

National Assembly for Wales

Greenhouse Gas Emissions in Wales February 2013

This research paper replaces the previous Greenhouse Gas Emissions in Wales research paper to include the latest data up to 2010.

It provides a short synopsis of the policy framework guiding action on greenhouse gas emissions. The paper examines total greenhouse gas emissions, carbon dioxide and methane emissions at a national and UK level using the 'production' and 'end-user' approaches. Also included is information on the per capita emissions and carbon dioxide emissions for each local authority in Wales.

Comparisons cannot be made with data in previous versions of this paper, due to changes in the sources and methodologies used.

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National Assembly for Wales

Greenhouse Gas Emissions in Wales
February 2013

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Summary

This paper replaces a research paper titled Greenhouse Gas Emissions in Wales, published in January 2012, to include data up to 2010. Comparisons with previous publications cannot be made due to changes in the sources and methodologies used.

In 2010, Wales emitted 46.6 Mega tonnes (Mt) of greenhouse gases using the ‘production’ approach; a 15 per cent reduction in emissions from the base year. **To reach the Welsh Government’s 2020 target of reducing net greenhouse gas emissions by 40 per cent below the base year, emissions will need to be reduced by a further 25 percentage points from base year emissions in ten years.**

In 2010, carbon dioxide comprised approximately 84 per cent of Wales’ total greenhouse gas emissions. **In 2010 Wales emitted 39.1 Mt of carbon dioxide using the ‘production’ approach; a 9.5 per cent reduction in emissions from the 1990 base year.**

Greenhouse gas emissions within the Welsh Government’s devolved competence in 2010 were 31.8Mt. This was an increase of 6 per cent from 2009. However the Committee on Climate Change expect that emissions will have decreased again in Wales in 2011. Over the baseline period of 2006-10, average annual emissions within devolved competence were 32.9Mt. This means that to meet the Welsh Government’s target will require an annual reduction of just under 1Mt from 2011.

On the basis of ‘end-user’ emissions, Wales has achieved much higher emissions reductions since the base year than if the ‘production’ approach is used. **In 2010 Wales emitted 41.4 Mt of ‘end-user’ greenhouse gases (excluding exports), a reduction of 23.8 per cent from 1990.**

Neath Port Talbot had the highest ‘end-user’ carbon dioxide emissions of local authorities in Wales in 2010, while **Merthyr Tydfil** had the lowest. Carbon dioxide emissions per capita were lowest in the **South Wales Valleys, Cardiff and some parts of North Wales**. When only carbon dioxide emissions within the scope of local authorities’ influence are considered, **Cardiff** had the highest ‘end-user’ carbon dioxide emissions in 2010, while **Merthyr Tydfil** had the lowest.

Contents

1. Introduction	1
2. Policies and Targets	2
2.1. International policy	3
2.2. European policy	4
2.3. UK policy	5
2.4. Wales policy	6
3. Measuring Greenhouse Gas Emissions.....	9
3.1. National Emissions calculations using the production approach	10
3.1.1. Total net greenhouse gas emissions	10
3.1.2. Carbon dioxide emissions	13
3.1.3. Methane emissions	17
3.2. National Emissions calculated using the ‘end-user’ approach	18
3.2.1. ‘End-user’ greenhouse gas emissions	19
3.2.2. ‘End-user’ carbon dioxide emissions	20
3.2.3. ‘End-user’ methane emissions	21
3.3. Greenhouse gas emissions within devolved competence	22
3.4. Comparison of changes in production and ‘end-user’ emissions	25
3.5. Local authority carbon dioxide emissions	29
3.5.1. Total carbon dioxide emissions within local authorities	29
3.5.2. Carbon dioxide emissions that local authorities can influence	37
4. Useful links and further information.....	45
Annex A: Total net greenhouse gas and carbon dioxide emissions in Wales in 2010, by sector	46

Greenhouse Gas Emissions in Wales

1. Introduction

The earth's climate has been varying for millions of years, with some variation being natural and expected. However, recent, rapid increases in pollution are thought to have changed the composition of both the atmosphere and the oceans, leading to an increase in the amount of heat retained within the planetary circulation systems.

The United Nations Intergovernmental Panel on Climate Change (IPCC) [Working Group I](#) concluded in their Fourth Assessment Report that there is compelling scientific evidence that the activities of humankind are responsible for changing the climate of the planet; stating that:

...most of the observed increase in global average temperature since the mid-20th century is *very likely* (>90 per cent probability of occurrence) to result from the observed increase in anthropogenic GHG concentrations.¹

This anthropogenic, or human-induced, change is what is usually referred to as 'climate change'.²

The IPCC Fourth Assessment also stated in 2007 that there was:

High agreement and much evidence that with current climate change mitigation policies and related sustainable development practices, global greenhouse gas emissions will continue to grow over the next few decades.³

This paper concentrates on human-induced greenhouse gas emissions, providing analysis of the recent changes in emissions in Wales and makes comparisons with other UK countries.

Emissions of carbon dioxide are the most significant human-induced greenhouse gas. In addition to total greenhouse gas emissions, this paper therefore looks at carbon dioxide emissions, and also considers recent changes in methane emissions.

¹ United Nations Intergovernmental Panel on Climate Change, [Climate Change 2007 : Synthesis Report](#), page39 [accessed 24 October 2012] THE IPCC Fifth Assessment Report is scheduled for completion in 2013-14.

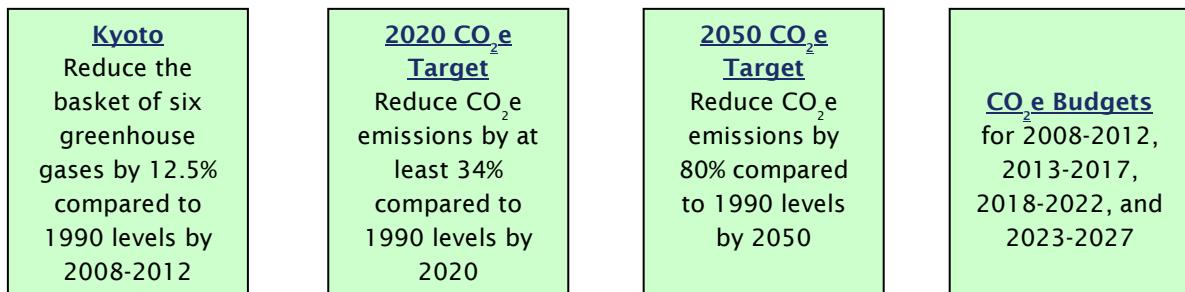
² It should be noted that a small minority of scientists claim that recent climate change is due to factors other than human-induced greenhouse gas emissions or that climate change models are not reliable enough to predict the future climate accurately.

³ United Nations Intergovernmental Panel on Climate Change, [Climate Change 2007 : Synthesis Report](#), page44 [accessed 24 October 2012]

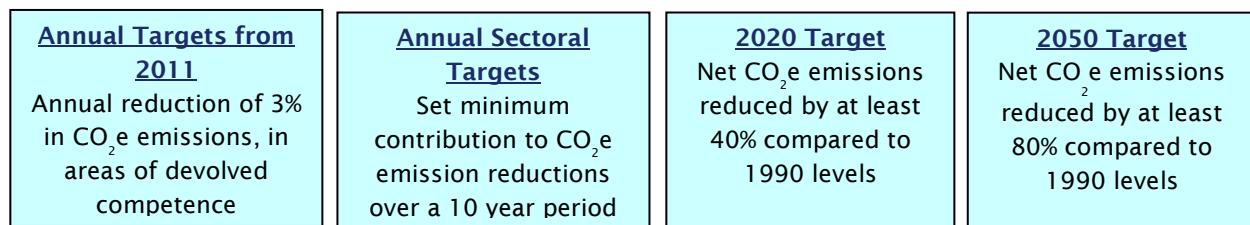
2. Policies and Targets

The following diagram provides an overview of the targets the UK Government and the Welsh Government have set to reduce the emissions of greenhouse gases, especially carbon dioxide, up to 2050. To obtain further information on the targets, click on the links within each box.

UK Targets



Wales Targets



Scotland Targets

2010-2022 and 2023-2027: Annual targets for maximum amount of net CO₂e emissions
2020: Net CO₂e emissions reduced by 42% compared to baseline
2020-2050: CO₂e emissions to be at least 3% lower than preceding year
2050: Net CO₂e emissions reduced by 80% compared to baseline

Northern Ireland Targets

2025: Reduce emissions of all GHGs (CO₂e) by 35% on baseline levels
2050: Net CO₂e emissions reduced by 80% compared to baseline

Source: [AEA Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010](#), page 3, August 2012; and Welsh Government, [Climate Change Strategy for Wales](#) page 34, October 2010 for Welsh targets.
Note: CO₂e is carbon dioxide equivalent emissions from greenhouse gases (GHGs).

2.1. International policy

The UN Framework Convention on Climate Change (UNFCCC)⁴ sets an overall framework for intergovernmental efforts to tackle climate change, with the objective of stabilising greenhouse gas emissions in the atmosphere and reducing the human impact on the climate system.⁵ It recognises that the climate system is a shared resource whose stability can be affected by emissions of carbon dioxide and other greenhouse gases. The Convention has been ratified by 195 parties (194 states⁶, and one regional economic integration organisation (the EU)), and entered into force on 21 March 1994.

The Kyoto Protocol⁷ is the protocol to the UNFCCC which entered into force on 16 February 2005; 192 Parties⁸ (191 States and one regional organisation - the EU) have ratified the Protocol to date.⁹ The Protocol's major feature is mandatory targets on greenhouse gas emissions, whereas the UNFCCC encouraged countries to stabilise greenhouse gas emissions. These targets range from -8 per cent to +10 per cent of 1990 (base year) emissions levels, 'with the view to reducing their overall emissions of such gases by at least 5 per cent below 1990 levels in the commitment period 2008 to 2012'. The European Union participated in both the UNFCCC and the Kyoto Protocol on behalf of its Member States. The EU countries have a target to reduce emissions by 8 per cent, and the UK has agreed to reduce its emissions to at least 12.5 per cent lower than the base year levels.¹⁰

The Kyoto agreement runs until 2012, and negotiations on a follow-up agreement have been taking place at UNFCCC conferences over previous years.

At the seventeenth UNFCCC conference, which was held in Durban, South Africa between 28 November and 9 December 2011,¹¹ following negotiations it was agreed by world governments that **a process would be launched to develop a protocol, another legal instrument or a legal outcome applicable to all Parties, through the Ad Hoc Working Group on the Durban Platform for Enhanced Action.** The eighteenth annual conference was held in Doha, Qatar between 26 November and 7 December 2012.

⁴ United Nations: [United Nations Framework Convention on Climate Change](#) [accessed 3 October 2012]

⁵ AEA Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010, page 1, August 2012 [accessed 3 October 2012]

⁶ The number of countries that have ratified the convention [accessed 3 October 2012]

⁷ United Nations: [Kyoto Protocol to the United Nations Framework Convention on Climate Change](#), 1998 [accessed 3 October 2012]

⁸ Countries are divided into three main Parties according to their differing commitments from the Kyoto Protocol.

⁹ The number of Parties to have ratified the protocol [accessed 3 October 2012]

¹⁰ DECC, [The UK Climate Change Programme Annual Report to Parliament](#), page 9, July 2008 [accessed 3 October 2012]

¹¹ United Nations, [United Nations Framework Convention on Climate Change Calendar 2011](#) [accessed 3 October 2012]

The new framework is to be finalised by 2015 and implemented from 2020.¹² The EU is pressing for an agreement that is ‘ambitious, comprehensive and legally binding’. Pending the new framework’s entry into force, the EU will take part in a second phase of the Kyoto Protocol starting on 1 January 2013.¹³ The UK Government would like to see agreement on a comprehensive legal treaty now, but states that a number of major developed and developing countries are not ready yet.¹⁴ The Doha conference was also the first time the Welsh Government was invited to contribute directly to the UN negotiations as part of the UK delegation, and it was involved in discussions in relation to the second commitment period for the Kyoto Protocol.¹⁵

2.2. European policy

The **European Climate Change Programme** was launched in June 2000, with the goal of identifying and developing all the necessary elements of an EU strategy to implement the Kyoto Protocol. The second phase of the programme commenced in October 2005. The EU has wide jurisdiction over environmental matters to influence climate change, the most relevant of which are:

- The EU has an objective of limiting global temperature increase to less than 2°C compared to pre-industrial levels, and has offered to increase its emissions reduction to 30 per cent by 2020, should other major emitting nations agree to take further action in a global agreement. Until an agreement is concluded, the EU’s target is a 20 per cent reduction from 1990 emissions levels, including targets to improve energy efficiency by 20 per cent by 2020¹⁶, and to increase the share of renewable energy to 20 per cent by 2020. The EU is also aiming to reduce domestic emissions by 80-95 per cent by 2050, as agreed at its Environment Council in November 2009.¹⁷
- Aviation was included in the EU Emissions Trading Scheme from January 2012. The petrochemicals, ammonia and aluminium industries will be included from 2013, when the third trading period starts.¹⁸

¹² United Nations Framework Convention on Climate Change, [Establishment of an Ad Hoc Working Group on the Durban Platform for Enhanced Action. Proposal by the President](#). 10 December 2011 [accessed 3 October 2012]

¹³ European Union, [What is the EU doing on climate change](#), [accessed 3 October 2012]

¹⁴ Department of Energy and Climate Change, [Demystifying..... the Kyoto Protocol](#), [accessed 22 October 2012]

¹⁵ Welsh Government, John Griffiths (Minister for Environment and Sustainable Development), [United Nations Framework Convention On Climate Change – Doha](#), Cabinet Oral Statement, 15 January 2013 [accessed 15 January 2013]

¹⁶ Department of Energy and Climate Change, [Demystifying..... the Kyoto Protocol](#), [accessed 22 October 2012]

¹⁷ European Union, [Roadmap for moving to a low-carbon economy in 2050](#) [accessed 3 October 2012]

¹⁸ European union, [Emissions Trading System \(EU ETS\)](#), [accessed 3 October 2012]

2.3. UK policy

In March 2006 the then UK Government published its new Climate Change Programme¹⁹ which set out its policies and priorities for action on climate change, both across the UK and internationally.

The *Climate Change Act 2008*²⁰ provides a legal framework to reduce future greenhouse gas emissions by 80 per cent compared to 1990 levels by 2050, with a reduction in emissions of at least 34 per cent compared to 1990 levels by 2020.²¹ It established a system of '**carbon budgeting**' every five years, during which time greenhouse gas emissions must be within predetermined limits. In addition, the Act also established the **Committee on Climate Change**, an independent body which advises the UK and Welsh Governments and reports to Parliament annually on progress towards targets and budgets.

In May 2011 it was announced that the UK Government is proposing a 50 per cent cut in greenhouse gas emissions for the carbon budget for 2023 to 2027, in line with advice it received from the Committee on Climate Change. This budget was set in law in June 2011.²² In October 2011 the UK Government published its Carbon Plan, a Government-wide plan of action on domestic and international climate change. The Plan sets out the UK Government's actions and deadlines for its departments over the next five years.²³

The UK Government published the **UK Climate Change Risk Assessment** (CCRA) on 25 January 2012. This is the first assessment of its kind for the UK and the first in a five year cycle. The outputs provide an evidence base that can be used by central government and devolved administrations in identifying priorities for action and appropriate adaptation measures.²⁴ The CCRA UK Government Report sets out the main priorities for adaptation in the UK under five key themes (Agriculture and Forestry; Business, industries and Services; Health and Wellbeing; Natural Environment; and Buildings and Infrastructure) identified in the CCRA 2012 Evidence Report.

On Thursday, November 29th 2012, the Secretary of State for Energy and Climate Change introduced the **Energy Bill** to the House of Commons. According to the UK Government the reforms will ensure that low-carbon electricity generation is sufficiently incentivised to ensure that new plants are built, which will be crucial if

¹⁹ Department of Energy and Climate Change, [UK Climate Change Programme](#), March 2006 [accessed 4 October 2012]

²⁰ [Climate Change Act 2008](#) (chapter 27) [accessed 12 October 2012]

²¹ Department of Energy and Climate Change webpage, [Climate Change Act 2008](#) [accessed 12 October 2012]

²² Department of Energy and Climate Change, [Carbon Budgets](#) [accessed 12 October 2012]

²³ Department of Energy and Climate Change, [Carbon Plan](#) [accessed 12 October 2012]

²⁴ Department for Environment, Food and Rural Affairs, [UK Climate Change Risk Assessment](#), 11 September 2012 [accessed 12 October 2012]

the UK is to meet its obligations to reduce carbon emissions and increase the use of renewables.

