



Non-CO₂ Greenhouse Gas Projections for England, Scotland, Wales and Northern Ireland

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and the Committee on Climate Change**

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AEA Group
329 Harwell
Didcot
Oxfordshire
OX11 0QJ

t: 0870 190 3857
f: 0870 190 6318

AEA is a business name of AEA Technology plc

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Author	Name	Joanna Jackson
Approved by	Name	Glen Thistlethwaite
	Signature	
	Date	8 th October 2009

Executive Summary

This report provides updated non-CO₂ greenhouse gas projections for the Devolved Administrations of England, Scotland, Wales and Northern Ireland. The projections presented in this report are consistent with the figures presented in the UK's Low Carbon Transition Plan, and the 1990-2007 historic greenhouse gas inventories for the Devolved Administrations.

Figure ES1 illustrates the overall trend in emissions by DA. The headline trends from 2007-2025 are:

- England -11%
- Scotland -3%
- Wales -2%
- Northern Ireland -6%
- Unallocated -61%

Figure ES1 Summary of non-CO₂ Greenhouse Gas Emissions by DA

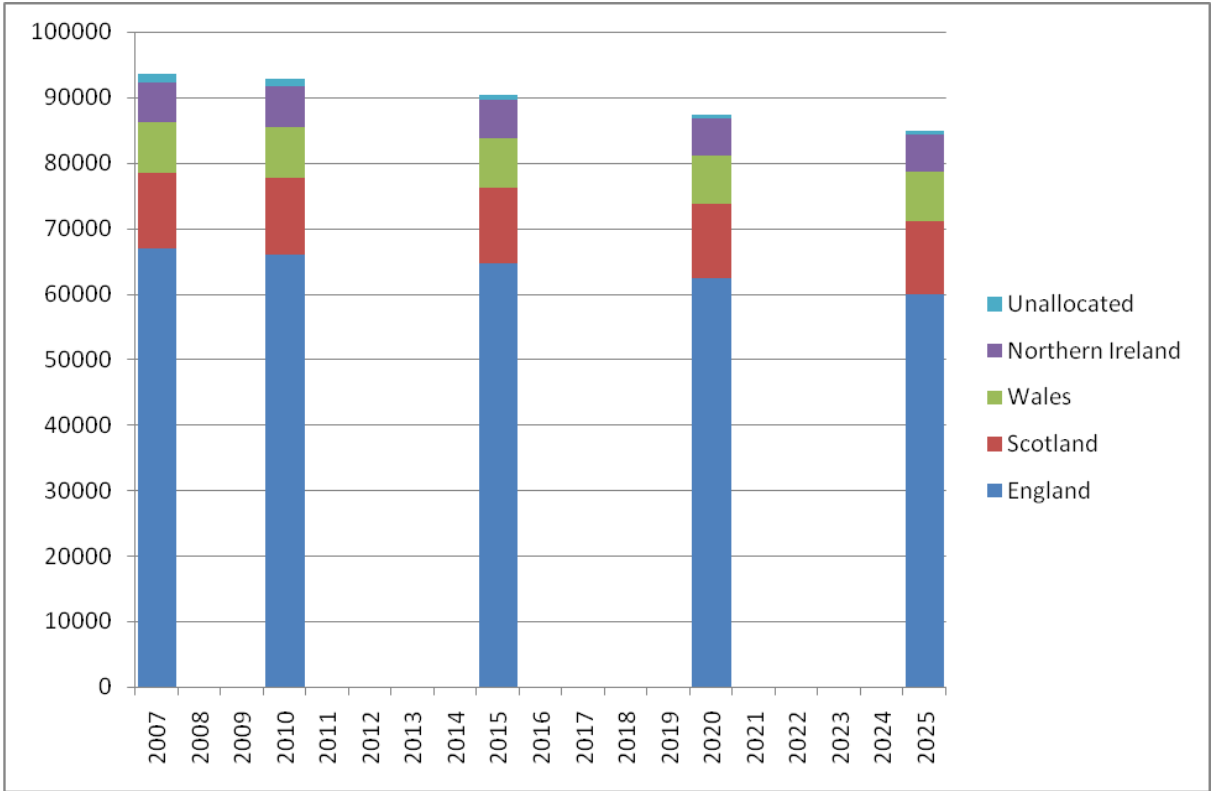


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1 Introduction

This report details projected emissions of non-CO₂ greenhouse gases for each of the DAs. The basis of these projections is the set of UK projections produced for the Low Carbon Transition Plan. The projections take into account methodological improvements made in the 1990-2007 UK and DA inventories, and the energy projections published by DECC to underpin the Budget in April 2009.

