5	34.8	22.7	3.8	8.7	3.0
2003	10.8	17.3	33.5	22.6	3.8	8.8	3.3
2004	9.7	15.6	35.1	21.9	4.2	9.8	3.8
2005	13.1	14.1	32.5	19.8	4.1	12.7	3.8
2006	24.1	11.5	28.0	16.5	3.9	11.7	4.3
2007	17.7	14.4	29.6	18.5	4.0	11.2	4.5
2008	17.7	14.6	27.3	19.4	4.5	11.3	5.3
2009	27.7	13.0	24.2	17.1	4.1	9.2	4.8
2010	17.5	16.0	26.4	20.8	4.7	9.3	5.4
2011	17.4	17.3	25.8	21.0	4.6	8.6	5.3

Combustion of fuels for energy (including electricity generation, heating, industrial processes and transport) 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. In 2011, emissions from fuels for energy constituted 81.6% of the total emissions.

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.

Landfilled waste is the next largest contributor to Guernsey’s total emissions, although the proportion it has contributed has decreased since 1990. 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.

Nitrous dioxide is also released as a result of the combustion of fuels for energy and as a result of waste disposal and agricultural processes, but at comparatively low levels.

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 power generation contributed 17.4% of Guernsey's total greenhouse gas emissions in 2011 (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.

Electricity has been imported via a cable link to France since 2001, reflected by a 75.9% decrease in power generation emissions between 2000 and 2001 (see [Table 4.1.1](#)).

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 4.1.1](#)). The red line on the chart shows the historic three year average.

In total, the emissions from power generation decreased by 52.4% (or 75.4kt of CO₂ equivalent) between 1990 and 2011.

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 total level of emissions.

The amount of electricity generated on island varies from year to year. In 2011, emissions from power generation were 0.2% (0.1kt of CO₂ equivalent) higher than in 2010. The cable link was used throughout the year, though there were island wide power cuts in September 2011.

Figure 4.1.1: Energy emissions - Power generation

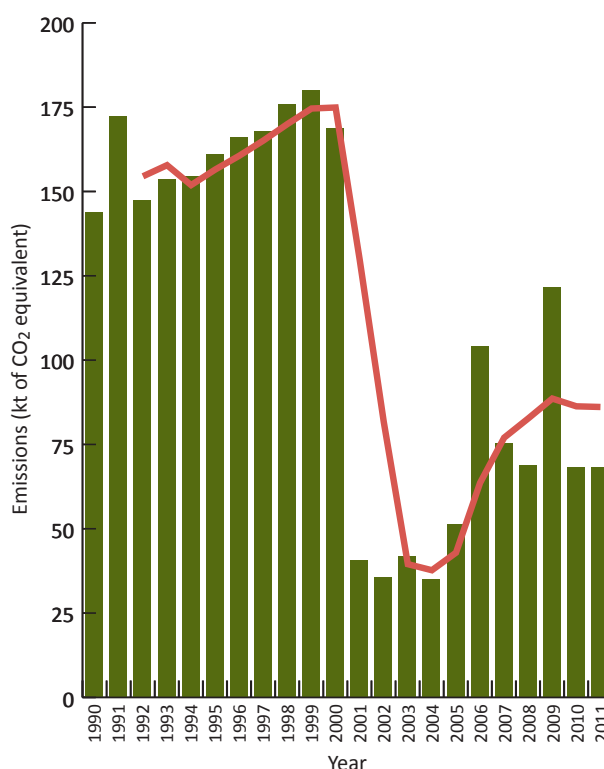
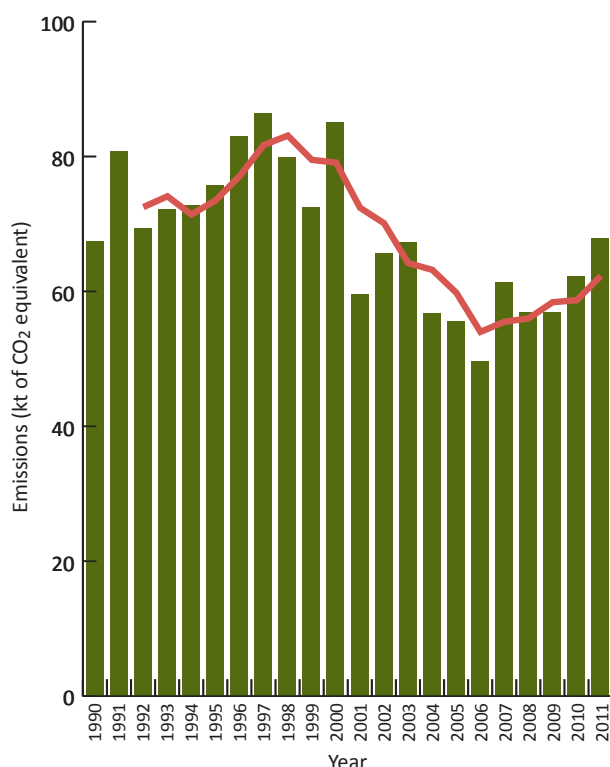