The House of Commons' Energy and Climate Change Committee conducted an inquiry to scrutinise the [draft Energy Bill](#) that was published on 22 May 2012. Its report was published on 23 July 2012.

2.4. Wales policy

The previous Welsh Government's [Climate Change Strategy for Wales](#), published in October 2010, provided details of how Wales will aim to meet its target for 3 per cent annual reductions in carbon equivalent emissions from 2011 'in areas of devolved competence'²⁵ in effect excluding the power sector and energy intensive industries, and to achieve at least a 40 per cent reduction in all greenhouse gas emissions by 2020. The Committee on Climate Change states that the two targets are compatible; and that if the Welsh Government delivers the 3 per cent target then this could allow it to meet the economy-wide target as long as the power sector in Wales reduces emissions at the same rate as the sector in the rest of the UK and energy-intensive industries do not increase emissions.²⁶

The Climate Change Commission for Wales first met in December 2007, and is an independent advisory body which helps to develop policy, and works towards creating a consensus on climate change.²⁷ The Commission is made up of stakeholders from businesses, the public sector, environmental organisations, the voluntary sector and representatives of the four major Welsh political parties.²⁸ The Commission worked alongside the Welsh Government to develop and approve the *Climate Change Strategy for Wales*.²⁹ The strategy sets out how and where the Welsh Government will act to reduce greenhouse emissions, and how they intend to work with partners such as the UK Government, businesses, organisations and communities. Targets are also set out for specific sectors such as transport, business, agriculture and land use, waste, residents and the public sector.³⁰

The *Climate Change Strategy* is supplemented by two delivery plans; the *Emissions Reduction Delivery Plan*³¹, which provides information on the policies

²⁵ Welsh Government: [Climate Change Strategy for Wales](#) page 34, October 2010 [accessed 12 October 2012]

²⁶ Committee on Climate Change, [Reducing emissions and preparing for climate change in Wales](#), page 9, October 2011 [accessed 12 October 2012]

²⁷ Welsh Government, [Climate Change Commission Background and History](#) [accessed 12 October 2012]

²⁸ Welsh Government, [Climate Change Commission Membership](#) [accessed 12 October 2012]

²⁹ Welsh Government, [Climate Change Strategy for Wales](#) page 5, (October 2010) [accessed 12 October 2012]

³⁰ Welsh Government, [Climate Change Strategy for Wales](#) page 38, (October 2010) [accessed 12 October 2012]

³¹ Welsh Government, [Delivery plan for Emission reduction](#), October 2010 [accessed 12 October 2012]

and programmes that the Welsh Government believes will enable it to meet its annual 3 per cent reduction in carbon emissions in devolved areas, and the *Adaptation Delivery Plan*³² which gives details of actions aimed at increasing Wales' resilience to climate change.

Under the *Climate Change Act 2008*, the Welsh Government is required to report to the National Assembly for Wales on its climate change objectives, policies and priorities. The *Climate Change Strategy* and the two delivery plans were submitted by the Welsh Government to the Assembly as the first report under these requirements. In March 2012, the [**first annual progress report**](#) was released in relation to the *Climate Change Strategy*. The report considers the progress made in implementing the Emission Reduction and Adaptation Delivery Plans since publication of the strategy in October 2010, and includes a qualitative assessment of the progress made in delivering the sector actions. The report does not detail Wales' performance in 2011 for the 3% annual emission reduction target, because the relevant UK emission statistics will not be available until July 2013.³³ Consequently, the next Welsh Government report will be published in the autumn of 2013³⁴.

The Welsh Government has also published *Preparing for a changing climate*,³⁵ a policy statement which sets out its response to the challenges facing Wales in relation to climate change, and provides information on how it will implement relevant provisions of the *Climate Change Act 2008*. At the same time, it released its *Climate Change Engagement Strategy*,³⁶ aimed at helping people, communities and organisations to relate to and understand climate change. As a result, they will then be able to make a difference to climate change and make more climate aware choices.

The [**Climate Change Risk Assessment for Wales**](#) report was produced as part of the UK CCRA. The report presents a national assessment of potential risks and opportunities from climate change facing Wales for the period to 2100. Its findings will inform the development of adaptation in Wales. The findings are presented in the same five key themes as the UK report, for different possible future scenarios and include an indication of confidence in the results and areas where there are evidence gaps.

³² Welsh Government, [**Adaptation Delivery Plan**](#), October 2010 [accessed 12 October 2012]

³³ Welsh Government, [**Climate Change Strategy for Wales**](#), 29 March 2012 [accessed 12 October 2012]

³⁴ Welsh Government, [**Climate Change Strategy for Wales; First Annual Progress Report**](#), March 2012 [accessed 12 October 2012]

³⁵ Welsh Government, [**Preparing for a changing climate**](#), October 2011 [accessed 12 October 2012]

³⁶ Welsh Government, [**Climate Change Engagement Strategy**](#), October 2011 [accessed 12 October 2012]

In March 2012 the Welsh Government issued the [Energy Wales: A Low Carbon Transition](#) document which sets out what they intend to do to move towards a sustainable, low carbon economy in Wales.

In January 2013, the Committee on Climate Change published its [second annual report](#) on the Welsh Government's progress on reducing emissions and preparing for climate change. Now that data for 2010 is available, the Committee has calculated the baseline figures upon which the Welsh Government's target to reduce emissions in areas of devolved competence will be assessed. Further detail on these is available in section 3.3 of this paper.

3. Measuring Greenhouse Gas Emissions

There are two main approaches to calculating greenhouse gas emissions:

- **Production or ‘source’ approach:** calculating emissions according to where emissions are produced. This is relatively easy to calculate and allocate to national accounts, however, it does not account for products that are made elsewhere and imported. This methodology is used by the AEA;³⁷ and has been used to enable comparisons between the devolved nations regarding total greenhouse gas emissions, carbon dioxide emissions and methane emissions. Progress against the targets outlined in section 2 is measured using the production approach.
- **Consumption or ‘end-user’ approach:** calculating emissions according to where the product of those emissions is consumed. This accounts for all the emissions associated with the consumption of energy, rather than those associated with the geographical location of where energy production takes place. Non-energy production emissions are still counted at the place of production. The AEA publishes ‘end-user’ statistics for total greenhouse gas emissions, carbon dioxide emissions and methane emissions for each of the devolved nations, and comparisons have been made in section 3.5 of the paper. ‘End-user’ data for carbon dioxide emissions by local authority have also been published by AEA³⁸ and figures for the Welsh local authorities are included in section 3.5.

In this paper, the statistics in section 3.1 use the ‘production’ approach and those in sections 3.2 and 3.5 use the ‘end-user’ methodology.

³⁷ AEA are a global sustainability consultancy who produce annual reports on greenhouse gas emissions in England, Scotland, Wales and Northern Ireland for the UK Government and devolved administrations.

³⁸ AEA, [2010 UK Carbon dioxide emissions for Local Authority and Government Office region level](#), 23 August 2012 [accessed 24 October 2012]

3.1. National Emissions calculations using the production approach

This section uses the production approach to compare total net greenhouse gas emissions in Wales, and other UK countries, with the targets outlined in the previous chapter. It then goes on to look at data using the production approach for carbon dioxide emissions and methane emissions in Wales and the other UK countries.

Throughout this Section due to updated emissions data and changes to methodologies, it is not possible to compare the figures published here with previous Research Service papers or previous AEA inventory publications.

3.1.1. Total net greenhouse gas emissions

Total greenhouse gas emissions are made up of six gases; carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.³⁹

There has been a general downward trend in greenhouse gas emissions in Wales over the past 20 years, although there have been rises in emissions in some years. In 2010, total net emissions of greenhouse gases in Wales were 46.6 Mega tonnes (Mt), 15 per cent lower than the base year (1990 or 1995)^{40,41}, however there was an increase of 3.5Mt between 2009 and 2010. In comparison with the other UK countries in 2010, Wales has reduced its emissions (below the 1990 or 1995 base year) by 15 per cent, which is 8.9 percentage points less than the UK average, as shown in table 1. England has had the largest reduction in emissions, of 26 per cent.

In a written statement in October 2012, John Griffiths AM, the Minister for Environment and Sustainable Development stated that:

There was an increase of around 8 per cent in greenhouse gas emissions in 2010 compared with 2009. This was due to increases in the residential, business and industrial process sectors, which may have been affected by the cold winters, at the start and end of 2010, and an increase in the production of iron and steel.⁴²

In a preliminary assessment, the Committee on Climate Change consider that emissions are likely to have fallen in 2011 due to temperatures being relatively

³⁹ AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2009](#), page v, September 2011 [accessed 20 January 2012]

⁴⁰ AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2009: Devolved Administration GHG Inventory Pivot Tables \(by source basis\)](#), September 2011 [accessed 20 January 2012]

⁴¹ Under the Kyoto Protocol, Annex 1 parties are able to use 1990 or 1995 as the base year for emissions of hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride, and a number of parties, including the United Kingdom and devolved nations, use 1995.

⁴² Welsh Government, John Griffiths (Minister for Environment and Sustainable Development, [Greenhouse Gas Emissions in Wales in 2010](#), Cabinet Written Statement, 15 October 2012 [accessed 24 October 2012]

mild, falling EU Emissions Trading Scheme (EUETS) emissions and the economic situation.⁴³

Table 1: Greenhouse gas emissions and percentage change from base year (1990 or 1995)^(a), Wales and the UK^(b), 1995 to 2010 (Mt CO₂ e)

Year	Wales		England		Scotland		Northern Ireland		United Kingdom	
	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year
Base Year	54.9	..	606.0	..	69.8	..	24.0	..	770.8	..
1995	51.4	..	543.7	..	67.3	..	24.2	..	708.5	..
1998	53.1	-3.1	533.2	-12.0	67.1	-3.9	23.8	-0.8	699.8	-9.2
1999	54.4	-0.9	504.8	-16.7	63.3	-9.2	24.0	0.3	668.6	-13.3
2000	56.1	2.3	504.1	-16.8	65.1	-6.6	23.7	-1.2	670.1	-13.1
2001	53.0	-3.4	511.1	-15.7	64.6	-7.4	24.2	0.7	674.6	-12.5
2002	46.2	-15.8	502.6	-17.1	60.6	-13.2	21.8	-8.9	653.2	-15.3
2003	47.2	-14.0	508.2	-16.1	59.8	-14.2	21.8	-9.1	657.6	-14.7
2004	50.9	-7.3	506.1	-16.5	57.4	-17.8	21.7	-9.7	656.4	-14.8
2005	49.1	-10.5	503.3	-16.9	56.1	-19.6	22.5	-6.0	651.0	-15.5
2006	50.7	-7.6	495.5	-18.2	59.6	-14.6	22.9	-4.4	646.4	-16.1
2007	47.7	-13.0	493.5	-18.6	55.3	-20.7	21.5	-10.3	636.4	-17.4
2008	49.3	-10.1	480.3	-20.7	53.5	-23.3	21.5	-10.4	622.0	-19.3
2009	43.1	-21.3	438.0	-27.7	49.8	-28.6	19.7	-17.6	568.0	-26.3
2010	46.6	-15.0	448.4	-26.0	53.2	-23.7	20.5	-14.7	586.3	-23.9

Source: AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010: Devolved Administration GHG Inventory Pivot Tables](#), (By-source Wales tab) August 2012

..= not applicable

Notes:

(a) The base years for carbon dioxide, methane and nitrous oxide emissions are 1990. The base years for hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride are 1995. AEA has calculated the base year figure for total greenhouse gas emissions based on the figures for the corresponding base years.

(b) Data excludes Crown Dependencies and Overseas Territories

Emissions from offshore sources are not allocated to any of the countries within the UK, but are instead recorded in an ‘unallocated’ inventory category.

Unallocated total net greenhouse gas emissions accounted for 3.0% (17.5Mt) of the UK’s emissions in 2010, an increase of 7.6% since 1990.⁴⁴ There are no ‘unallocated’ emissions for hydrofluorocarbons, perfluorocarbons or sulphur hexafluoride. Unallocated emissions make up the difference between the sum of the four devolved nations’ total net greenhouse gas emissions and the UK figure.

The largest sources of emission in 2010 include electricity production (25 per cent of total GHGs), road transport (12 per cent of total GHGs), residential combustion for heating and cooking (10 per cent of total GHGs), and industrial combustion for heat and electricity in the business sector (7 per cent of total GHGs).

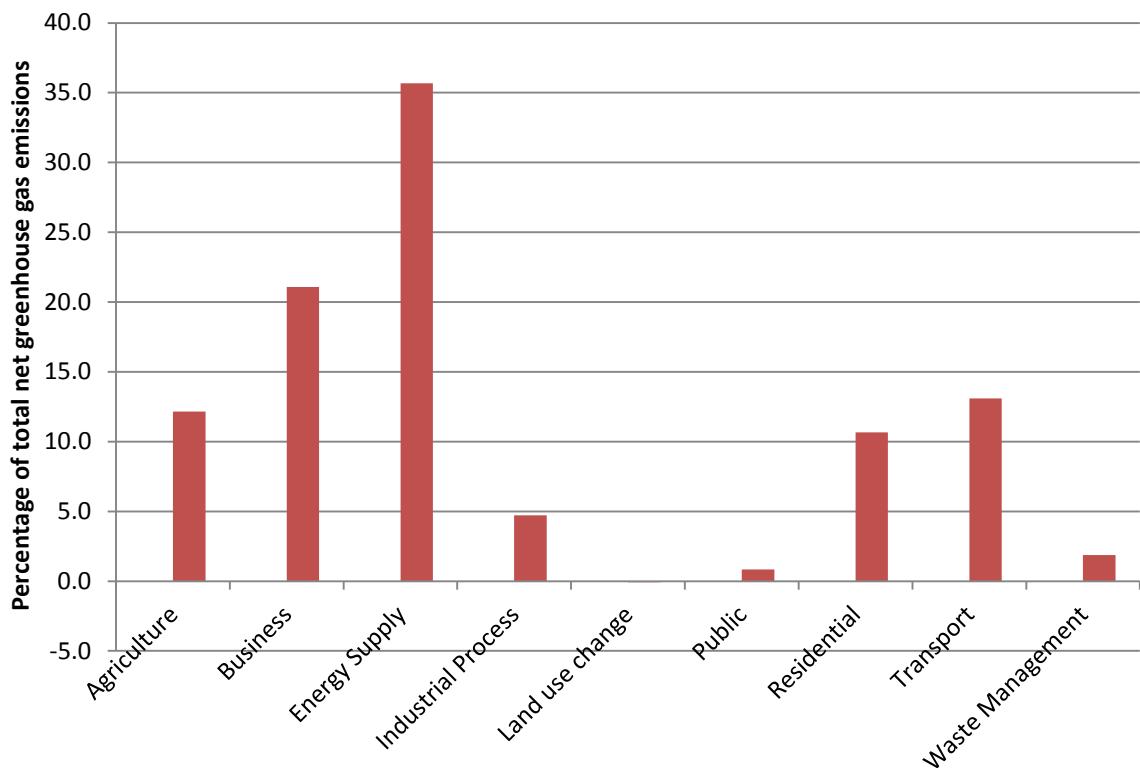
⁴³ Committee on Climate Change, [2012 Annual Progress Report](#), pages 247 and 248, July 2012 [accessed 24 October 2012]

⁴⁴ AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010](#), page v, August 2012 [accessed 24 October 2012]

Wales is a net exporter of electricity i.e. it exports more than it uses. Wales exported the equivalent of 24.5% of its generation to consumers in England in 2010, falling to 13.4% in 2011.⁴⁵

Figure 1 below shows total net greenhouse gas emissions in Wales by sector in 2010. **It can be seen that the energy supply sector produced most total net greenhouse gas emissions in 2010, producing 36 per cent of all total net greenhouse gas emissions.** Business produced 21 per cent, while residential, transport and agriculture each produced between 10 and 15 per cent of total net greenhouse gas emissions in Wales in 2010.