This report is an update to the DA projections presented in *Projections of non-CO₂ greenhouse gases to 2050* (AEA, 2008). The full range of detailed methodological descriptions presented within the 2008 report are not repeated here; this report summarises any revisions to the projections methodology, and highlights where the DA projections are affected by changes to the underlying data and disaggregation methods within the UK and DA historic GHG inventories within the latest inventory cycle (i.e. to generate 1990-2007 estimates).

1.1 Recent Revisions to the Non-CO₂ Projections

The UK non-CO₂ projections have been revised several times over the last two years, to reflect revisions to the DECC UK energy projections, and the recent economic downturn. These different UK emission projections estimates are summarised below, with an indication of where DA projections have also been derived:

- 2008: “*Projections of non-CO₂ greenhouse gases to 2050*” report issued by AEA, including DA emissions projections. These projections were based on Updated Energy Projection 30 (UEP30) and the 2008 (1990-2006) UK Greenhouse Gas inventory.
- Early 2009: UK projections updated to use UEP32 and the 2009 (1990-2007) inventory. (These data were not published.)
- May 2009: UK projections updated to use UEP37, and the 2008 (1990-2006) UK Greenhouse Gas inventory baseline. These projections were published within the UK’s 5th National Communication (5NC¹) and were submitted to the EU Monitoring Mechanism.
- June 2009: UK projections updated to use UEP37 and the 2009 (1990-2007) UK Greenhouse Gas inventory. These projections were published within the Low Carbon Transition Plan.
- This report, October 2009: DA disaggregated non-CO₂ projections consistent with the Low Carbon Transition Plan²

1.2 Scope of these DA Non-CO₂ Projections

The projections included in this report are consistent with the UK projections presented in the Low Carbon Transition Plan (LCTP), as published in June 2009. Information that has become available since the LCTP publication (e.g. plant-specific operational information such as planned closures) has not been taken into consideration in the derivation of these DA projections. All such new information will be considered within the next revision to the UK non-CO₂ projections.

Note also that the emission projections included as part of the LCTP include estimates of emissions from the UK’s Crown Dependencies. These Crown Dependency emission projections are excluded from the DA data presented here, and hence the sum of the DA emission projections do not match exactly the UK projection estimates reported within the LCTP.

¹ http://unfccc.int/files/national_reports/annex_i_natcom/submitted_natcom/application/pdf/gbr_nc5.pdf

² http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx

2 Updates to Data and Estimation Methods

This section highlights the major reasons for changes between the previous set of DA projections and the current data set.

2.1 Updated UK GHG Inventory Baseline

The projections presented in this report are based on the 2009 (1990 – 2007) UK GHG inventory baseline, whereas the previous projections were based on the 2008 (1990 – 2006) inventory baseline. A number of significant updates to the historic inventory data have affected the “baseline” (or starting point) for the non-CO₂ greenhouse gas projections, including:

- **Changes to N₂O emission factors for road transport.** Emissions are now calculated using N₂O emission factors from COPERT 4. This change has had a significant effect on both the historic and projected emissions of N₂O, with emissions now declining from the late nineties and this trend is projected to continue into the future. The previous projections indicated a continued increase in emissions from this sector.
- **Updated landfill emissions and projections.** The UK landfill model underwent a major review, in which a gap was identified in the activity data within the model. Commercial and Industrial waste arisings excluded Scotland. This has now been rectified, leading to higher methane emissions in this sector from 1998 onwards.
- **Changes to emission factors and methods for agriculture.** Methane emission factors for swine wastes were revised up, to be in line with the guidelines set out in the IPCC 2000 Good Practice Guidance. N₂O emissions were also revised up, due to the inclusion of revised emission factors for poultry waste management systems. The method used to re-base the agriculture projections in line with the latest inventory (based on comparing emissions data for 2004) means that these changes are reflected in the projections.
- **Offshore oil and gas.** Reported emissions data for this sector were reviewed and updated for both the historic and projected inventories.

Changes made to the historic inventory directly impact on the projections. The model is set up to ensure that time series consistency is maintained. Therefore, if an emission factor in the historic inventory is updated to reflect new data, and no changes are expected in the future, then this revised emission factor will be used for future years. Full details of changes made to the UK GHG Inventory can be found in *UK Greenhouse Gas Inventory, 1990 – 2007* (AEA, 2009)³.