Table 4.1.1: Energy emissions - Power generation

	Total emissions (kt of CO ₂ equivalent)	Annual % change	Cumulative % change
1990	143.8	n/a	n/a
1991	172.3	19.8	19.8
1992	147.4	-14.5	2.5
1993	153.6	4.2	6.8
1994	154.7	0.7	7.5
1995	161.1	4.1	12.0
1996	166.2	3.2	15.5
1997	168.0	1.1	16.8
1998	175.8	4.6	22.2
1999	180.1	2.5	25.3
2000	168.7	-6.4	17.3
2001	40.7	-75.9	-71.7
2002	35.8	-12.0	-75.1
2003	42.0	17.3	-70.8
2004	35.2	-16.2	-75.5
2005	51.5	46.4	-64.2
2006	104.1	102.2	-27.6
2007	75.3	-27.7	-47.7
2008	68.8	-8.6	-52.2
2009	121.7	76.9	-15.4
2010	68.3	-43.9	-52.5
2011	68.4	0.2	-52.4

4.1 Emissions by Source - Energy

Figure 4.1.2: Energy emissions - Industrial combustion



Energy emissions also include industrial combustion emissions (relating to building processes, use of generators etc), which increased by 0.6% (or 0.4kt of CO₂ equivalent) between 1990 and 2011 (see [Figure 4.1.2](#) and [Table 4.1.2](#)). The red line on the chart shows the historic three year average.

The majority of the emissions are in the form of carbon dioxide, but methane and nitrous oxide are also released in the combustion processes.

This source was the fourth largest contributor to emissions in 2011, at 67.8kt of CO₂ equivalent (17.3% of the total).

Levels of greenhouse gas emitted from Guernsey as a result of industrial fuel combustion had generally trended downwards since a peak in 1998 (see [Figure 4.1.2](#)). However, levels have begun to increase again since 2006.

In 2011, emissions from industrial combustion were 8.9% (5.5kt of CO₂ equivalent) higher than in 2010.

Table 4.1.2: Energy emissions - Industrial combustion

	Total emissions (kt of CO ₂ equivalent)	Annual % change	Cumulative % change
1990	67.4	n/a	n/a
1991	80.7	19.7	19.7
1992	69.3	-14.2	2.7
1993	72.2	4.2	7.1
1994	72.7	0.7	7.8
1995	75.7	4.1	12.2
1996	83.0	9.7	23.1
1997	86.4	4.0	28.0
1998	79.9	-7.5	18.4
1999	72.4	-9.4	7.3
2000	85.1	17.6	26.2
2001	59.6	-30.0	-11.6
2002	65.7	10.2	-2.6
2003	67.3	2.4	-0.3
2004	56.7	-15.7	-15.9
2005	55.6	-2.0	-17.6
2006	49.7	-10.6	-26.3
2007	61.3	23.4	-9.1
2008	56.9	-7.2	-15.6
2009	56.9	0.0	-15.6
2010	62.3	9.3	-7.7
2011	67.8	8.9	0.6

4.1 Emissions by Source - Energy

Emissions from transport decreased between 1990 and 2011 by 19.2% (24.1kt of CO₂ equivalent) to 101.4kt of CO₂ equivalent (see **Figure 4.1.3** and **Table 4.1.3**). The red line on the chart shows the historic three year average.