Figure 1: Total net greenhouse gas emissions in Wales by sector, 2010 (per cent)



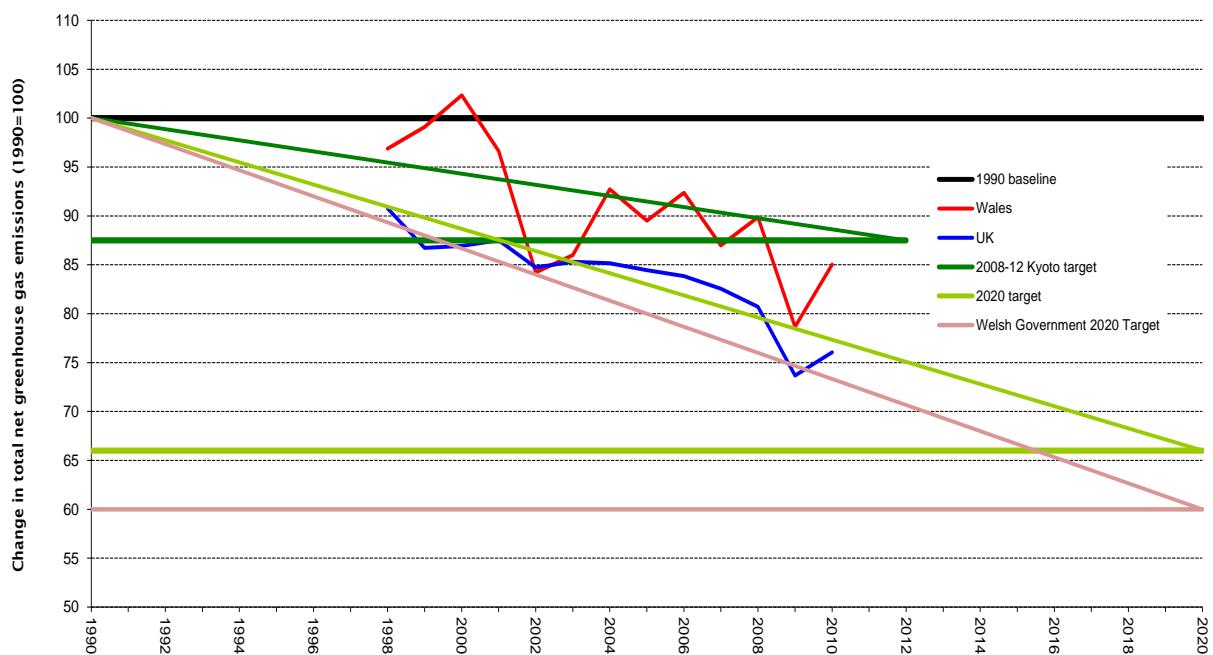
Source: AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010: Devolved Administration GHG Inventory Pivot Tables](#), (By-source Wales tab) August 2012 and Research Service calculations - data is available in Annex A of this research paper.

Figure 2 shows the trend of greenhouse gas emissions in Wales in comparison with the UK trend and the trend lines to achieve the UK 2020 target of reducing total net greenhouse gas emissions by 34 per cent below the 1990 base year. It also shows the trend lines for the Welsh Government target of reducing net greenhouse gas emissions by 40 per cent and the 2008-12 Kyoto Protocol target of the UK reducing greenhouse gas emissions by 12.5 per cent, also by 2020.

⁴⁵ Department for Energy and Climate Change, [Electricity generation and supply figures for Scotland, Wales, Northern Ireland and England, 2008 to 2011](#), page 1, December 2012 [accessed 24 October 2012]

To reach the Welsh Government's 2020 target of reducing greenhouse gas emissions by 40 per cent below the 1990 base year, emissions will need to be reduced by a further 25 percentage points from base year emissions in ten years.

Figure 2: Trends in total net greenhouse gas emissions from 1990 to 2010, (against base year) Wales and UK



Source: AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010](#), August 2012

(a) For figures prior to 1998, data is only available for 1990 and 1995; therefore these years have not been included on the trend lines.

(b) Different methodologies have been used from previous AEA publications; therefore comparisons cannot be made with previous papers.

3.1.2. Carbon dioxide emissions

Carbon dioxide accounts for approximately 84 per cent of total net greenhouse gas emissions in the UK.⁴⁶ Wales has performed inconsistently in reducing carbon dioxide emissions over the past 20 years. In 2010, total emissions of carbon dioxide in Wales were 39.1 Mt, representing a 9.5% decrease from the base year (1990)⁴⁷. However, there was an increase of 3.4 Mt between 2009 and 2010. In comparison with the other UK countries in 2010, Wales has reduced its

⁴⁶ AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010: Devolved Administration GHG Inventory Pivot Tables](#), (By-source UK tab) August 2012 [accessed 24 October 2012]

⁴⁷ AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010: Devolved Administration GHG Inventory Pivot Tables](#), August 2012 [accessed 24 October 2012]

emissions (below the 1990 base year) by 6.5 percentage points less than the UK average, as shown in table 2. Scotland has had the largest reduction in emissions, of 18.8 per cent.

Table 2: Carbon dioxide emissions^(a) and percentage change from base year (1990), Wales and the UK^(b), 1990 to 2010 (Mt CO₂)

Year	Wales		England		Scotland		Northern Ireland		United Kingdom	
	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year
1990	43.2	..	463.9	..	50.9	..	16.7	..	588.9	..
1995	40.7	-5.6	423.0	-8.8	50.0	-1.8	16.9	1.1	550.4	-6.5
1998	43.0	-0.3	420.4	-9.4	50.5	-0.9	16.4	-2.1	550.8	-6.5
1999	44.3	2.5	412.6	-11.1	47.6	-6.5	16.8	0.1	541.6	-8.0
2000	46.4	7.5	416.4	-10.3	49.9	-1.9	16.7	0.0	548.8	-6.8
2001	43.8	1.5	429.5	-7.4	50.1	-1.6	17.2	2.9	560.7	-4.8
2002	37.3	-13.5	423.8	-8.7	46.6	-8.5	15.5	-7.7	543.5	-7.7
2003	38.5	-10.8	433.6	-6.5	46.6	-8.5	15.5	-7.6	553.3	-6.0
2004	42.3	-1.9	432.8	-6.7	44.3	-12.9	15.4	-8.3	553.7	-6.0
2005	40.4	-6.3	431.3	-7.0	43.2	-15.2	16.3	-2.8	549.8	-6.6
2006	42.1	-2.5	425.9	-8.2	46.8	-8.0	16.7	-0.2	548.1	-6.9
2007	39.8	-7.9	425.1	-8.4	42.9	-15.7	15.5	-7.3	540.3	-8.2
2008	41.7	-3.3	412.7	-11.0	41.4	-18.7	15.6	-6.9	527.7	-10.4
2009	35.7	-17.2	373.0	-19.6	37.9	-25.5	13.9	-16.9	476.4	-19.1
2010	39.1	-9.5	383.2	-17.4	41.4	-18.8	14.7	-12.5	494.5	-16.0

Source: AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010: Devolved Administration GHG Inventory Pivot Tables](#), August 2012

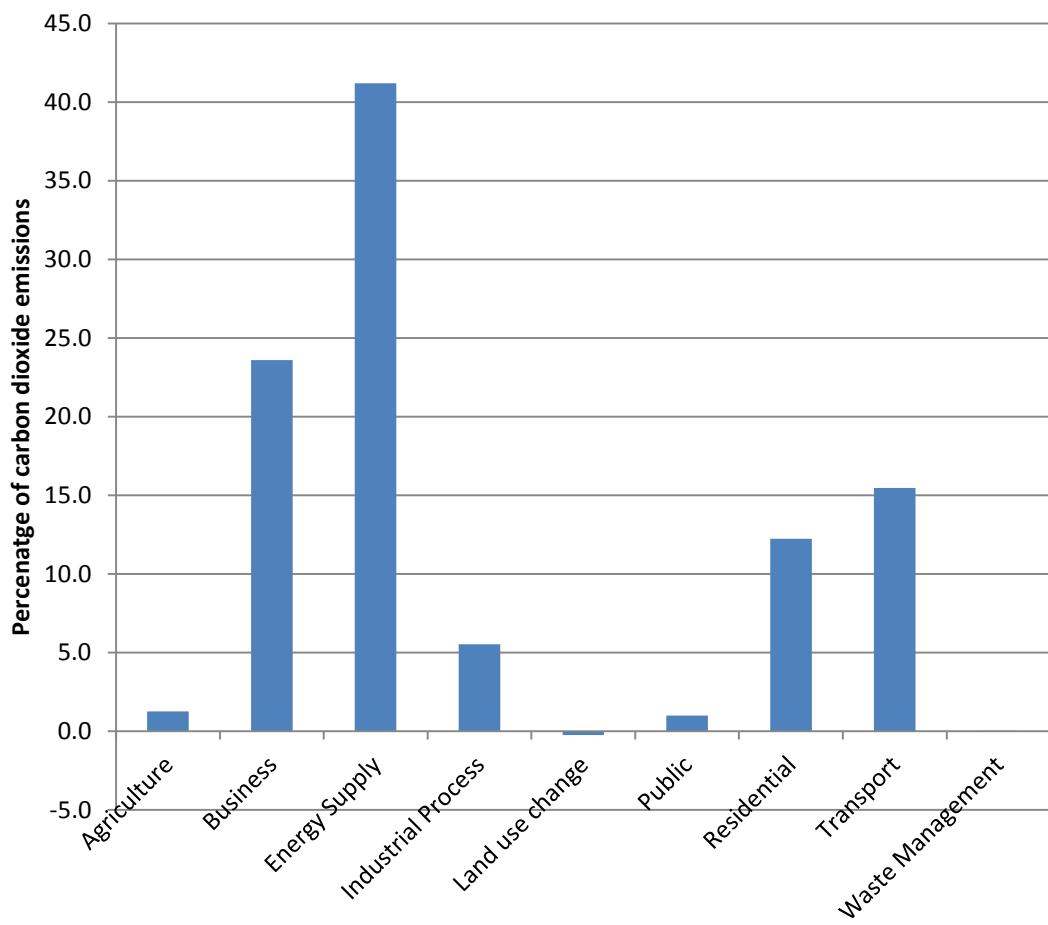
Notes:

(a)Different methodologies have been used from previous AEA publications; therefore comparisons cannot be made with previous papers.

(b)Data excludes Crown Dependencies and Overseas Territories

It can be seen from figure 3 that the energy supply sector produced 41 per cent of all carbon dioxide emissions in Wales in 2010, which was the largest proportion of all sectors. Business produced 24 per cent, and transport produced 15 per cent of all carbon dioxide emissions in Wales during 2010.

Figure 3: Carbon dioxide emissions in Wales by sector, 2010 (per cent)



Source: AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010: Devolved Administration GHG Inventory Pivot Tables](#), (By-source Wales tab) August 2012 and Research Service calculations - data is available in Annex A of this research paper.

The Environment Agency has provided details⁴⁸ of the top 14 carbon dioxide emitters in the EU Emissions Trading Scheme (EUETS) in Wales from 2005 to 2011, and these are shown in Table 3. The EUETS covers around 11,000 installations across Europe, which account for approximately 45 per cent of European Union carbon dioxide emissions. The Environment Agency has advised that approximately 96 per cent of verified EUETS emissions in Wales are attributable to these 14 emitters. The remaining installations in Wales covered by the EUETS accounted for approximately 4 per cent of verified emissions. Welsh emitters contributed approximately 10 per cent of verified emissions at the UK level between 2005 and 2011.

⁴⁸ The Environment Agency provided these figures on request.

Table 3: Top 14 carbon dioxide emitters in the EUETS in Wales, 2005-11 (Mt CO₂)

Site	2005		2006		2007		2008		2009		2010		2011	
	Allocated Emissions	Verified Emissions												
Port Talbot Steelworks	7.8	6.1	7.8	6.6	7.8	7.1	7.8	6.9	7.8	5.3	7.8	7.3	7.8	6.6
Aberthaw Power Station	4.1	5.3	4.1	7.3	4.1	4.2	4.1	7.0	4.1	5.0	4.1	4.7	4.1	4.8
Chevron Limited - Pembroke	2.1	2.3	2.1	2.3	2.1	2.5	2.1	2.2	2.1	2.5	2.1	2.5	2.1	2.4
Connahs Quay Power Station	1.9	3.4	1.9	3.2	1.9	3.4	1.9	3.3	1.9	3.2	1.9	3.0	1.9	1.8
Severn Power Ltd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.5	1.2	1.2
Baglan Bay Power Station	0.8	1.1	0.8	1.1	0.8	1.4	0.8	0.7	0.8	0.3	0.8	1.2	0.8	1.2
Murco Petroleum Milford Haven Refinery	1.2	1.0	1.2	1.2	1.2	1.2	1.2	1.1	1.2	1.1	1.3	0.9	1.3	1.1
Deeside Power Station	0.7	1.0	0.7	0.6	0.7	0.9	0.7	1.2	0.7	1.2	0.7	1.2	0.7	0.7
Uskmouth Power Plant	0.9	1.0	0.9	0.9	0.9	0.7	0.9	1.3	0.9	0.7	0.9	0.4	0.9	0.4
South Hook LNG Terminal	0.0	0.0	0.1	0.0	0.3	0.0	0.0	0.0	0.1	0.1	0.3	0.3	0.3	0.4
Shotton Combined Heat and Power	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.5	0.4	0.5	0.2
Padeswood Works	0.8	0.3	0.8	0.6	0.8	0.6	0.8	0.5	0.8	0.3	0.8	0.2	0.8	0.2
Milford Energy Plant	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.2	0.2	0.2	0.2
Dow Corning Cogen Plant	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total of top 14 emitters	20.9	22.1	21.0	24.3	21.5	22.3	20.9	25.0	21.0	20.3	22.1	22.8	22.7	21.4
Other Wales Operators	1.9	0.8	2.0	0.7	2.1	1.1	1.5	1.2	1.7	1.2	1.8	1.0	1.9	0.8
Wales Total	22.8	22.9	23.1	25.0	23.6	23.5	22.4	26.3	22.7	21.6	23.8	23.8	24.6	22.3

Source: Environment Agency

Notes:

- (a) The Environment Agency advises that emissions figures for Wales are potentially volatile as they are influenced significantly by a small number of installations.
- (b) Verified emissions for the 2005-10 period have been influenced significantly by the global recession and maintenance works at Aberthaw Power Station in 2007.

As can be seen in Table 3 above, **in 2011 the Tata Steelworks in Port Talbot was the largest emitter of carbon dioxide in the EUETS in Wales, with verified emissions of 6.6Mt of carbon dioxide**. Over the 2005 to 2011 period, the 55 installations in Wales covered by the EUETS were allocated 162.9Mt of carbon dioxide emissions. Actual verified carbon dioxide emissions during this period were 165.2Mt.

3.1.3. Methane emissions

Wales has consistently reduced methane emissions over the past 20 years. In 2010, methane emissions in Wales were 3.9Mt, 46.8 per cent lower than the base year (1990)⁴⁹. In comparison with the other UK countries in 2010, Wales has reduced its emissions (below the 1990 base year) by 10.9 percentage points less than the UK average, as shown in table 4. England has had the largest reduction in emissions, of 61.7 per cent.