2.2 Updated DA Inventory Baseline

The historic DA inventories are estimated based on the UK inventory, using appropriate DA drivers to disaggregate data from the UK total to the DA level. The previous projections used, as a starting point, the 2008 DA Inventories. This has now been updated, and these projections use the new 2009 DA Inventories as a starting point. Some of the major changes affecting non-CO₂ emissions in 2007 are listed below.

- Revision of site specific emissions data for oil terminals
- Corrections to allocations of cattle in the agriculture sector
- Gas use has been reallocated across sectors to reflect revised data for Northern Ireland
- Detailed review of point source data has allowed better reporting of the DA split for industrial fuel use emissions

Full details of changes can be found in *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990 – 2007* (AEA, 2009)⁴.

³ Chapter 10, available from http://www.airquality.co.uk/reports/cat07/0905131425_ukghgi-90-07_main_chapters_Issue2_UNFCCC_CA_v5_Final.pdf

⁴ Section 7.2, available from http://www.airquality.co.uk/reports/cat07/0909231418_DA_GHGI_report_2007_maintext_Issue_1.pdf

2.3 Geographical Coverage

Improvements have been made to the database used for calculating emissions and projections; the additional detail of the new database system enables emissions from the Crown Dependencies (Jersey, Guernsey and the Isle of Man) to be de-selected and excluded from the emission estimates.

Previously, for the purposes of the DA inventories, emissions from the Crown Dependencies were all allocated to England (where they were separately identified) or allocated across the DAs (where they were inherent in the UK fuel use data). The improvements to the database mean that these emissions can be reported separately and no longer form part of the DA inventories.

2.4 Updates to Projected Activity Data

2.4.1 UK Activity Projections

The energy projections used in the estimates presented in this report are the DECC Updated Energy Projections 37 (UEP37), which were used to underpin the development of UK Carbon Budgets, presented within the Budget in April 2009⁵. UEP 37 was based on UEP32, including revised economic forecasts, carbon prices and policy appraisals.

Road traffic projections have been updated to use the DfT's 2007 projections.

2.4.2 DA Activity Projections

The UEP37 energy projections include site-specific forecasts for power generation from coal-fired power stations, and the DA projections use these data to calculate the likely future split in emissions from this source. The DECC forecast data includes information about power station sites that are expected to close, and includes estimates for the development of new coal power stations to supplement the remaining generation capacity. However, it is unknown where this new capacity for coal-fired generation will be sited, and therefore it is necessary to make some assumptions about the likely distribution of the new coal-fired stations.

For the purposes of these DA-specific projections we have assumed that the future development of coal-fired generation capacity will reflect the pattern of coal-fired electricity production from the existing power stations in 2010. This is considered to be a reasonable assumption, on the basis that it is likely that new power stations will be commissioned on sites where the necessary infrastructure already exists, i.e. on the site of a power station that has closed, or through increased capacity at operating plant. However, this assumption is subject to significant uncertainty.

Updated LULUCF projections for each of the DAs have been provided by CEH, in line with the projections used for the LCTP.

Other DA specific future drivers remain unchanged from the previous projections.