Despite this decrease, emissions from this source constituted the largest proportion of the total in 2011, when it contributed 31.7% of energy emissions and 25.8% of total emissions.

Similar to previous years, approximately 80% of transport emissions resulted from on Island road transport in 2011.

Levels of greenhouse gases emitted as a result of transport have generally been trending downwards since a peak in 2000 (see **Figure 4.1.3**).

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

Figure 4.1.3: Energy emissions - Transport

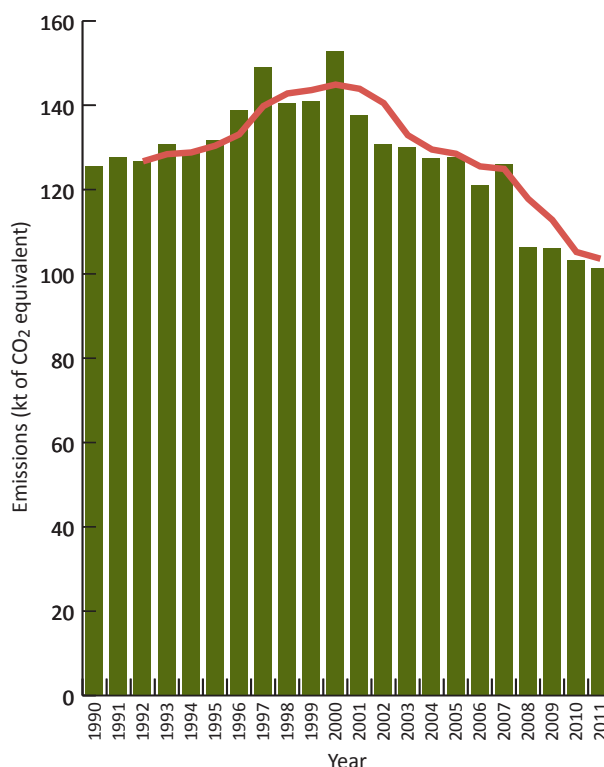
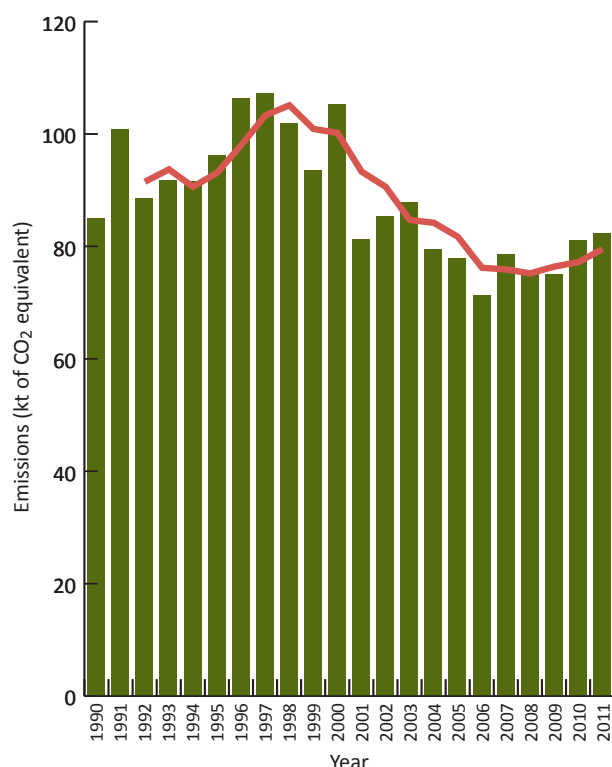