Table 4: Methane emissions and percentage change from base year (1990), Wales and the UK^(a), 1990 to 2010 (Mt CO₂e)

Year	Wales		England		Scotland		Northern Ireland		United Kingdom	
	Emissions (Mt)	Percentage change since base year	Emissions (Mt)	Percentage change since base year	Emissions (Mt)	Percentage change since base year	Emissions (Mt)	Percentage change since base year	Emissions (Mt)	Percentage change since base year
1990	7.3	..	72.4	..	11.9	..	3.7	..	97.1	..
1995	6.2	-14.6	61.4	-15.2	10.7	-9.5	3.5	-4.3	83.7	-13.8
1998	5.8	-21.2	52.7	-27.3	9.5	-19.7	3.4	-6.5	73.0	-24.9
1999	5.6	-22.9	49.2	-32.1	8.7	-26.3	3.3	-10.2	68.2	-29.8
2000	5.4	-26.3	45.7	-36.9	8.3	-29.9	3.2	-13.9	63.8	-34.3
2001	4.9	-32.4	41.6	-42.6	7.7	-35.3	3.1	-15.9	58.5	-39.7
2002	4.8	-34.8	39.6	-45.3	7.1	-40.3	3.0	-17.5	55.6	-42.7
2003	4.6	-37.7	34.8	-51.9	6.4	-45.9	3.0	-19.7	49.9	-48.7
2004	4.5	-38.4	33.5	-53.7	6.3	-47.3	2.9	-20.3	48.4	-50.2
2005	4.5	-38.6	32.3	-55.5	6.3	-47.3	3.1	-17.0	46.9	-51.7
2006	4.5	-38.4	31.3	-56.8	6.1	-48.6	3.0	-18.9	45.6	-53.0
2007	4.2	-43.1	30.0	-58.6	6.0	-49.5	2.9	-20.2	44.1	-54.6
2008	3.9	-46.1	29.3	-59.5	5.8	-51.1	2.9	-21.2	42.9	-55.9
2009	3.9	-47.1	28.5	-60.7	5.6	-52.5	2.9	-22.5	41.8	-57.0
2010	3.9	-46.8	27.8	-61.7	5.6	-52.9	2.9	-22.3	41.1	-57.7

Source: AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010: Devolved Administration GHG Inventory Pivot Tables](#), August 2012

Note:

(a)Data excludes Crown Dependencies and Overseas Territories

Agriculture is the largest source of methane emissions in Wales. Enteric fermentation⁵⁰ contributed 90 per cent of total agricultural methane emissions in Wales in 2010. Total methane emissions from beef and dairy cattle accounted for 63 per cent of agricultural methane emissions in 2010,⁵¹ with emissions from sheep accounting for a further 35 per cent of the agriculture methane emissions in 2010.

⁴⁹ AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2009](#), page xv , September 2011 [accessed 20 January 2012]

⁵⁰ The United Nations Intergovernmental Panel on Climate Change (IPCC) states that: "Methane is produced in herbivores as a byproduct of enteric fermentation, a digestive process by which carbohydrates are broken down by micro-organisms into simple molecules for absorption into the bloodstream...ruminant livestock (e.g. cattle, sheep) are major sources of methane."

UNIPCC, [IPCC Guidelines for National Greenhouse Gas Inventories](#) (page 10.24), February 2009 [accessed 20 January 2012]

⁵¹ AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010](#), page 75, August 2012 [accessed 24 October 2012]

3.2. National Emissions calculated using the ‘end-user’ approach

Emissions of greenhouse gases are typically reported under international conventions using the production approach, which allocates emissions to the source sector at the point of their release.⁵² However, to provide a more representative view of consumption rather than production, end-user inventories can be used. Emissions associated with sector consumption of all fuels, including emissions associated with electricity use are shown in end-user inventories.⁵³

Table 5 below compares the UK distribution of greenhouse gas emissions by end user and by source/production in 2010. The devolved administrations’ ‘end-user’ inventories include emissions relating to the refining of fuels that are subsequently exported outside the UK.⁵⁴ These appear within the ‘exports’ line in the devolved administrations’ ‘end-user’ inventories. In its 2009 report, AEA published two sets of ‘end-user’ figures, one set including exported emissions, and one set excluding exported emissions. In 2010 ‘end-user’ data including exported emissions has been published, but figures excluding exported emissions have not. **However, it is possible to calculate figures for ‘end-user’ data excluding exported emissions, so I have calculated and used these figures in the paper, as with previous versions of the paper.** These figures will therefore differ from those quoted elsewhere. Imports such as electricity imported from the EU and consumed in the UK are not included.

Table 5: Share of greenhouse gas emissions by source and by ‘end-user’, 2010

	By source	End-user including exports	End-user excluding exports
England	76.5	79.9	80.0
Scotland	9.1	8.9	8.9
Wales	8.0	7.4	7.3
Northern Ireland	3.5	3.8	3.9
Unallocated	3.0	0.0	0.0

Source: AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010: Devolved Administration GHG Inventory Pivot Tables](#), August 2012 plus Research Service calculations

⁵² AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010](#), page iv, August 2012 [accessed 24 October 2012]

⁵³ Ibid. page 5

⁵⁴ Ibid. page 5

It can be seen that Wales has a smaller share of ‘end-user’ emissions, 7.3 per cent of UK emissions when exports are excluded, in comparison to its share of 8.0 per cent of ‘by source’ UK emissions.

This section uses the ‘end-user’ approach to compare total net greenhouse gas emissions in Wales and other UK countries. It then goes on to look at data using the ‘end-user’ approach for carbon dioxide emissions and methane emissions in Wales and the other UK countries.

Throughout this section due to updated emissions data and changes to methodologies, it is not possible to compare the figures published here with previous Research Service papers or previous AEA inventory publications.

3.2.1. ‘End-user’ greenhouse gas emissions

As stated above, it is possible to measure ‘end-user’ emissions either including or excluding exports; **figures excluding exports are set out below.**

Overall there has been a general downward trend in ‘end-user’ greenhouse gas emissions (excluding exports) in Wales over the past 20 years, although there have been rises in some years. **In 2010, total ‘end-user’ emissions of greenhouse gases in Wales were 41.4 Mega tonnes (Mt), 23.8% lower than the base year (1990 or 1995)⁵⁵, and there was an increase of 4.0 Mt between 2009 and 2010.** Of the other UK countries, Scotland has had the largest reduction in emissions, of 31.8%. As can be seen in table 6, Wales has had a greater reduction in ‘end-user’ greenhouse gas emissions excluding exports than Northern Ireland over the past 20 years.

⁵⁵ Under the Kyoto Protocol, Annex 1 parties are able to use 1990 or 1995 as the base year for emissions of hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride, and a number of parties, including the United Kingdom and devolved nations, use 1995.

Table 6: ‘End-user’ greenhouse gas emissions excluding exports and percentage change from base year (1990 or 1995), Wales and the other UK countries, 1990 to 2010 (Mt CO₂ e)

Year	Wales		England		Scotland		Northern Ireland		United Kingdom	
	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year
1990	54.3	..	604.8	..	74.0	..	24.8	..	758.0	..
2003	45.4	-16.4	517.6	-14.4	56.4	-23.8	22.5	-9.2	641.9	-15.3
2004	46.0	-15.4	515.5	-14.8	55.3	-25.3	22.4	-9.7	639.2	-15.7
2005	44.1	-18.9	511.7	-15.4	55.2	-25.4	22.7	-8.5	633.7	-16.4
2006	44.5	-18.1	507.7	-16.1	54.4	-26.4	23.1	-7.0	629.7	-16.9
2007	43.5	-19.9	500.1	-17.3	52.8	-28.6	22.8	-8.1	619.3	-18.3
2008	42.0	-22.6	489.6	-19.0	52.5	-29.1	22.3	-10.2	606.4	-20.0
2009	37.4	-31.1	444.5	-26.5	48.8	-34.1	21.2	-14.4	551.9	-27.2
2010	41.4	-23.8	455.8	-24.6	50.5	-31.8	22.2	-10.5	569.8	-24.8

Source: AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010: Devolved Administration GHG Inventory Pivot Tables](#), August 2012 plus Research Service calculations

3.2.2. ‘End-user’ carbon dioxide emissions

In relation to ‘end-user’ carbon dioxide emissions excluding exports, there has been a general downward trend in Wales over the past 20 years, although there have been rises in emissions in some years. **In 2010, ‘end-user’ emissions of carbon dioxide in Wales were 33.8 Mega tonnes (Mt), 20 per cent lower than the base year (1990)⁵⁶, however there was an increase of 3.7 Mt between 2009 and 2010.** Of the other UK countries, Scotland has had the largest reduction in emissions, of 28.8%. As can be seen in table 7, Wales has had a greater reduction in ‘end-user’ carbon dioxide emissions excluding exports than England, Northern Ireland and the UK over the past 20 years.

Table 7: ‘End-user’ carbon dioxide emissions excluding exports and percentage change from base year (1990), Wales and the other UK countries, 1990 to 2009 (Mt CO₂)

Year	Wales		England		Scotland		Northern Ireland		United Kingdom	
	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year
1990	42.2	..	466.7	..	54.1	..	17.0	..	579.9	..
2003	36.6	-13.3	442.9	-5.1	42.8	-20.9	16.0	-5.9	538.2	-7.2
2004	37.4	-11.5	442.1	-5.3	42.0	-22.4	15.9	-6.5	537.3	-7.4
2005	35.4	-16.1	439.5	-5.8	42.1	-22.1	16.3	-4.3	533.3	-8.0
2006	35.9	-14.9	437.9	-6.2	41.5	-23.2	16.7	-1.7	532.1	-8.2
2007	35.6	-15.6	431.3	-7.6	40.3	-25.4	16.7	-2.0	523.9	-9.7
2008	34.5	-18.4	421.7	-9.6	40.2	-25.7	16.2	-4.5	512.6	-11.6
2009	30.1	-28.8	379.0	-18.8	36.7	-32.1	15.2	-10.4	461.0	-20.5
2010	33.8	-20.0	390.2	-16.4	38.5	-28.8	16.2	-4.4	478.7	-17.5

Source: AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010: Devolved Administration GHG Inventory Pivot Tables](#), August 2012 plus Research Service calculations

⁵⁶ AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010](#), page 75, August 2012 [accessed 24 October 2012]

3.2.3. 'End-user' methane emissions

There has also been a general downward trend in 'end-user' methane emissions excluding exports in Wales over the past 20 years. In 2010, 'end-user' emissions of methane in Wales were 3.9 Mega tonnes (Mt), 48.5% lower than the base year (1990)⁵⁷, however there was an increase of 0.1 Mt between 2009 and 2010. Of the other UK countries, England has had the largest reduction in emissions, of 60.9%. As can be seen in table 8, Wales has had a greater reduction in 'end-user' methane emissions excluding exports than Northern Ireland over the past 20 years.

Table 8: 'End-user' methane emissions excluding exports and percentage change from base year (1990), Wales and the other UK countries, 1990 to 2010 (Mt CO₂)

Year	Wales		England		Scotland		Northern Ireland		United Kingdom	
	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year	Emissions (Mt)	Percentage change from base year
1990	7.6	..	71.6	..	13.0	..	4.3	..	96.7	..
2003	4.7	-38.8	34.7	-51.5	6.8	-47.9	3.2	-26.4	49.4	-48.9
2004	4.6	-39.8	33.5	-53.2	6.6	-49.6	3.1	-27.2	47.9	-50.5
2005	4.4	-41.6	32.3	-54.9	6.5	-50.2	3.2	-25.1	46.5	-51.9
2006	4.5	-41.2	31.3	-56.4	6.3	-51.6	3.1	-26.9	45.2	-53.2
2007	4.1	-46.3	30.3	-57.7	6.1	-53.0	3.1	-28.3	43.6	-54.9
2008	4.0	-48.0	29.5	-58.8	6.0	-54.3	3.0	-29.3	42.5	-56.0
2009	3.8	-49.5	28.7	-59.9	5.8	-55.4	3.0	-30.2	41.4	-57.2
2010	3.9	-48.5	28.0	-60.9	5.7	-55.9	3.0	-30.0	40.8	-57.8

Source: AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010: Devolved Administration GHG Inventory Pivot Tables](#), August 2012 plus Research Service calculations

⁵⁷ AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010](#), page 75, August 2012 [accessed 24 October 2012]

3.3. Greenhouse gas emissions within devolved competence

The Welsh Government's [Climate Change Strategy for Wales](#), published in October 2010, provided details of how Wales will aim to meet its target for three per cent annual reductions in carbon equivalent emissions from 2011 'in areas of devolved competence'⁵⁸ against a baseline of average emissions over 2006-10. The target covers around 70 per cent of total Welsh greenhouse gas emissions, although emissions from the power sector and energy-intensive industries in the EUETS are not included in the target as they are not within devolved competence.

A mixture of 'by source' and 'end-user' emissions are included within the scope of the target, and the main emitting sectors identified by the Committee on Climate Change are transport, business, residential and agriculture.⁵⁹ Based on the Welsh Government's methodology, direct emissions included are those from all sectors except those from the power sector and energy-intensive industries in the EUETS, while the indirect emissions included are those from electricity use.⁶⁰

The Committee on Climate Change has published details of the baseline emissions for 2006 to 2010 which are being used to assess performance against the Welsh Government's target to reduce emissions in areas of devolved competence from 2011 onwards by three per cent per year. **The average annual emissions over the baseline period were 32.9Mt.** To meet the target, emissions will need to be reduced by just under 1Mt per year from 2011, implying emissions of 23Mt in 2020.⁶¹

The Committee on Climate Change has provided details of emissions within devolved competence by emitting sector for each year from 2006 to 2010, and these are summarised in table 9 below.

Table 9: Greenhouse gas emissions within Wales' devolved competence, by sector, 2006 to 2010 (Mt CO₂e)

Sector	2006	2007	2008	2009	2010	Baseline emissions (average 2006 to 2010)
Transport	6.7	6.7	6.6	6.2	6.2	6.5
Business	12.7	12.2	10.7	9.3	10.3	11.0
Residential	8.1	7.6	7.7	7.1	7.7	7.6
Agriculture and Land Use	6.6	6.0	5.6	5.5	5.9	5.9
Waste	1.0	1.0	0.9	0.9	0.9	0.9
Public Sector	0.9	0.9	0.9	0.8	0.8	0.9
Total	35.9	34.4	32.4	29.9	31.8	32.9

Source: Committee on Climate Change

⁵⁸ Welsh Government: [Climate Change Strategy for Wales](#) page 34, October 2010 [accessed 24 October 2011]

⁵⁹ Committee on Climate Change, [Progress reducing emissions and preparing for climate change in Wales](#), page 15, January 2013 [accessed 24 October 2011]

⁶⁰ Ibid. page 13

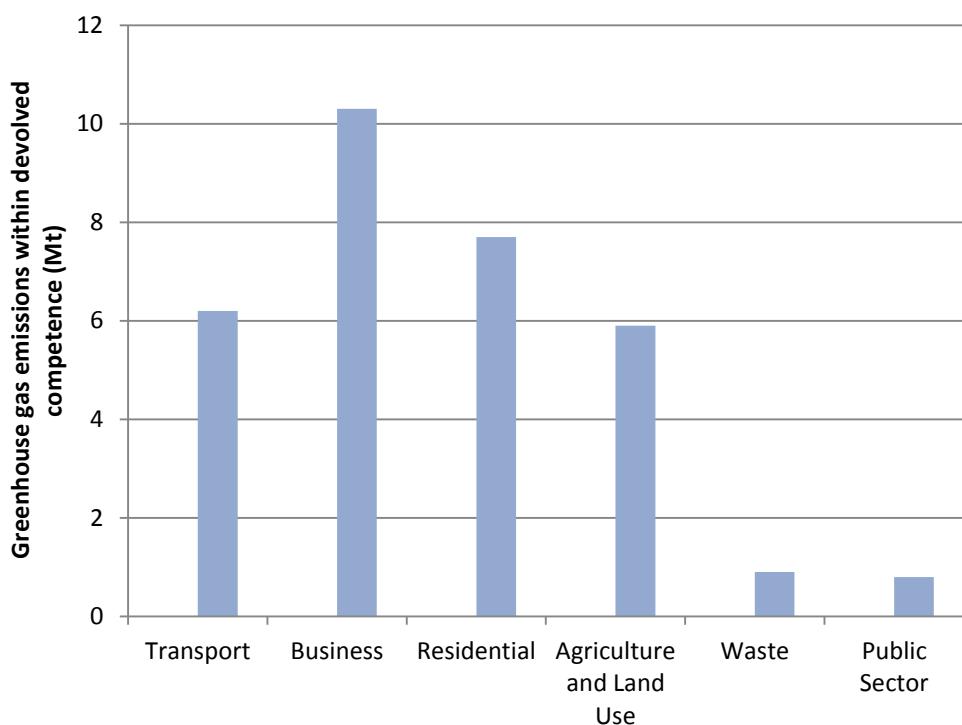
⁶¹ Ibid. page 15

As can be seen in Table 9, greenhouse gas emissions within the Welsh Government's devolved competence in 2010 were 31.8Mt. Total greenhouse gas emissions within devolved competence in 2009 were 29.9Mt, so the 2010 figure was an increase of 6.4 per cent from the 2009 figure.

The largest source of emissions in 2010 was business, with emissions of 10.3Mt. Residential, transport and agricultural emissions were the next highest sources of greenhouse gas emissions within devolved competence. Figure 4 shows the distribution of greenhouse gas emissions in devolved areas in 2010 by sector.