⁵ http://www.hm-treasury.gov.uk/d/Budget2009/bud09_chapter7_193.pdf

3 England

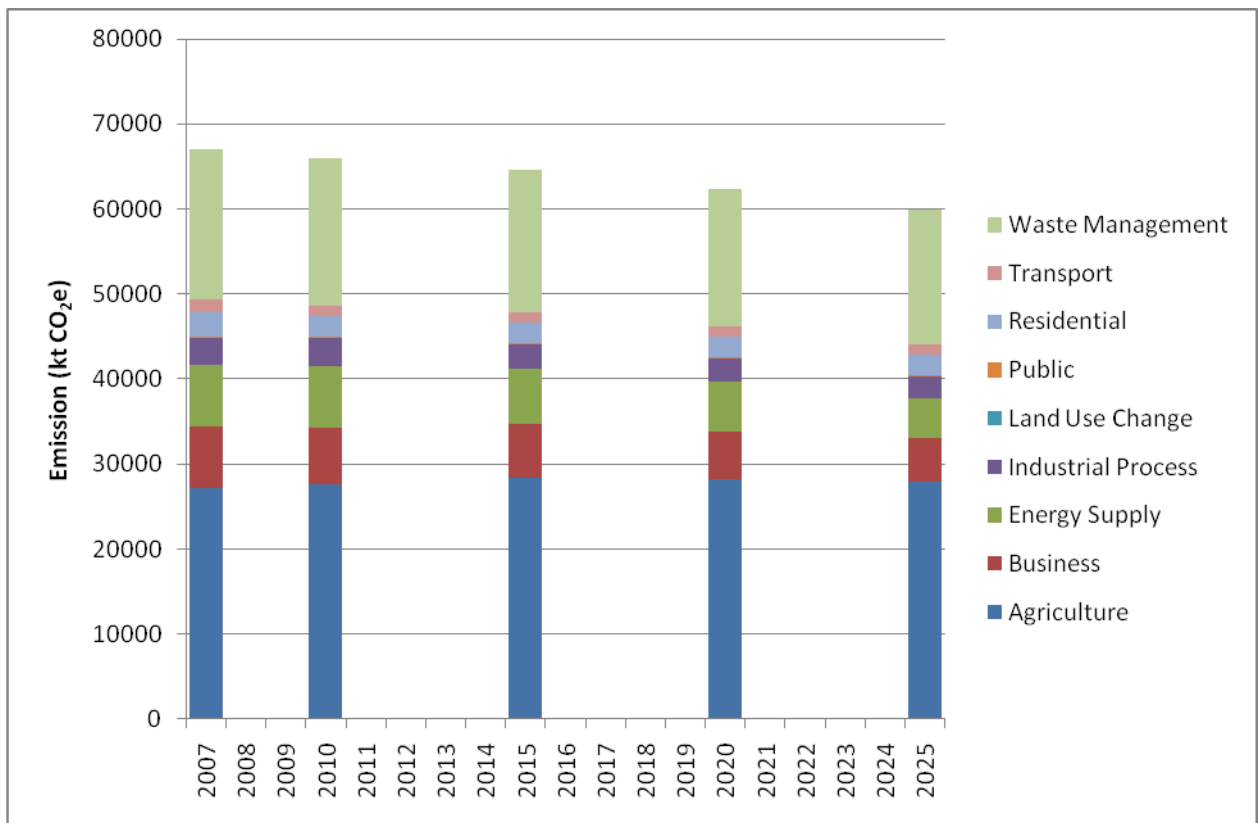
Table 3.1 and Figure 3.1 summarise projected emissions from England, by National Communication category. Total emissions are projected to decrease from 2007 to 2025 by 11%. This is driven mostly by:

- A decrease in methane emissions from energy supply. This is due to (i) declining emissions from both closed and active coal mines, reflecting declining mining activity, and (ii) reduced emissions from the gas distribution network, which reflects the planned programme of pipe replacements.
- A decrease in methane emissions from waste management. The recent historic trend of reducing methane emissions from landfill waste is expected to continue into the future, as the disposal of waste to landfill is reduced and the elution of methane from waste degradation is managed more effectively, e.g. through improved methane capture and oxidation systems.
- Decreased HFC emissions from refrigeration (within the Business sector).

Table 3.1 Projected Non-CO₂ Emissions for England (kt CO₂e)

Summary of Emission Projections for England, 2007 to 2025						
Greenhouse Gas	NC Category	2007	2010	2015	2020	2025
Methane	Agriculture	10,216	10,084	10,074	10,025	9,851
	Business	211	194	194	193	193
	Energy Supply	6,181	6,258	5,615	5,172	3,955
	Industrial Process	100	76	85	94	99
	Land Use Change	17	12	10	10	10
	Public	17	17	18	17	18
	Residential	303	238	180	166	169
	Transport	128	108	91	89	90
	Waste Management	16,489	16,245	15,625	15,075	14,658
Methane Total		33,661	33,233	31,890	30,842	29,043
N ₂ O	Agriculture	16,951	17,517	18,349	18,219	18,058
	Business	1,063	1,036	1,032	1,027	1,023
	Energy Supply	1,050	939	930	769	766
	Industrial Process	2,795	3,000	2,548	2,322	2,198
	Land Use Change	2	2	1	1	1
	Public	10	13	13	13	13
	Residential	81	69	56	51	51
	Transport	1,350	1,103	1,069	1,102	1,137
	Waste Management	1,087	1,112	1,153	1,195	1,235
N ₂ O Total		24,390	24,790	25,152	24,700	24,482
HFCs	Business	5,420	4,920	4,569	3,869	3,411
	Industrial Process	178	176	176	176	176
	Residential	2,526	2,114	2,123	2,129	2,135
HFCs Total		8,124	7,210	6,868	6,174	5,722
PFCs	Business	20	17	21	26	32
	Industrial Process	96	82	82	82	82
PFCs Total		116	100	104	109	114
SF ₆	Business	544	472	440	434	442
	Industrial Process	138	138	130	133	135
SF ₆ Total		682	610	570	567	577