Table 4.1.3: Energy emissions - Transport

	Total emissions (kt of CO ₂ equivalent)	Annual % change	Cumulative % change
1990	125.5	n/a	n/a
1991	127.8	1.8	1.8
1992	126.8	-0.8	1.0
1993	130.8	3.1	4.2
1994	128.7	-1.6	2.5
1995	131.7	2.3	4.9
1996	138.8	5.4	10.6
1997	149.0	7.4	18.7
1998	140.6	-5.6	12.0
1999	141.0	0.3	12.4
2000	152.9	8.4	21.8
2001	137.7	-9.9	9.7
2002	130.7	-5.1	4.2
2003	130.2	-0.4	3.7
2004	127.6	-1.9	1.7
2005	127.8	0.1	1.8
2006	121.1	-5.2	-3.5
2007	126.0	4.0	0.4
2008	106.3	-15.6	-15.3
2009	106.2	-0.1	-15.4
2010	103.2	-2.8	-17.8
2011	101.4	-1.8	-19.2

4.1 Emissions by Source - Energy

Figure 4.1.4: Energy emissions - Commercial and domestic combustion



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 (21.0% of the 2011 total).

The emissions from commercial and domestic combustion were 82.3kt of CO₂ equivalent in 2011, which was 3.3% lower than in 1990 but 1.6% higher than in 2010 (see [Table 4.1.4](#)).

The emissions from this source have ranged from under 80kt to over 100kt of CO₂ equivalent over the twenty two years covered by the inventory. The trend (see [Figure 4.1.4](#)) is similar to that for industrial combustion (as in [Figure 4.1.2, Page 6](#)), generally decreasing over the ten year period ending in 2006.

However, as with industrial combustion (see [Page 6](#)), levels have begun to rise again in recent years and are now approaching 1990 levels.

The red line on the chart shows the historic three year average.

Table 4.1.4: Energy emissions - Commercial and domestic combustion

	Total emissions (kt of CO ₂ equivalent)	Annual % change	Cumulative % change
1990	85.0	n/a	n/a
1991	100.8	18.6	18.6
1992	88.5	-12.3	4.0
1993	91.7	3.6	7.8
1994	91.6	-0.1	7.7
1995	96.2	5.0	13.1
1996	106.4	10.6	25.1
1997	107.2	0.8	26.1
1998	101.8	-5.0	19.7
1999	93.6	-8.1	10.0
2000	105.3	12.5	23.8
2001	81.2	-22.9	-4.6
2002	85.3	5.0	0.2
2003	87.8	3.0	3.2
2004	79.4	-9.5	-6.6
2005	77.8	-2.0	-8.5
2006	71.3	-8.4	-16.2
2007	78.5	10.1	-7.6
2008	75.6	-3.7	-11.1
2009	75.1	-0.7	-11.7
2010	81.0	7.9	-4.8
2011	82.3	1.6	-3.3

4.2 Emissions by Source - Agriculture, land use, land use change and forestry

Other emissions include those from agriculture, land use, land use change and forestry (shown in **Figure 4.2.1**), which contributed 4.6% of the total emissions in 2011. The red line on the chart shows the historic three year average.

The majority of these emissions are methane released by the digestive processes of cattle. The decrease between 1995 and 1996 resulted from a change in the way cattle data was sourced.

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 from cattle. Livestock related emissions have since remained at a steady level. However, there has been a generally increasing trend in total emissions from this source since 2002, due to increasing emissions resulting from land use change.

The total level of emissions from these sources decreased by 3.9% between 1990 and 2011.