It should be noted that Figures 4 and 5 cannot be compared to the graphs in section 3.2 of this paper as the figures in section 3.2 are calculated using the 'production' approach whereas the data used in Figures 4 and 5 were calculated by the Committee on Climate Change using a combination of the 'production' and 'end-user' methods.

Figure 4: Total greenhouse gas emissions within devolved competence by sector, 2010 (Mt CO₂e)

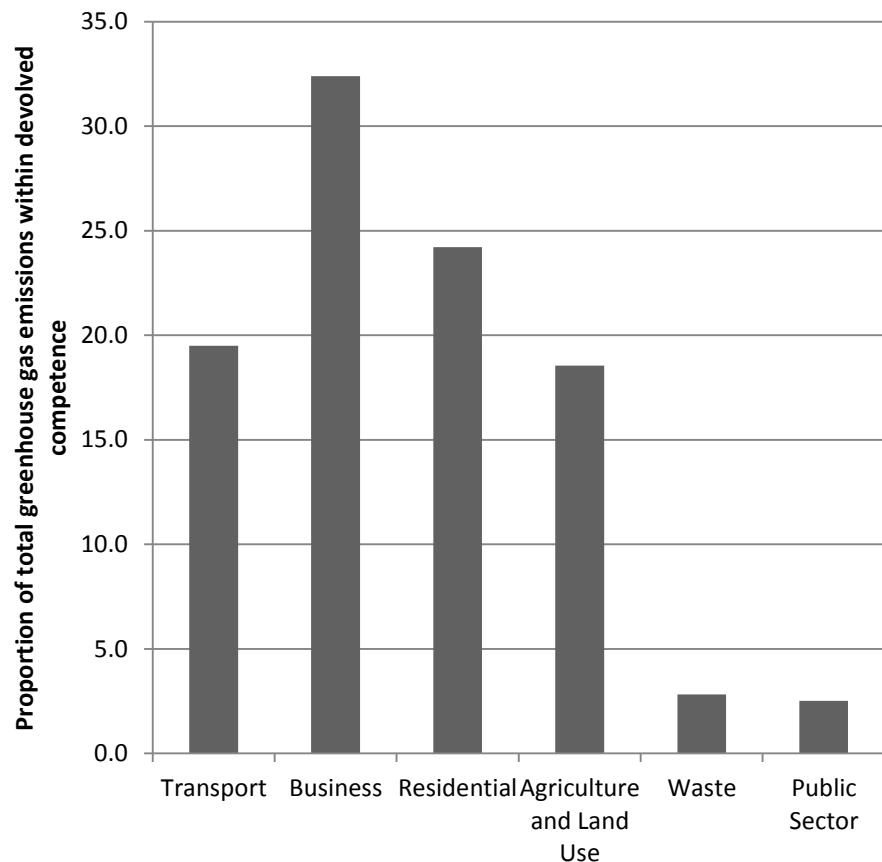


Source: Committee on Climate Change

Figure 5 shows the proportion of total greenhouse gas emissions within devolved competence by sector for 2010. It can be seen from Figure 5 that 32 per cent of total greenhouse gas emissions within devolved competence are from the business sector. The next highest sectors were the residential sector, which made

up 24 per cent of emissions within devolved competence, and the transport sector which accounted for 19 per cent of emissions.

Figure 5: Percentage of total greenhouse gas emissions in Wales within devolved competence by sector, 2010



Source: AEA, Committee on Climate Change and Research Service calculations

3.4. Comparison of changes in production and ‘end-user’ emissions

Comparing the different levels of emissions for each of the UK countries using the production and ‘end-user’ approaches shows the difference between energy production and energy consumption patterns. Table 10 provides a summary of the changes in levels of carbon dioxide, methane and total greenhouse gas emissions between 1990 and 2010 for each of the UK countries for the production and ‘end-user’ approaches.

Table 10: Changes in emissions levels for Wales and the other UK countries from base year (1990 or 1995) using production and ‘end-user’ approaches, base year to 2010 (Mt CO₂e)

<i>Percentage change in emissions from base year to 2010</i>				
Country	Gas	Production approach	End-user approach including exports	End-user approach excluding exports
Wales	Carbon Dioxide	-9.5	-18.0	-20.0
	Methane	-46.8	-48.4	-48.5
	Total Greenhouse Gases	-15.0	-22.2	-23.8
England	Carbon Dioxide	-17.4	-14.9	-16.4
	Methane	-61.7	-60.6	-60.9
	Total Greenhouse Gases	-26.0	-23.4	-24.6
Scotland	Carbon Dioxide	-18.8	-27.9	-28.8
	Methane	-52.9	-55.9	-55.9
	Total Greenhouse Gases	-23.7	-31.1	-31.8
Northern Ireland	Carbon Dioxide	-12.5	-3.2	-4.4
	Methane	-22.3	-29.9	-30.0
	Total Greenhouse Gases	-14.7	-9.6	-10.5
United Kingdom	Carbon Dioxide	-16.0	-16.0	-17.5
	Methane	-57.7	-57.7	-57.8
	Total Greenhouse Gases (a)	-23.9	-23.6	-24.8

Source: AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010](#), August 2012 [accessed 20 January 2013]

Note:

- (a) The production and end-user including exports figures for total greenhouse gas emissions at UK level are slightly different due to AEA using different base years for these figures. The production figures published by AEA use a mixture of 1990 and 1995 as the base year, while the end-user emissions figures use 1990 as the base year.

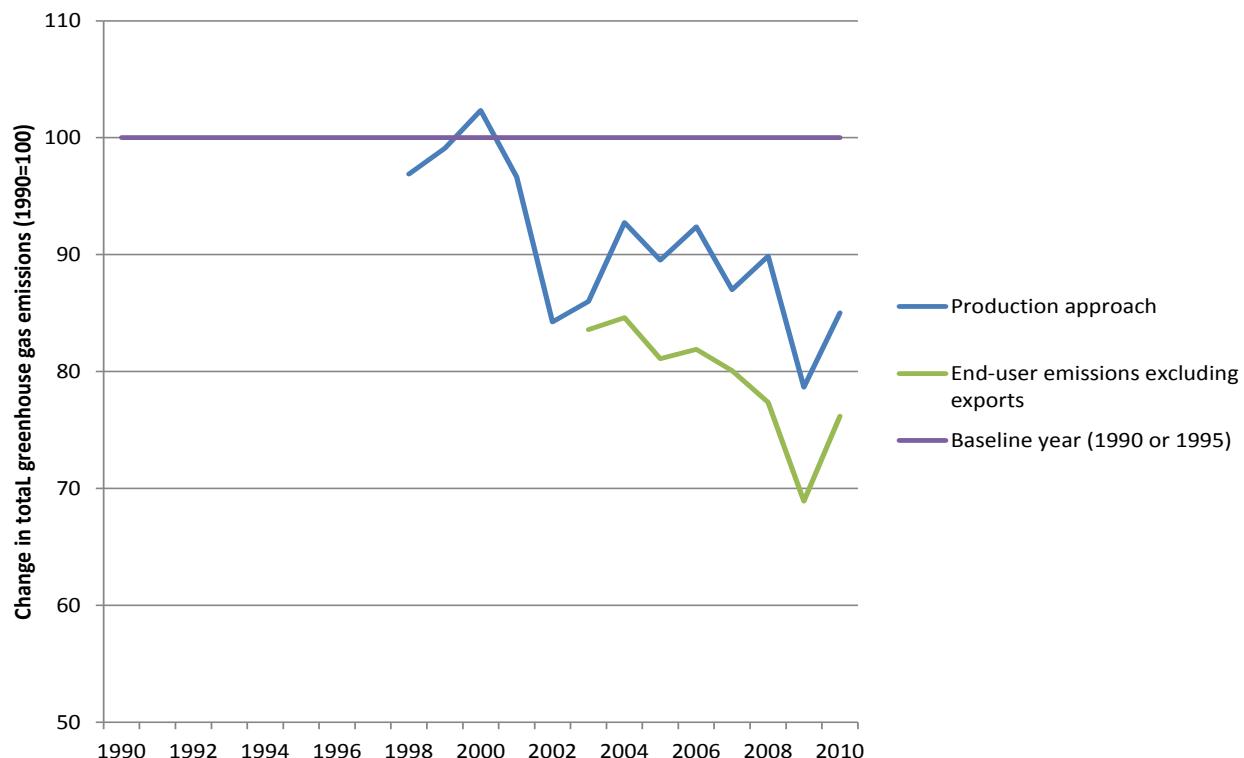
As can be seen from Table 10, there are variations between the UK countries in whether they have higher levels of emissions reductions according to the ‘production’ or ‘end-user’ approach. **Wales is a net exporter of electricity, which means that it has lower ‘end-user’ emissions than ‘production’ emissions.** The 2010 AEA report states that Wales’ end-user greenhouse gas emissions in 2010 were 8 per cent lower than its ‘production’ emissions.⁶²

⁶² AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010](#), page 58, August 2012 [accessed 24 October 2012]

Of the other UK countries, Scotland has also achieved higher emissions reductions on the ‘end-user’ basis as it is a net exporter of electricity.⁶³ England and Northern Ireland both have higher levels of emissions reductions on a production basis compared to ‘end-user’ emissions, which indicates that both countries consume more fuel or electricity than they produce.

Figure 6 provides an index of the trends of total greenhouse gas emissions levels for Wales for the production and ‘end-user’ methods of measuring emissions.

Figure 6: Trends in greenhouse gas emissions levels for Wales from base year (1990 or 1995) using production and ‘end-user’ approaches, 1990 to 2010 (Mt CO₂e)



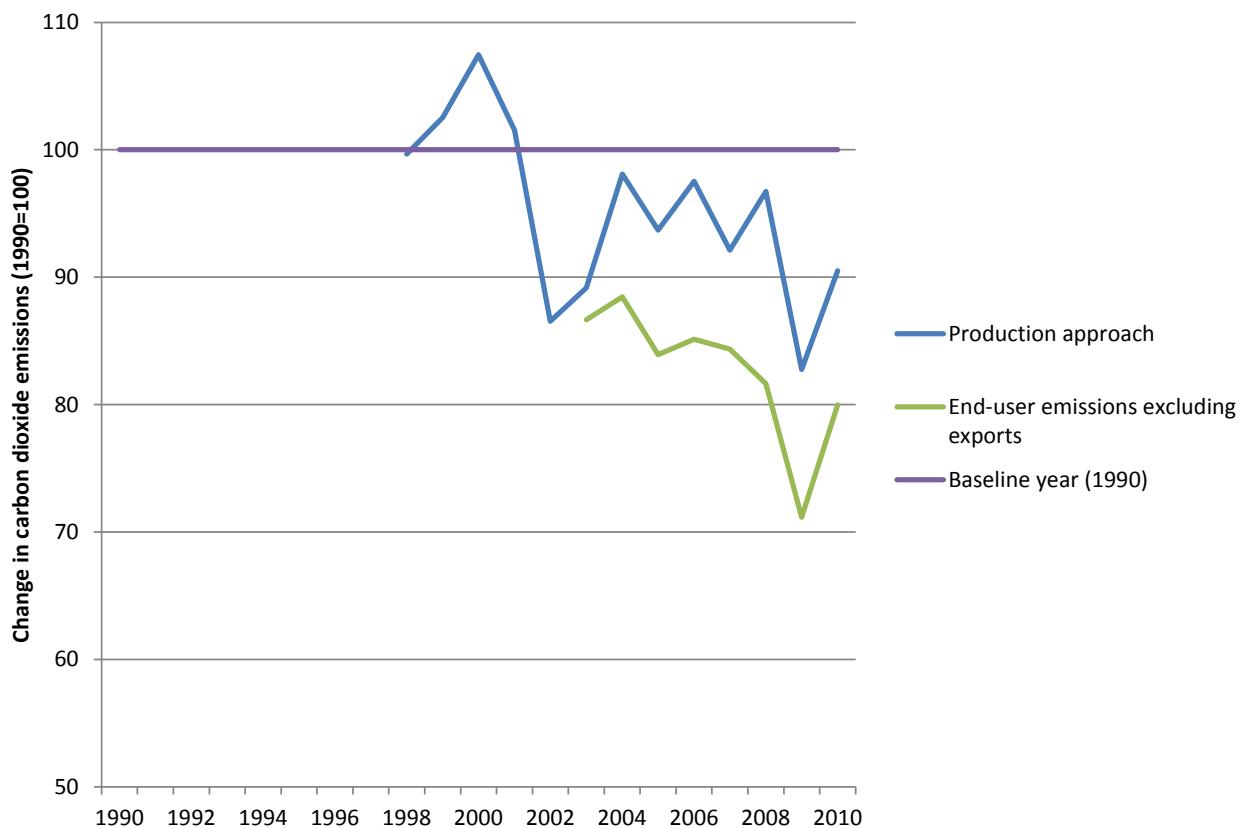
Source: AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010: Devolved Administration GHG Inventory Pivot Tables](#), August 2012 plus Research Service calculations

- (a) For greenhouse gas emissions calculated using the production approach, prior to 1998, data is only available for 1990 and 1995; therefore these years have not been included on the trend lines.
- (b) For greenhouse gas emissions calculated using the ‘end-user’ approach, prior to 2003, data is only available for 1990; therefore this year has not been included on the trend lines.

Figure 7 provides an index of the trends of carbon dioxide emissions levels for Wales for the production and ‘end-user’ methods of measuring emissions.

⁶³ Ibid. page 34

Figure 7: Trends in carbon dioxide emissions levels for Wales from base year (1990) using production and ‘end-user’ approaches, 1990 to 2010 (Mt CO₂)

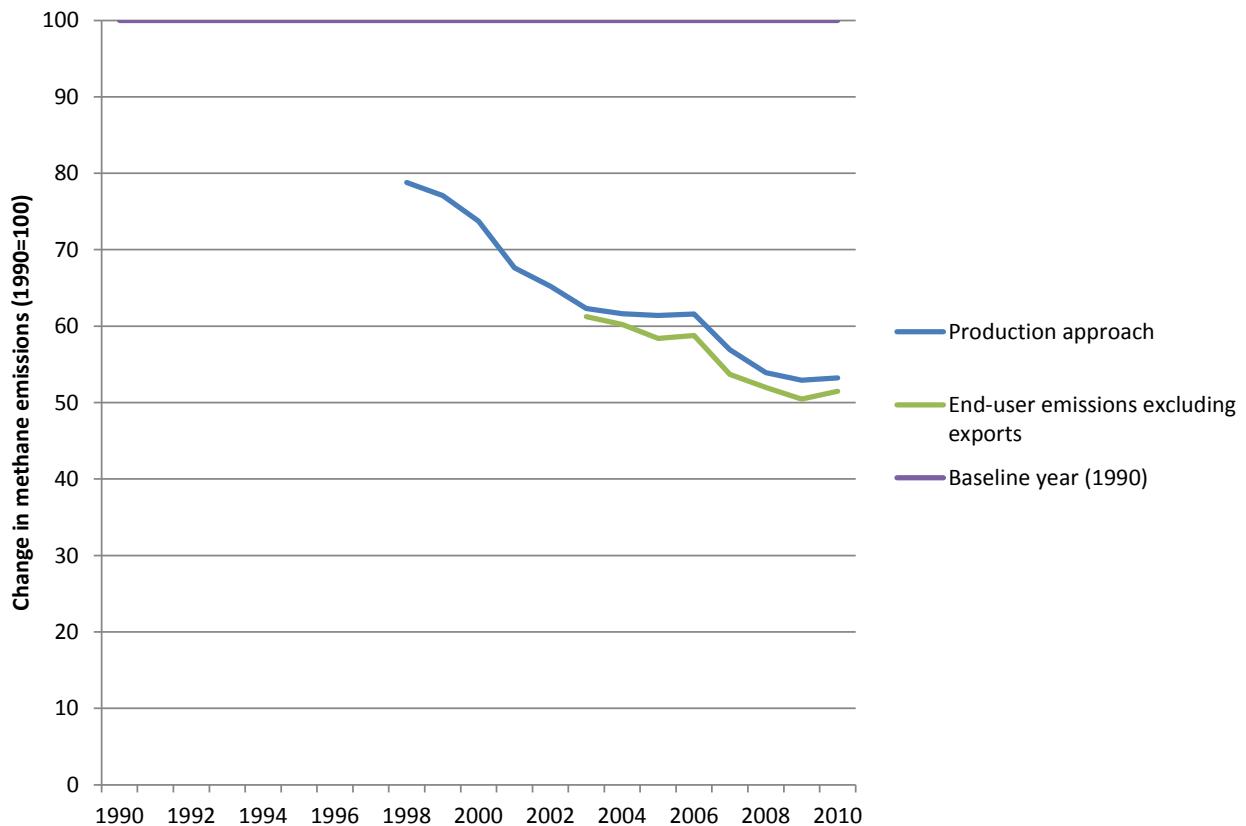


Source: AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010: Devolved Administration GHG Inventory Pivot Tables](#), August 2012 plus Research Service calculations

- (a) For carbon dioxide emissions calculated using the production approach, prior to 1998, data is only available for 1990 and 1995; therefore these years have not been included on the trend lines.
- (b) For carbon dioxide emissions calculated using the ‘end-user’ approach, prior to 2003, data is only available for 1990; therefore this year has not been included on the trend lines.