Figure 3.1 Projected Non-CO₂ Emissions for England by National Communication Category



4 Scotland

Table 4.1 and Figure 4.1 summarise projected emissions from Scotland, by National Communication category. Scottish emissions are projected to decline by 3% from 2007 to 2025. The main drivers for this projected trend are:

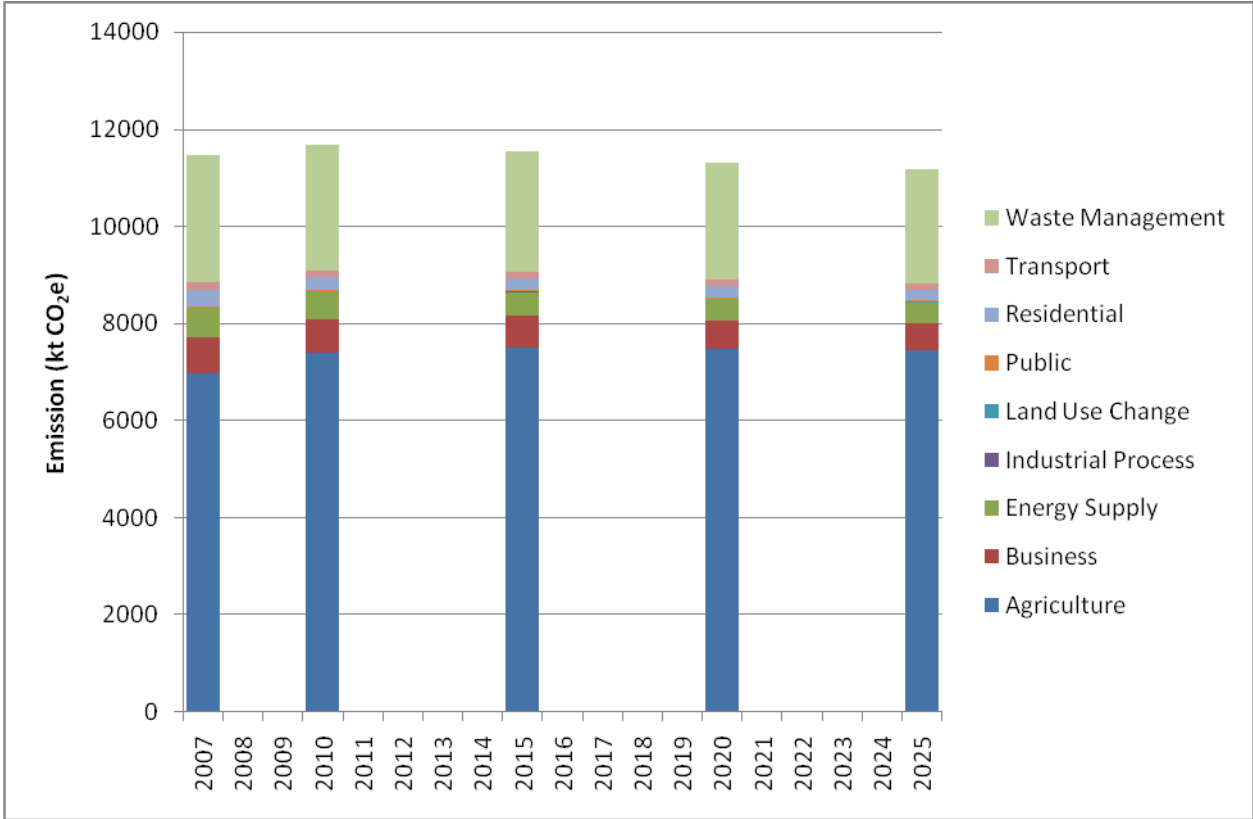
- Decreases in methane emissions from energy supply (due to gas network renewal and reducing emissions from closed coal mines) and waste management.
- Decreases in HFC emission from refrigeration and air conditioning.
- Increases in N₂O emissions from agricultural soils, and slight increases in methane from agricultural sources, such as enteric fermentation from cattle.

The base year for the agriculture projections is 2004, and the historic inventory shows that emissions have declined significantly from 2004 to 2007. As such the projected increase in agricultural emissions is somewhat uncertain, although the forecast trends out to 2025 do indicate an increase in both nitrous oxide and methane from agricultural sources.