Figure 4.2.1: Agriculture, land use, land use change and forestry emissions

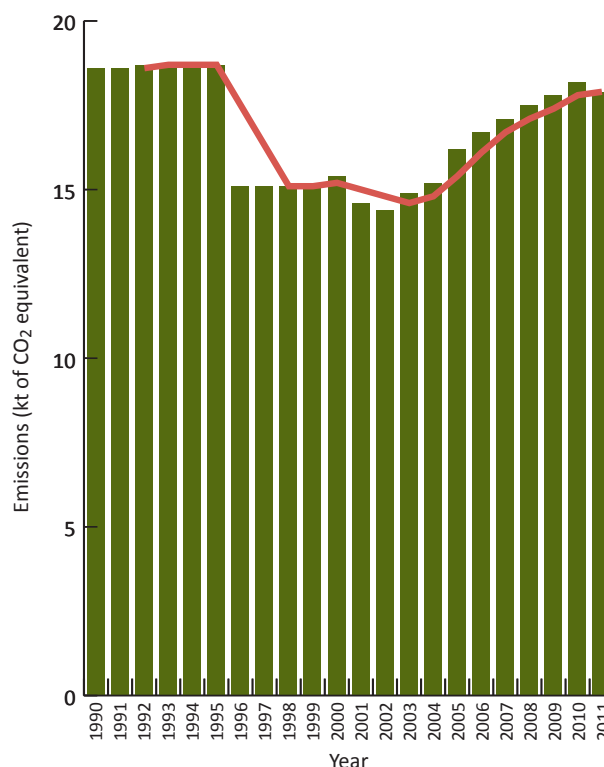


Table 4.2.1: Agriculture, land use, land use change and forestry emissions

	Total emissions (kt of CO ₂ equivalent)	Annual % change	Cumulative % change
1990	18.6	n/a	n/a
1991	18.6	0.0	0.0
1992	18.7	0.6	0.6
1993	18.7	0.0	0.6
1994	18.7	-0.2	0.3
1995	18.7	0.0	0.4
1996	15.1	-18.9	-18.6
1997	15.1	0.1	-18.5
1998	15.1	-0.4	-18.8
1999	15.1	-0.1	-18.9
2000	15.4	2.5	-16.9
2001	14.6	-5.6	-21.5
2002	14.4	-1.3	-22.6
2003	14.9	3.3	-20.0
2004	15.2	2.3	-18.2
2005	16.2	6.8	-12.6
2006	16.7	3.0	-10.0
2007	17.1	2.2	-8.1
2008	17.5	2.1	-6.1
2009	17.8	2.0	-4.2
2010	18.2	2.0	-2.4
2011	17.9	-1.5	-3.9

4.3 Emissions by Source - Waste

Figure 4.3.1: Waste emissions

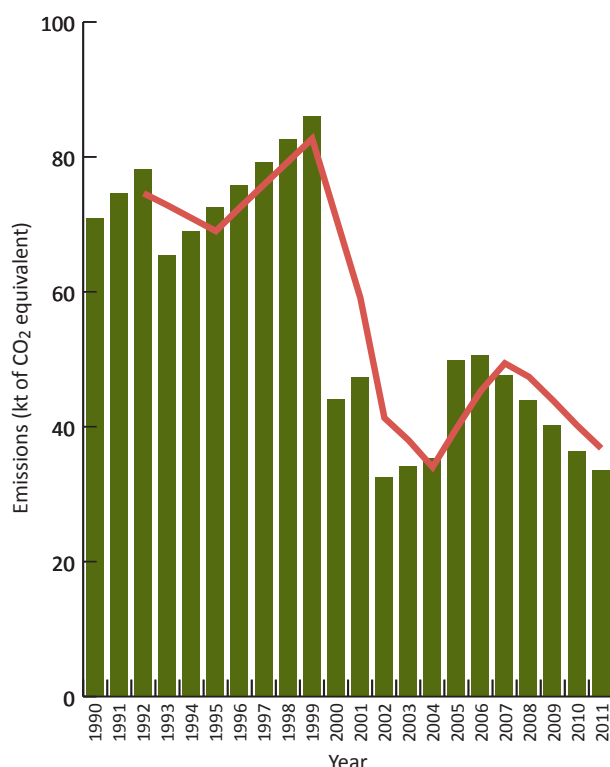


Table 4.3.1: Waste emissions

	Total emissions (kt of CO ₂ equivalent)	Annual % change	Cumulative % change
1990	71.0	n/a	n/a
1991	74.6	5.1	5.1
1992	78.2	4.8	10.2
1993	65.5	-16.3	-7.7
1994	69.0	5.4	-2.7
1995	72.5	5.0	2.2
1996	75.9	4.7	7.0
1997	79.3	4.5	11.8
1998	82.7	4.2	16.5
1999	86.0	4.0	21.2
2000	44.1	-48.7	-37.9
2001	47.3	7.3	-33.3
2002	32.5	-31.3	-54.2
2003	34.1	4.9	-51.9
2004	35.4	3.9	-50.1
2005	49.9	40.7	-29.7
2006	50.6	1.5	-28.7
2007	47.7	-5.6	-32.7
2008	43.9	-8.1	-38.2
2009	40.2	-8.3	-43.3
2010	36.4	-9.5	-48.7
2011	33.6	-7.7	-52.6