Figure 8 provides an index of the trends in methane emissions levels for Wales for the production and ‘end-user’ methods of measuring emissions.

Figure 8: Trends in methane emissions levels for Wales from base year (1990) using production and 'end-user' approaches, 1990 to 2010 (Mt CO₂e)



Source: [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010: Devolved Administration GHG Inventory Pivot Tables](#), August 2012 plus Research Service calculations

- (a) For methane emissions calculated using the production approach, prior to 1998, data is only available for 1990 and 1995; therefore these years have not been included on the trend lines.
- (b) For methane emissions calculated using the 'end-user' approach, prior to 2003, data is only available for 1990; therefore this year has not been included on the trend lines.

3.5. Local authority carbon dioxide emissions

Figures at a local authority level are available for carbon dioxide emissions, both for all emissions within local authorities and for emissions that are within the scope of local authorities' influence. This paper includes both sets of figures to provide further detail on carbon dioxide emissions within local authorities.

3.5.1. Total carbon dioxide emissions within local authorities

The principal methodology for allocating emissions to local authorities allocates emissions on an 'end user' basis. As explained at the start of Section 3 in this paper, this means that emissions are distributed according to the point of energy consumption or the point of emission if non-energy related. Emissions from the production of goods are assigned to where the production takes place.

The values arising from this methodology give an idea of geographical use, rather than production, so it is useful in informing about emissions from use of energy in local authority areas. Detailed carbon dioxide emissions for 2010 by sector, and local authority are shown in table 11. Figures were first collected by the UK Government's Department for Energy and Climate Change (DECC) in 2005. Figure 9 shows the percentage change in total carbon dioxide emissions between 2005 and 2010, by local authority, while figure 10 shows the shows the percentage change in total carbon dioxide emissions between 2009 and 2010.

The Wales figure for total 'end-user' carbon dioxide emissions in table 11 (32.2Mt) differs from the figure in table 7 (33.8Mt) as there are a number of methodological differences in how the two datasets are assembled. Additionally, some sectors are excluded from the figures in table 11, including domestic shipping, domestic aviation, military transport and international shipping and aviation.⁶⁴

⁶⁴ DECC, [Local and regional CO₂ emissions for 2005-2010 - Full dataset – Wales Reconciliation](#), 23 August 2012 [accessed 25 October 2012]

Table 11: Carbon dioxide emissions by sector and local authority^(a), 2010 (kt CO₂)

Local Authority	Industry & Commercial	Domestic	Road Transport	LULUCF (b)	Total	Welsh rank /22 (of total emissions)	UK rank /406 (of total emissions)
Isle of Anglesey	205	221	131	38	594	20	330
Gwynedd	293	345	271	70	978	14	184
Conwy	179	290	265	42	776	16	256
Denbighshire	207	246	192	36	682	18	296
Flintshire	1,011	445	376	16	1,848	3	44
Wrexham	825	334	216	20	1,395	8	98
Powys	395	422	339	135	1,291	10	109
Ceredigion	233	233	159	73	697	17	294
Pembrokeshire	583	353	228	77	1,240	11	116
Carmarthenshire	590	521	428	113	1,651	5	63
Swansea	580	549	369	17	1,515	6	81
Neath Port Talbot	7,897	325	277	16	8,516	1	2
Bridgend	437	304	288	16	1,045	12	164
Vale of Glamorgan	772	287	218	22	1,300	9	107
Cardiff	960	687	633	8	2,289	2	30
Rhondda Cynon Taf	469	531	442	14	1,456	7	89
Merthyr Tydfil	119	137	90	5	350	22	388
Caerphilly	360	395	248	11	1,013	13	173
Blaenau Gwent	163	165	79	4	411	21	381
Torfaen	271	194	138	4	607	19	321
Monmouthshire	272	234	339	28	873	15	223
Newport	913	306	435	7	1,661	4	58
Wales	17,735	7,520	6,159	772	32,187

Source: DECC, [Local and regional CO2 emissions for 2005-2010 - Full dataset](#), (Summary tab), 23 August 2012 and Research Service calculations.

(a) Different methodologies have been used from previous AEA publications; therefore comparisons cannot be made with previous papers.

(b) LULUCF – Land use, land use change and forestry.

Figure 11 shows the ranking of emissions levels of Welsh local authorities in comparison to all local authorities in the UK.

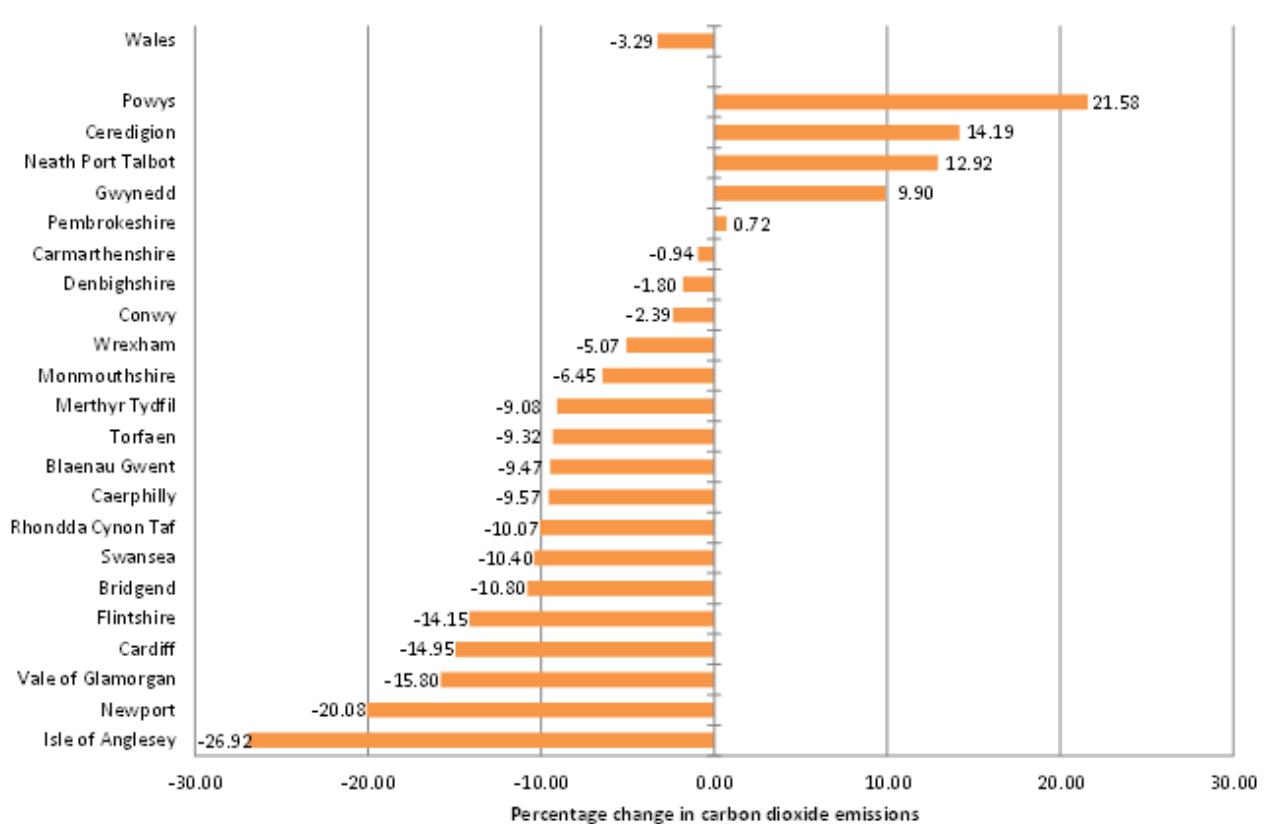
The following observations can be made from table 11 and figures 9, 10 and 11:

- The local authority with the highest carbon dioxide emissions in 2010 was **Neath Port Talbot** (the main contributor to this is the Tata Steelworks in Port Talbot). Between 2005 and 2010 **Neath Port Talbot** experienced the third highest increase in emissions (12.9%) of all the Welsh local authorities, and between 2009 and 2010 it had the highest increase in emissions (38.5%) of all Welsh authorities;
- Industrial and commercial emissions accounted for 55 per cent of all carbon dioxide emissions in Wales in 2010;
- **Of the 22 Welsh local authorities, 17 reduced their carbon dioxide emissions between 2005 and 2010, however only two showed reductions between 2009 and 2010.** The Isle of Anglesey reduced their emissions by

the most between both 2005 to 2010 and 2009 to 2010 (26.9 per cent and 10.7 per cent respectively), while **Powys** increased its emissions by the most between 2005 and 2010 (21.6 per cent) and **Neath Port Talbot** increased its emissions the most between 2009 and 2010 (38.5 per cent). Other than **Neath Port Talbot**, the authorities with the largest increases in carbon emissions between both 2005 and 2010 and 2009 and 2010 tend to be rural local authorities;

- Of the 406 local authorities in the UK, **Neath Port Talbot** had the 2nd highest emissions in 2010. **Merthyr Tydfil** (with the lowest emissions in Wales) had the 388th highest carbon dioxide emissions of UK local authorities.

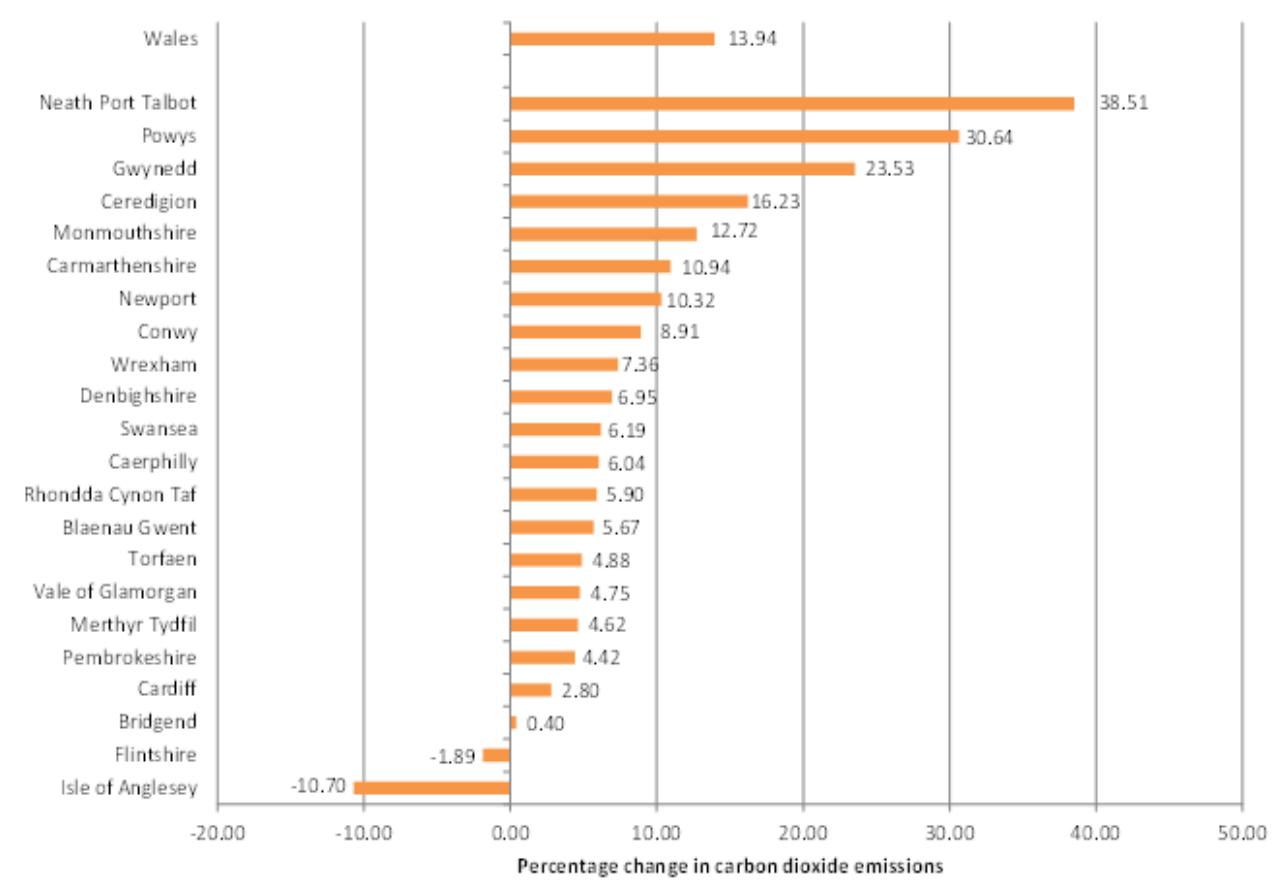
Figure 9: Percentage change in carbon dioxide emissions between 2005 and 2010, by Welsh local authority^(a)



Source: DECC, [Local and regional CO2 emissions for 2005-2010 - Full dataset](#), (Summary tab), 23 August 2012 and Research Service calculations

(a) Different methodologies have been used from previous AEA publications, therefore comparisons cannot be made with previous papers.

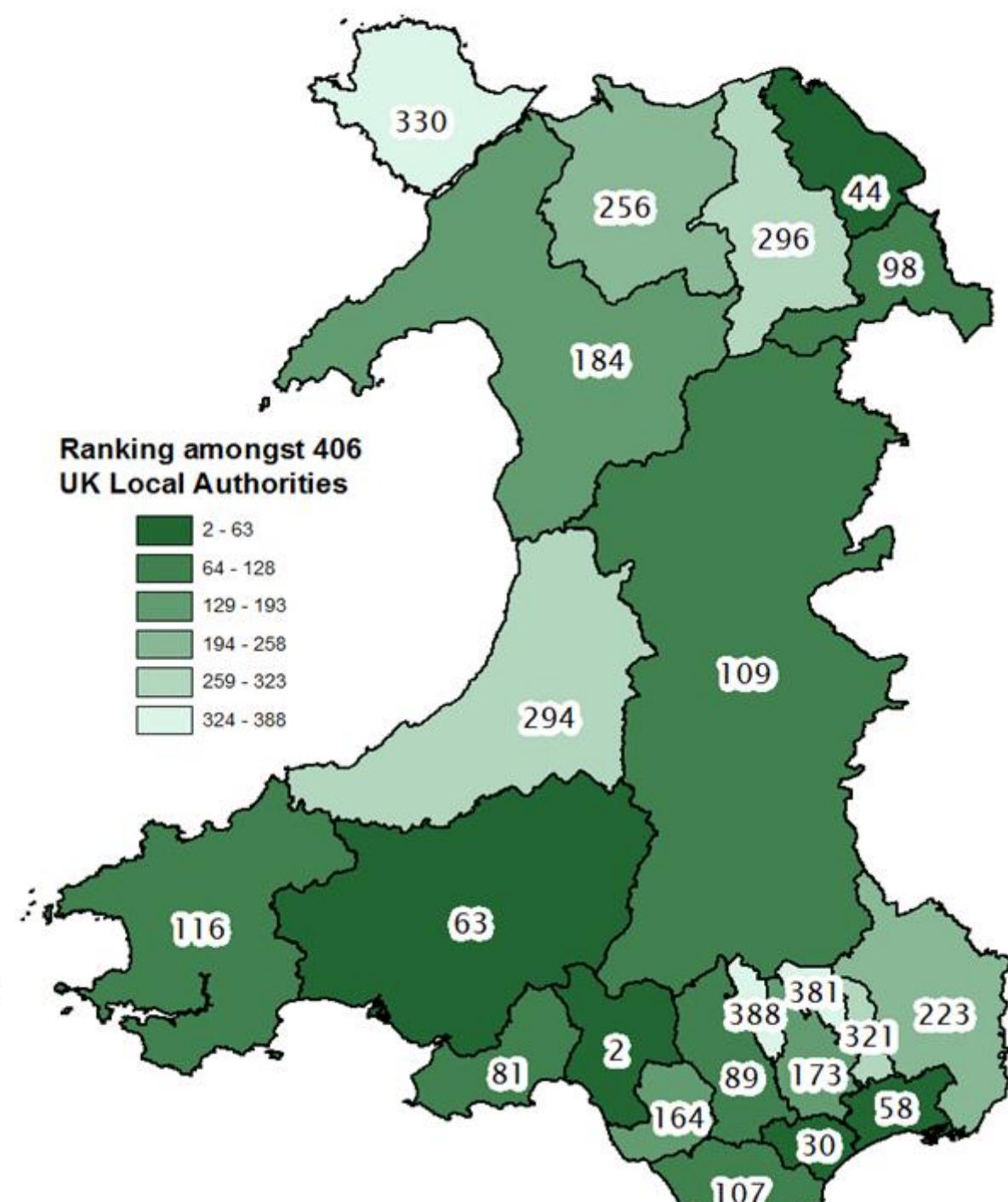
Figure 10: Percentage change in carbon dioxide emissions between 2009 and 2010, by Welsh local authority^(a)



Source: DECC, [Local and regional CO2 emissions for 2005-2010 - Full dataset](#), (Summary tab), 23 August 2012 and Research Service calculations

(a) Different methodologies have been used from previous AEA publications, therefore comparisons cannot be made with previous papers.