Table 4.1 Projected Non-CO₂ Emissions for Scotland (kt CO₂e)

Summary of Emission Projections for Scotland, 2007 to 2025						
Greenhouse Gas	NC Category	2007	2010	2015	2020	2025
Methane	Agriculture	3097	3185	3229	3230	3222
	Business	12	11	11	11	11
	Energy Supply	456	429	368	325	293
	Industrial Process	20	15	18	22	26
	Land Use Change	10	7	6	6	6
	Public	2	2	2	2	2
	Residential	55	37	25	23	23
	Transport	13	11	9	9	9
	Waste Management	2515	2476	2376	2287	2219
Methane Total		6180	6173	6043	5915	5812
N ₂ O	Agriculture	3872	4220	4270	4236	4222
	Business	96	94	93	93	92
	Energy Supply	151	154	138	117	122
	Industrial Process	0	0	0	0	0
	Land Use Change	2	1	1	1	1
	Public	1	1	1	1	1
	Residential	15	11	7	7	7
	Transport	153	128	125	129	132
	Waste Management	109	110	112	113	113
N ₂ O Total		4399	4719	4747	4697	4691
HFCs	Business	524	477	440	370	322
	Industrial Process	0	0	0	0	0
	Residential	254	210	205	201	196
HFCs Total		779	686	646	571	519
PFCs	Business	56	48	60	73	89
	Industrial Process	1	1	1	1	1
PFCs Total		57	49	61	74	90
SF ₆	Business	54	48	47	51	56
	Industrial Process	0	0	0	0	0
SF ₆ Total		54	48	47	51	56

Figure 4.1 Projected Non-CO₂ Emissions for Scotland by National Communication Category



5 Wales

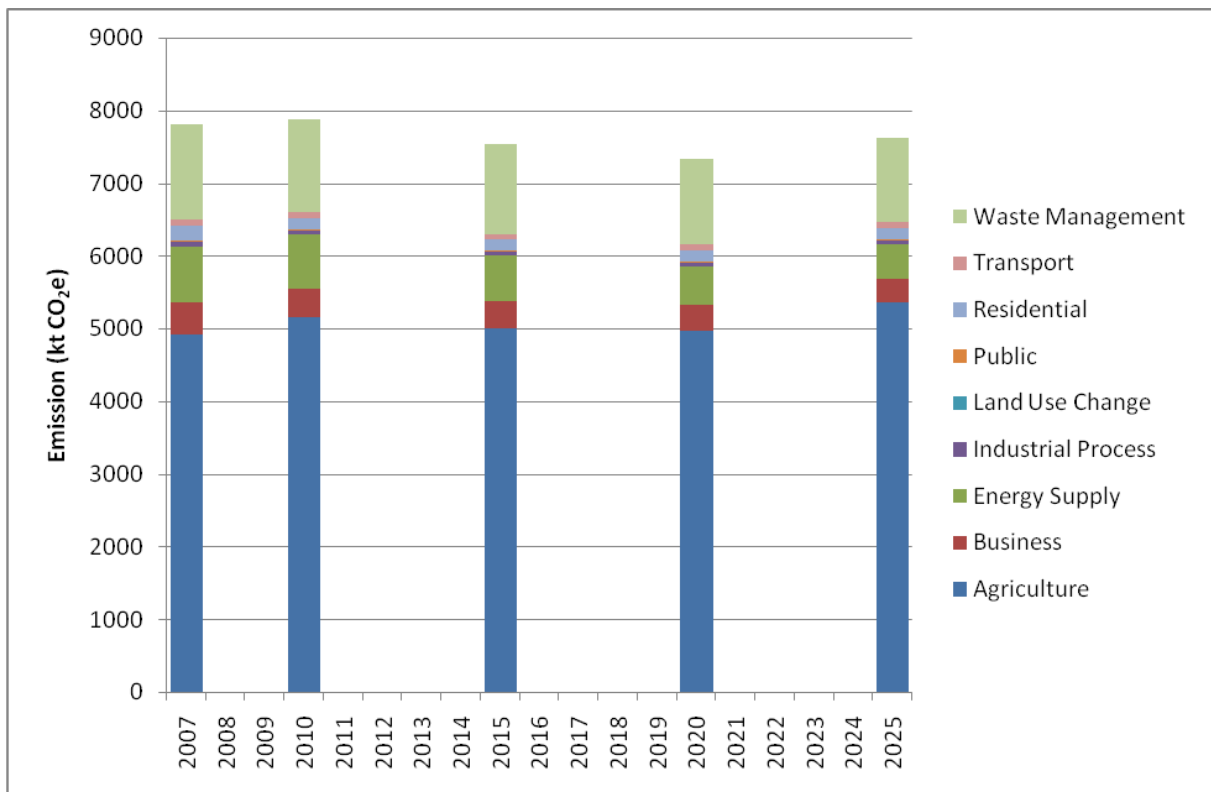
Table 5.1 and Figure 5.1 summarise projected emissions from Wales, by National Communication category. Welsh emissions are projected to decrease by 2% from 2007 to 2025, mainly due to:

- Decreases in methane emissions from energy supply (due to gas network renewal and reducing emissions from closed coal mines) and waste management.
- Decreases in HFC emission from refrigeration and air conditioning.
- Increases in N₂O emissions from agricultural soils, and methane and N₂O emissions from livestock. Emissions from cattle and sheep are projected to increase from 2020 to 2025.

Table 5.1 Projected Non-CO₂ Emissions for Wales (kt CO₂e)

Summary of Emission Projections for Wales, 2007 to 2025						
Greenhouse Gas	NC Category	2007	2010	2015	2020	2025
Methane	Agriculture	2,531	2,623	2,541	2,524	2,748
	Business	55	51	50	50	50
	Energy Supply	690	654	521	456	388
	Industrial Process	14	15	15	15	16
	Land Use Change	3	2	1	1	1
	Public	1	1	1	1	1
	Residential	43	30	21	20	20
	Transport	8	6	5	5	5
	Waste Management	1,233	1,214	1,166	1,123	1,090
Methane Total		4,577	4,596	4,321	4,196	4,320
N ₂ O	Agriculture	2,394	2,527	2,456	2,441	2,607
	Business	84	81	81	81	80
	Energy Supply	72	84	100	76	78
	Industrial Process	20	21	21	21	21
	Land Use Change	0	0	0	0	0
	Public	1	1	1	1	1
	Residential	9	7	6	5	5
	Transport	93	74	72	74	76
	Waste Management	63	64	66	67	69
N ₂ O Total		2,737	2,860	2,803	2,766	2,937
HFCs	Business	250	229	215	185	164
	Industrial Process	0	0	0	0	0
	Residential	147	122	121	120	119
HFCs Total		397	351	336	304	283
PFCs	Business	4	3	4	5	6
	Industrial Process	39	26	26	26	26
PFCs Total		43	30	31	32	33
SF ₆	Business	39	34	33	32	33
	Industrial Process	10	10	10	10	10
SF ₆ Total		49	45	43	43	43

Figure 5.1 Projected Non-CO₂ Emissions for Wales by National Communication Category



6 Northern Ireland

Table 6.1 and Figure 6.1 summarise projected emissions from Northern Ireland, by National Communication category. Emissions from Northern Ireland are projected to decrease by 6% from 2007 to 2025. The main drivers behind this trend are:

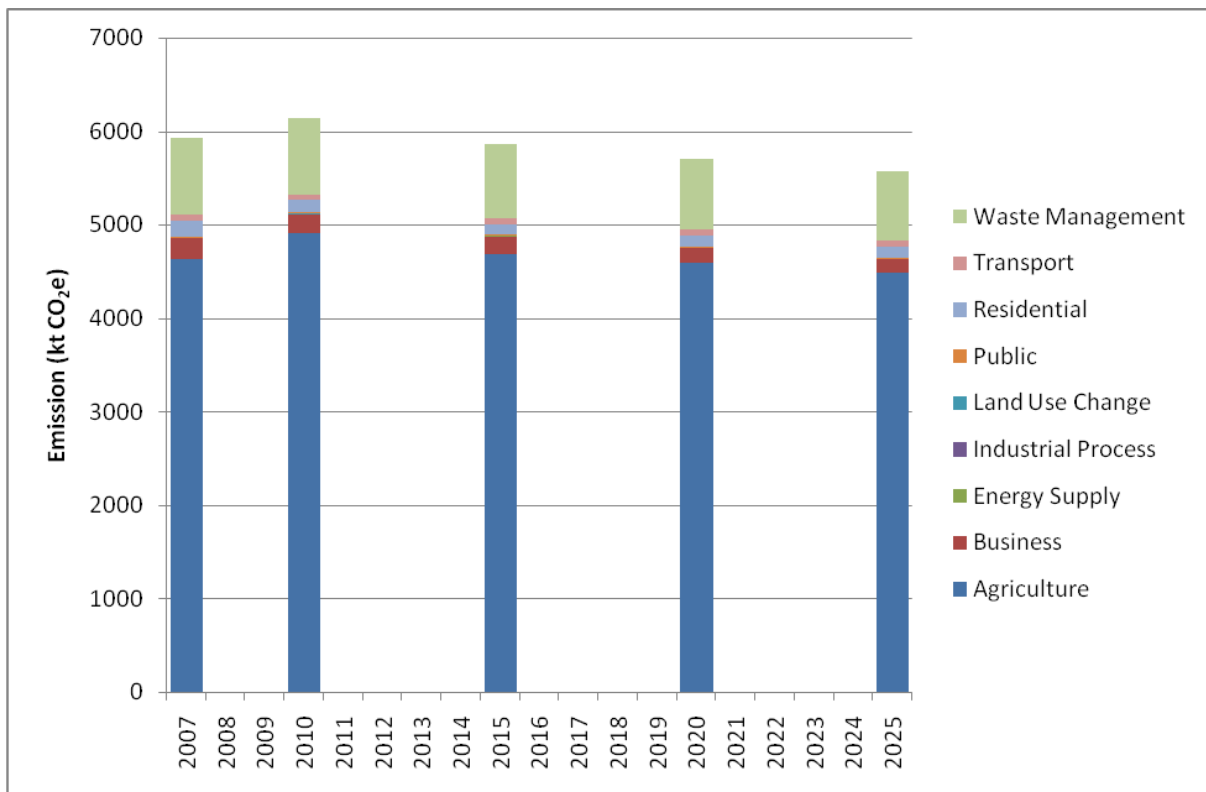
- A significant decrease in methane emissions from agriculture, due to a forecast decline in livestock numbers.
- Decreasing emissions from landfill waste.
- Reduced emissions from refrigeration and air conditioning.

These decreasing emissions have been partially offset by an increase in emissions of N₂O from agricultural soils.

Table 6.1 Projected Non-CO₂ Emissions for Northern Ireland (kt CO₂e)

Summary of Emission Projections for Northern Ireland, 2007 to 2025						
Greenhouse Gas	NC Category	2007	2010	2015	2020	2025
Methane	Agriculture	2,432	2,429	2,299	2,251	2,180
	Business	2	2	2	2	2
	Energy Supply	2	1	1	1	1
	Industrial Process	-	-	-	-	-
	Land Use Change	1	1	2	1	1
	Public	0	0	0	0	0
	Residential	64	45	32	31	30
	Transport	4	3	3	3	3
	Waste Management	792	780	749	721	701
Methane Total		3,297	3,262	3,088	3,011	2,919
N ₂ O	Agriculture	2,205	2,482	2,381	2,335	2,301
	Business	43	42	41	41	41
	Energy Supply	17	13	17	11	11
	Industrial Process	-	-	-	-	-
	Land Use Change	0	0	0	0	0
	Public	1	1	1	1	1
	Residential	16	14	11	10	10
	Transport	58	56	58	60	62
	Waste Management	37	38	39	41	41
N ₂ O Total		2,378	2,646	2,549	2,499	2,467
HFCs	Business	165	152	143	122	108
	Industrial Process	-	-	-	-	-
	Residential	87	73	73	72	72
HFCs Total		252	225	216	194	180
PFCs	Business	-	-	-	-	-
	Industrial Process	-	-	-	-	-
PFCs Total		-	-	-	-	-
SF ₆	Business	7	5	4	4	4
	Industrial Process	-	-	-	-	-
SF ₆ Total		7	5	4	4	4

Figure 6.1 Projected Non-CO₂ Emissions for Northern Ireland by National Communication Category



7 Unallocated Emissions

Projected emissions associated with offshore oil and gas processing are not allocated to the individual DAs; this is consistent with the approach taken for the historic DA inventories.

Unallocated emission projections of CH₄ and N₂O are summarised below. There are no unallocated emissions of F-Gases. Emissions are projected to decline by 61%, in line with a projected decrease in offshore oil and gas production from the UK Continental Shelf area.

Table 7.1 Unallocated (Offshore) Greenhouse Gas Projections (kt CO₂e)

Summary of Unallocated (Offshore) Emission Projections, 2007 to 2025						
Greenhouse Gas	NC Category	2007	2010	2015	2020	2025
Methane	Energy Supply	1006	780	550	391	339
N ₂ O	Energy Supply	302	344	260	176	174



AEA group
329 Harwell
Didcot
Oxfordshire
OX11 0QJ

Tel: 0870 190 xxxx
Fax: 0870 190 xxxx