Waste is the next largest contributor to Guernsey's total emissions after energy. It contributed 8.6% (33.6kt of CO₂ equivalent) of the total emissions in 2011.

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 CO₂ equivalents.

There have been decreases in the emissions from this source since 2006 (see [Figure 4.3.1](#) and [Table 4.3.1](#)). This mirrors the trend in waste going to landfill during these years.

The cumulative decrease between 1990 and 2011 was 52.6% (or 37.3kt of CO₂ equivalent). The red line on the chart shows the historic three year average.

5.1 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 (see **Figure 5.1.1**). The red line on the chart shows the historic three year average.

In 2011, they contributed 5.3% of the total, compared to less than 0.1% in 1990, an increase of 20.8kt 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.

Figure 5.1.1: F gases emissions

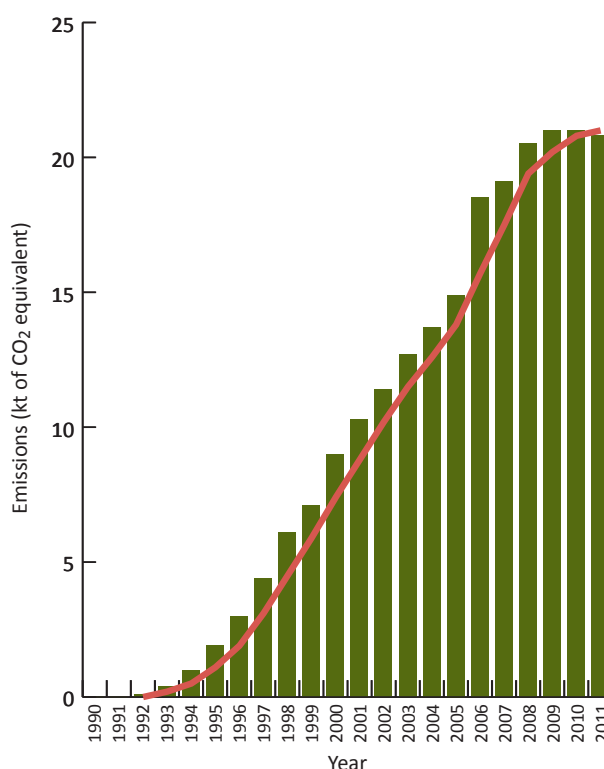


Table 5.1.1: F gases emissions

	Total emissions (kt of CO ₂ equivalent)	Annual % change	Cumulative % change
1990	0.0	n/a	n/a
1991	0.0	20.7	20.7
1992	0.1	43.9	73.7
1993	0.4	479.2	906.3
1994	1.0	166.0	2,577.0
1995	1.9	99.2	5,233.0
1996	3.0	57.3	8,289.9
1997	4.4	46.1	12,154.0
1998	6.1	40.3	17,095.8
1999	7.1	16.7	19,969.8
2000	9.0	26.0	25,189.2
2001	10.3	14.7	28,915.1
2002	11.4	10.3	31,916.0
2003	12.7	11.4	35,558.7
2004	13.7	8.1	38,452.5
2005	14.9	8.5	41,733.7
2006	18.5	24.6	52,039.3
2007	19.1	3.3	53,742.1
2008	20.5	7.0	57,486.3
2009	21.0	2.6	59,012.1
2010	21.0	0.0	59,003.6
2011	20.8	-0.8	58,508.4

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 (Research Section Manager) 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*](mailto:policy.research@gov.gg)

web: [*www.gov.gg/pru*](http://www.gov.gg/pru)