Figure 11: Ranking of carbon dioxide emissions in comparison to UK local authorities, by Welsh local authority, 2010



Source: Research Service

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Per capita emissions provide an indication of the level of emissions in comparison with the population size of a local authority. Table 12 provides carbon dioxide emissions per capita in 2010 by sector, while figure 12 highlights the geographical differences of the total emissions per capita.

The following observations can be made from table 12 and figure 12:

- The highest emissions per capita were in **Neath Port Talbot** (62 tonnes per capita), while **Caerphilly** had the lowest (5.9 tonnes per capita). (The main contributor to the high Neath Port Talbot figure is the Tata steelworks in Port Talbot);
- The contribution of the Tata steelworks to the **Neath Port Talbot** figure is also reflected in its industry and commercial carbon dioxide emissions, which at 57.5 tonnes per capita are the highest in Wales. **Conwy** had the lowest industrial and commercial emissions, 1.6 tonnes per capita;
- There is little difference between domestic carbon dioxide emissions across Wales, ranging from 2.0 to 3.2 tonnes per capita. **Cardiff** had the lowest domestic emissions, while the **Isle of Anglesey** and **Powys** had the highest;
- **Monmouthshire** had the highest road transport emissions per capita, at 3.8 tonnes per capita, while **Blaenau Gwent** had the lowest, 1.2 tonnes per capita.

Table 12: Carbon dioxide emissions per capita^(a), by sector in Wales, 2010 (tonnes per capita)

Local Authority	Industry & Commercial	Domestic	Road Transport	LULUCF (b)	Total
Isle of Anglesey	3.0	3.2	1.9	0.6	8.7
Gwynedd	2.5	2.9	2.3	0.6	8.2
Conwy	1.6	2.6	2.4	0.4	7.0
Denbighshire	2.1	2.5	2.0	0.4	7.1
Flintshire	6.8	3.0	2.5	0.1	12.3
Wrexham	6.2	2.5	1.6	0.2	10.4
Powys	3.0	3.2	2.6	1.0	9.8
Ceredigion	3.0	3.0	2.1	0.9	9.1
Pembrokeshire	5.0	3.0	1.9	0.7	10.6
Carmarthenshire	3.3	2.9	2.4	0.6	9.1
Swansea	2.5	2.4	1.6	0.1	6.5
Neath Port Talbot	57.5	2.4	2.0	0.1	62.0
Bridgend	3.2	2.3	2.1	0.1	7.8
Vale of Glamorgan	6.2	2.3	1.7	0.2	10.4
Cardiff	2.8	2.0	1.9	0.0	6.7
Rhondda Cynon Taf	2.0	2.3	1.9	0.1	6.2
Merthyr Tydfil	2.1	2.5	1.6	0.1	6.3
Caerphilly	2.1	2.3	1.4	0.1	5.9
Blaenau Gwent	2.4	2.4	1.2	0.1	6.0
Torfaen	3.0	2.1	1.5	0.0	6.7
Monmouthshire	3.1	2.7	3.8	0.3	9.9
Newport	6.5	2.2	3.1	0.0	11.8
Wales Total	5.9	2.5	2.0	0.3	10.7

Source: DECC, [Local and regional CO2 emissions for 2005-2010 - Full dataset](#), (Summary tab), 23 August 2012 and Research Service calculations

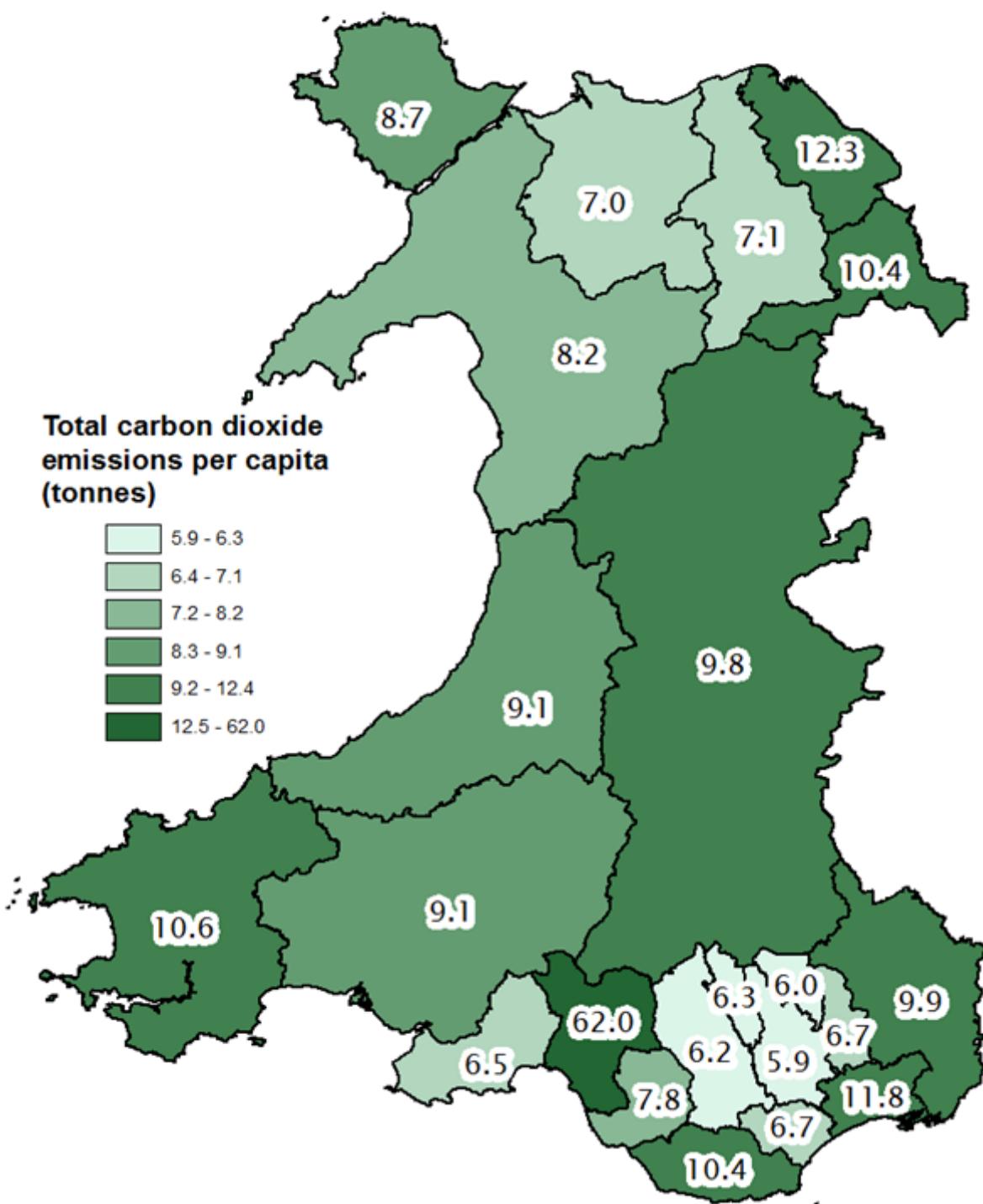
(a) Total may not add up to the sum of the sectors due to rounding.

(b) LULUCF – Land use, land use change and forestry.

Notes:

Different methodologies have been used from previous AEA publications; therefore comparisons cannot be made with previous papers.

Figure 12: Total carbon dioxide emissions per capita, by Welsh local authority, 2010



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3.5.2. Carbon dioxide emissions that local authorities can influence

DECC also collates a dataset which represents the level of carbon dioxide emissions that local authorities are directly able to influence. This excludes a number of types of emissions that it deems are not within the scope local authorities' influence. These are:

- Motorways – all emissions from the “Road transport (motorways)” sector have been removed;
- EU Emissions trading schemes sites – these emissions have been removed from the “Large industrial installations” sector, with the exception of energy suppliers (e.g. power stations), whose emissions are indirectly included via the end-user estimates for electricity use. Note that not all the emissions from the “Large industrial installations” sector are produced by EU ETS installations, hence the fact that there are emissions remaining in this sector in the subset;
- Diesel railways – all emissions from the “Diesel Railways” sector have been excluded;
- Land Use, Land Use Change, and Forestry – all emissions belonging to the “LULUCF Net emissions” sector have been excluded from the main dataset.⁶⁵

Figures for carbon dioxide emissions within the scope of local authorities for 2010 by sector, and local authority are shown in table 13. Figures were first collected by DECC in 2005. Figure 13 shows the percentage change in carbon dioxide emissions within the scope of local authorities between 2005 and 2010, by local authority. Figure 14 shows the percentage change in carbon dioxide emissions within the scope of local authorities between 2009 and 2010.

⁶⁵ DECC, 2010 [Local Authority CO2 emissions estimates: Statistical summary](#), pages 18-19, 20 September 2012 [accessed 26 September 2012]

Table 13: Carbon dioxide emissions within the scope of local authorities by sector and local authority, 2010 (kt CO₂)

Local Authority	Industry and Commercial	Domestic	Road Transport	Grand Total	Welsh Rank /22 (of total emissions)	UK rank /406 (of total emissions)
Isle of Anglesey	201	221	131	553	20	321
Gwynedd	290	345	271	905	12	172
Conwy	175	290	265	730	16	246
Denbighshire	205	246	192	644	17	279
Flintshire	745	445	376	1,566	2	56
Wrexham	819	334	216	1,369	5	73
Powys	392	422	339	1,152	9	110
Ceredigion	201	233	159	593	19	305
Pembrokeshire	568	353	228	1,149	10	113
Carmarthenshire	538	521	407	1,466	3	62
Swansea	576	549	285	1,409	4	71
Neath Port Talbot	800	325	171	1,295	7	87
Bridgend	372	304	180	855	13	193
Vale of Glamorgan	316	287	186	789	14	216
Cardiff	935	687	523	2,145	1	26
Rhondda Cynon Taf	459	531	374	1,365	6	75
Merthyr Tydfil	118	137	90	345	22	391
Caerphilly	358	395	248	1,000	11	140
Blaenau Gwent	163	165	79	406	21	379
Torfaen	266	194	138	598	18	301
Monmouthshire	259	234	249	742	15	240
Newport	716	306	223	1,245	8	97
Wales Total	9,473	7,520	5,328	22,322

Source: DECC, [Emissions within the scope of influence of Local Authorities for 2005-10](#), (Subset summary tab), 23 August 2012 and Research Service calculations.

Figure 15 shows the ranking of emissions levels within the scope of local authorities of the Welsh local authorities in comparison to all local authorities in the UK.

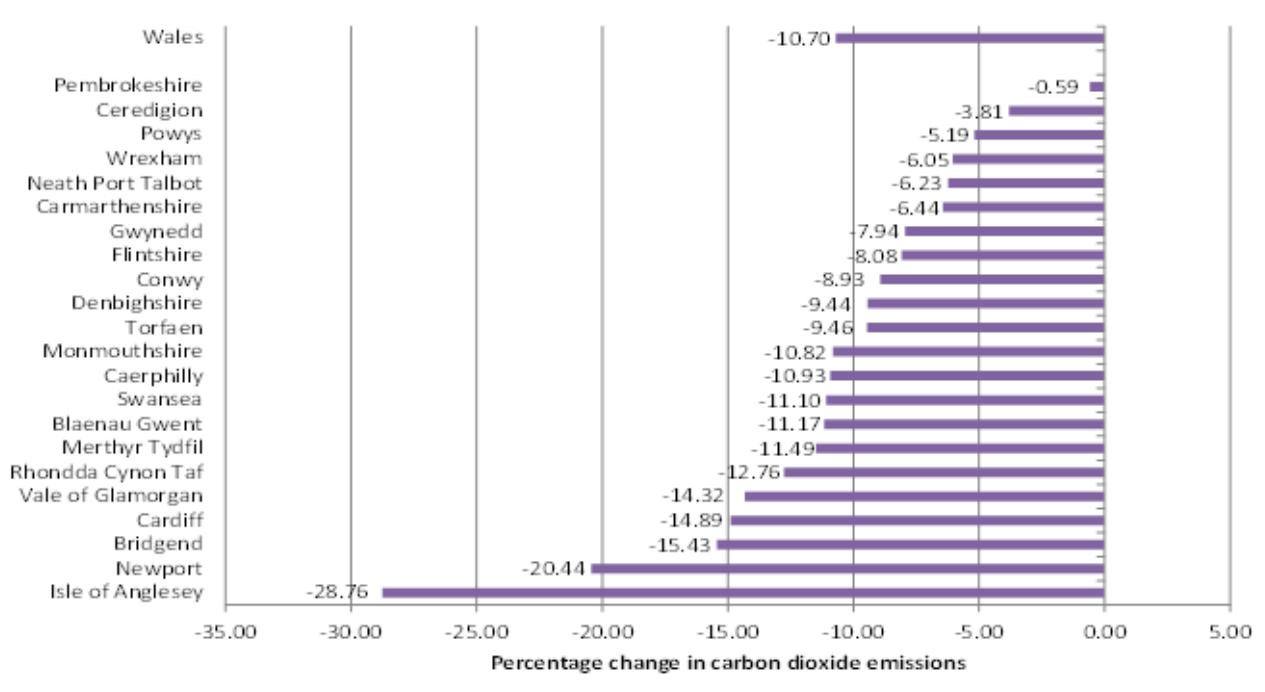
The following observations can be made from table 13 and figures 13, 14 and 15:

- The local authority with the highest carbon dioxide emissions within its scope of influence in 2010 was **Cardiff**, although it reduced its emissions by 14.9 per cent between 2005 and 2010, the fourth largest decrease of the Welsh local authorities;
- When only emissions within the scope of local authorities are considered, the industrial and commercial emissions of **Neath Port Talbot, the Vale of Glamorgan, Newport and Flintshire** decreased considerably from the figures shown in Table 11. This is mainly due to the exclusion of the EUETS

sites from emissions within the scope of local authorities as the majority of the top 13 Welsh emitters in the EUETS scheme are situated within these four local authorities;

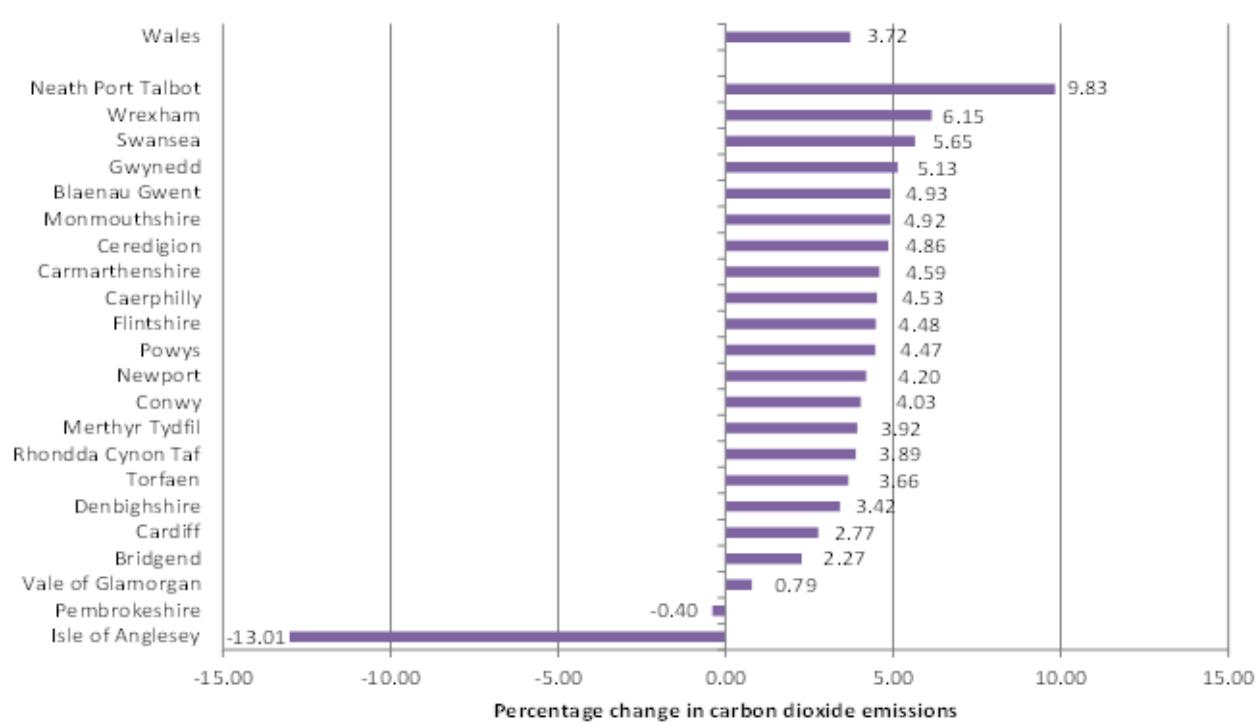
- Industrial and commercial emissions accounted for 42 per cent of all carbon dioxide emissions within the scope of influence of local authorities in Wales in 2010;
- **All Welsh local authorities reduced the carbon dioxide emissions within the scope of their influence between 2005 and 2010, but only two showed reductions between 2009 and 2010.** Although Pembrokeshire was one of these two authorities, their emissions were the least reduced of all local authorities between 2005 and 2010 (0.6 per cent), while the Isle of Anglesey reduced their emissions by the most for both periods (28.8 per cent and 13.0 per cent respectively). The increases between 2009 and 2010 for emissions within the direct influence of local authorities were, on average, lower than the increases for all emissions within local authorities;
- Of the 406 local authorities in the UK, Cardiff had the 26th highest emissions within the scope of its influence in 2010. Merthyr Tydfil (with the lowest emissions in Wales) had the 391st highest carbon dioxide emissions of UK local authorities.

Figure 13: Percentage change in carbon dioxide emissions within the scope of influence of local authorities between 2005 and 2010, by Welsh local authority



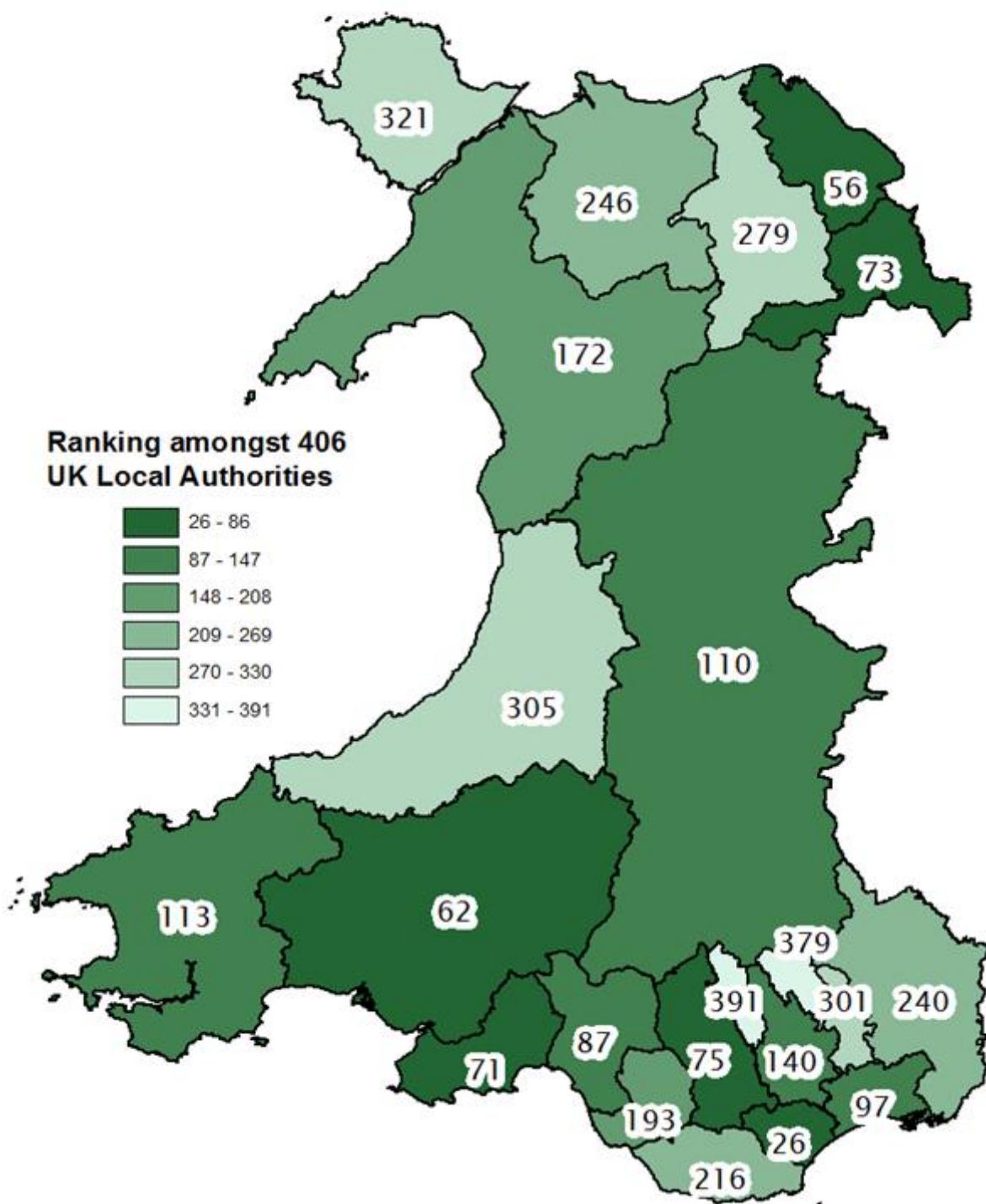
Source: DECC, [Emissions within the scope of influence of Local Authorities for 2005-10](#), (Subset summary tab), 23 August 2012 and Research Service calculations.

Figure 14: Percentage change in carbon dioxide emissions within the scope of influence of local authorities between 2009 and 2010, by Welsh local authority



Source: DECC, [Emissions within the scope of influence of Local Authorities for 2005-10](#), (Subset summary tab), 23 August 2012 and Research Service calculations.

Figure 15: Ranking of carbon dioxide emissions within the scope of local authorities' influence in comparison to UK local authorities, by Welsh local authority, 2010



Source: Research Service

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Per capita emissions provide an indication of the level of emissions in comparison with the population size of a local authority. Table 14 provides carbon dioxide emissions per capita within the scope of local authorities in 2010 by sector, while figure 16 highlights the geographical differences of emissions per capita.

The following observations can be made from table 14 and figure 16:

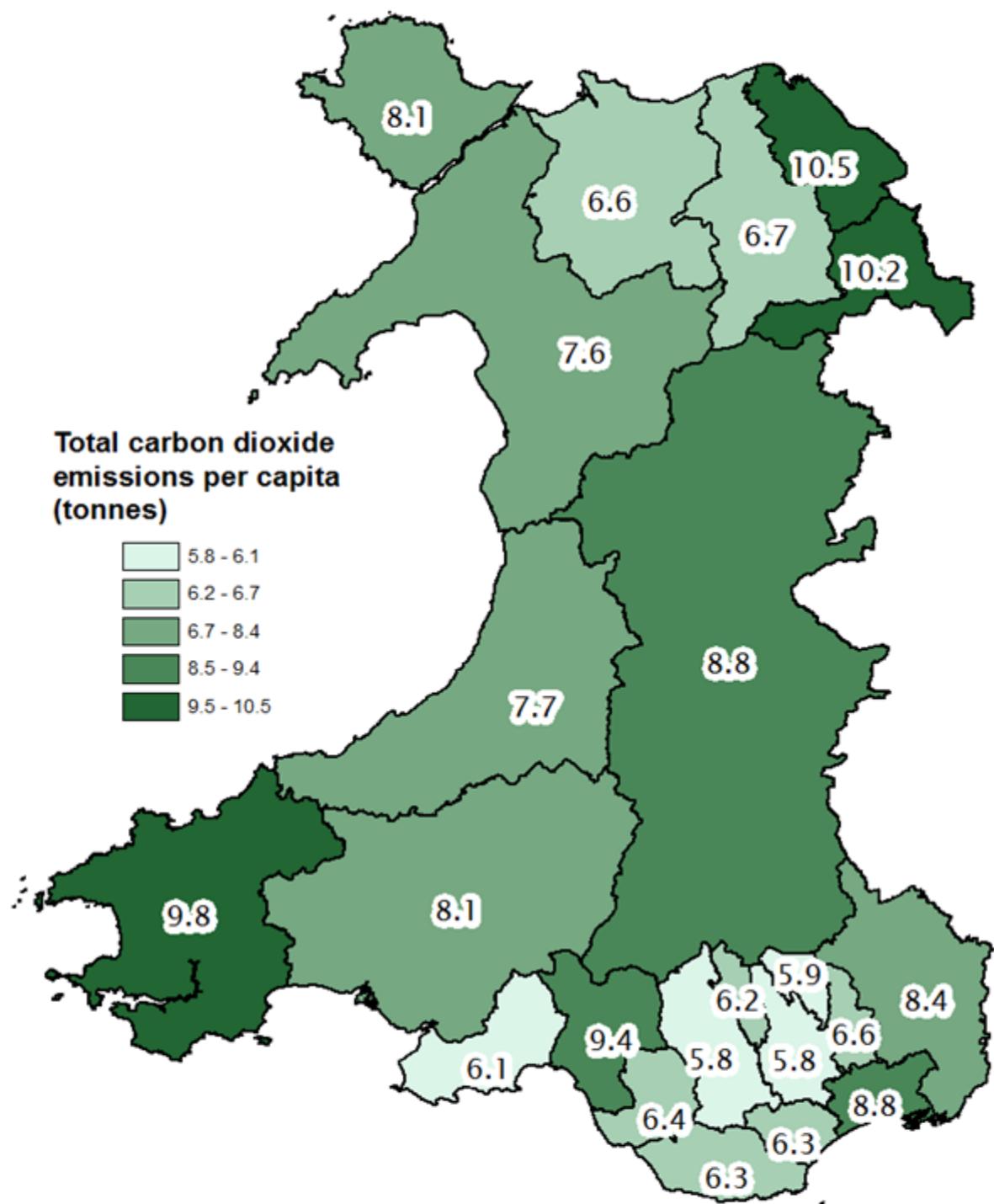
- The highest emissions per capita were in **Flintshire** (10.5 tonnes per capita), while **Rhondda Cynon Taf** and **Caerphilly** had the joint lowest (5.8 tonnes per capita);
- At 6.1 tonnes per capita, **Wrexham's** industrial and commercial emissions are the highest in Wales. **Conwy** had the lowest industrial and commercial emissions, 1.6 tonnes per capita;
- There is little difference between domestic carbon dioxide emissions across Wales, ranging from 2.0 to 3.2 tonnes per capita. **Cardiff** had the lowest domestic emissions, while the **Isle of Anglesey** and **Powys** had the joint highest; and
- **Monmouthshire** had the highest road transport emissions per capita, at 2.8 tonnes per capita, while **Blaenau Gwent, Swansea and Neath Port Talbot** had the lowest, at 1.2 tonnes per capita.

Table 14: Carbon dioxide emissions within the scope of local authorities per capita, by sector in Wales, 2010 (tonnes per capita)

Local Authority	Industry & Commercial		Road Transport		Total
		Domestic			
Isle of Anglesey	2.9	3.2	1.9		8.1
Gwynedd	2.4	2.9	2.3		7.6
Conwy	1.6	2.6	2.4		6.6
Denbighshire	2.1	2.5	2.0		6.7
Flintshire	5.0	3.0	2.5		10.5
Wrexham	6.1	2.5	1.6		10.2
Powys	3.0	3.2	2.6		8.8
Ceredigion	2.6	3.0	2.1		7.7
Pembrokeshire	4.9	3.0	1.9		9.8
Carmarthenshire	3.0	2.9	2.3		8.1
Swansea	2.5	2.4	1.2		6.1
Neath Port Talbot	5.8	2.4	1.2		9.4
Bridgend	2.8	2.3	1.3		6.4
Vale of Glamorgan	2.5	2.3	1.5		6.3
Cardiff	2.7	2.0	1.5		6.3
Rhondda Cynon Taf	2.0	2.3	1.6		5.8
Merthyr Tydfil	2.1	2.5	1.6		6.2
Caerphilly	2.1	2.3	1.4		5.8
Blaenau Gwent	2.4	2.4	1.2		5.9
Torfaen	2.9	2.1	1.5		6.6
Monmouthshire	2.9	2.7	2.8		8.4
Newport	5.1	2.2	1.6		8.8
Wales Total	3.2	2.5	1.8		7.4

Source: DECC, [Emissions within the scope of influence of Local Authorities for 2005-10](#), (Subset summary tab), 23 August 2012 and Research Service calculations.

Figure 16: Total carbon dioxide emissions per capita within scope of local authorities, by Welsh local authority, 2010



Source: Research Service

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Ordnance Survey 100047295.

4. Useful links and further information

The links below provide further information about the data sources in this paper and also contain links to further information about greenhouse gas emissions at an international, European, UK and Welsh level.

- [Climate Change Commission for Wales](#)
- Welsh Government website on [Climate Change](#)
- The Welsh Government's [Wales Carbon Footprint](#) website
- [The Department of Energy and Climate Change](#) (DECC)
- [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990 to 2010](#), published by AEA
- [2010 Local Authority Carbon Dioxide figures](#), published by DECC
- [Emissions within the scope of influence of Local Authorities for 2005-10](#), published by DECC
- [Reducing emissions and preparing for climate change in Wales: 2011 Progress Report](#), published by the Climate Change Commission
- The UK Government's [Carbon Plan](#)
- The UK Government's [Committee on Climate Change](#)
- [The Met Office Hadley Centre](#)
- [Tyndall Centre for Climate Change Research](#)
- [European Climate Change Programme](#)
- [UN Framework Convention on Climate Change](#)

Annex A: Total net greenhouse gas and carbon dioxide emissions in Wales in 2010, by sector

Sector	Total net greenhouse gas emissions (Mt)	Percentage of total net greenhouse gas emissions	Carbon dioxide emissions (Mt)	Percentage of carbon dioxide emissions
Agriculture	5.7	12.1	0.5	1.3
Business	9.8	21.1	9.2	23.6
Energy Supply	16.6	35.7	16.1	41.2
Industrial Process	2.2	4.7	2.2	5.5
Land use change	0.0	-0.1	-0.1	-0.3
Public	0.4	0.8	0.4	1.0
Residential	5.0	10.7	4.8	12.2
Transport	6.1	13.1	6.0	15.5
Waste Management	0.9	1.9	0.0	0.0
Total	46.6	100.0	39.1	100.0

Source: AEA, [Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2010: Devolved Administration GHG Inventory Pivot Tables](#), (By-source Wales tab), August 2012