



Reducing emissions in **Scotland**

1st Progress Report



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The Committee



Lord Adair Turner, Chair

Lord Turner of Ecchinswell is the Chair of the Committee on Climate Change and Chair of the Financial Services Authority. He has previously been Chair at the Low Pay Commission, Chair at the Pension Commission, and Director-General of the Confederation of British Industry (CBI).



David Kennedy, Chief Executive

David Kennedy is the Chief Executive of the Committee on Climate Change. Previously he worked on energy strategy at the World Bank and the design of infrastructure investment projects at the European Bank for Reconstruction and Development. He has a PhD in economics from the London School of Economics.



Professor Samuel Fankhauser

Professor Samuel Fankhauser is acting Co-Director of the Grantham Research Institute on Climate Change at the London School of Economics, a Director at Vivid Economics and a member of the Adaptation Sub-Committee. He is a former Deputy Chief Economist of the European Bank for Reconstruction and Development.



Sir Brian Hoskins

Professor Sir Brian Hoskins, CBE, FRS is the Director of the Grantham Institute for Climate Change at Imperial College and Professor of Meteorology at the University of Reading. He is a Royal Society Research Professor and is also a member of the National Science Academies of the USA and China.



Professor Julia King

Professor Julia King CBE FREng is Vice-Chancellor of Aston University. She led the “King Review” for HM Treasury in 2007/8 on decarbonising road transport. She was formerly Director of Advanced Engineering for the Rolls-Royce industrial businesses. Julia is one of the UK’s Business Ambassadors, supporting UK companies and inward investment in low-carbon technologies.



Lord Robert May

Professor Lord May of Oxford, OM AC FRS holds a Professorship jointly at Oxford University and Imperial College. He is a Fellow of Merton College, Oxford. He was until recently President of The Royal Society, and before that Chief Scientific Adviser to the UK Government and Head of its Office of Science & Technology.



Professor Jim Skea

Professor Jim Skea is Research Director at UK Energy Research Centre (UKERC) having previously been Director of the Policy Studies Institute (PSI). He led the launch of the Low Carbon Vehicle Partnership and was Director of the Economic and Social Research Council’s Global Environmental Change Programme.

Introduction and executive summary

This is our first progress report on emission reductions in Scotland¹, as requested by Scottish Ministers under the Climate Change (Scotland) Act (2009).

The Scottish Act set a long-term target to reduce emissions of greenhouse gases (GHGs) by 80% in 2050 relative to 1990, with an interim target to reduce emissions by 42% in 2020 relative to 1990. Secondary legislation passed in October 2010 and October 2011² also legislated a series of annual emission reduction targets for 2010 to 2022 and 2023 – 2027 respectively.

This report sets out our views on progress towards meeting these targets and the milestones set out for 2020 in the Scottish Government's strategy (the 'Report on Proposals and Policies – or the 'RPP') to meet targets³. While the first legislated annual target is for 2010, the full inventory emission data required to assess whether this target has been met will not be available until later this year. Therefore we consider the latest available emission data (for 2009) together with more recent temperature and sectoral data for indications of emission trends in 2010. We aim to assess the extent of underlying progress towards the targets through the implementation of abatement measures and to highlight delivery challenges.

Our key conclusions are:

- Scottish emissions fell in 2009, mainly due to the impact of the recession.
- They are likely to have risen in 2010 given the relatively cold weather and also due to increased use of carbon-intense fuels in power generation and energy-intensive industry.
- Our assessment of progress to date against milestones for 2020 suggests that good progress has been made on investment in renewable electricity, with capacity being added at a rate in recent years that is consistent with meeting the likely capacity required to meet targets by 2020. Preparations for CCS are progressing, and delivery against renewable heat is currently ahead of the indicative trajectory towards 2020.
- Progress has been made in energy efficiency improvement in buildings, purchase of more efficient vehicles, piloting of smarter choices programmes, and schemes to encourage farmers' uptake of climate change mitigation measures.

¹ It follows a report to Scottish Ministers from the Adaptation Sub-Committee in 2011 on Scotland's progress towards preparing for climate change: 'How well is Scotland preparing for climate change?', <http://www.theccc.org.uk/reports/adaptation/asc-scotland>

² Climate Change (Annual Targets) (Scotland) Order 2010 : http://www.legislation.gov.uk/ssi/2010/359/pdfs/ssi_20100359_en.pdf and Climate Change (Annual Targets) (Scotland) Order 2011: http://www.legislation.gov.uk/ssi/2011/353/pdfs/ssi_20110353_en.pdf

³ Scottish Government (2011) 'Low carbon Scotland: Meeting the emission reduction targets 2010-2022 – the report on proposals and policies: <http://scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/lowcarbon/rpp>



- New policies will be needed to sustain the progress that has been achieved under the Scottish Climate Change Act. In some areas, the key policies are UK-level; such as the Electricity Market Reform, the Green Deal/Energy Company Obligation, and the Renewable Heat Incentive. However there is an important role for the Scottish Government to support and monitor the implementation of these policies in Scotland, for example through addressing non-financial barriers to take-up of the RHI and additional energy efficiency initiatives.
- Several key policy areas are devolved directly to the Scottish Government. These include demand-side transport policy where it will be imperative to build on the recent Smarter Choices pilot scheme and proceed to full roll-out. Within agriculture and land use, programmes to encourage emission reductions among farmers and actions to protect the significant carbon stocks within Scotland's peat soils are particularly important.
- Even with these new policies, either a tightening of the European Union Emissions Trading System (EU ETS) cap or additional effort in the non-traded sector will be required to meet targets under the Scottish Climate Change Act. Given uncertainty over whether the cap will be changed, the Scottish Government should explore scope for further emissions reductions across the non-traded sector.

We set out the analysis that underpins these conclusions in 8 sections:

1. High level assessment of emission trends
2. Energy supply
3. Residential sector
4. Public and business sectors
5. Transport
6. Agriculture and related land use, and forestry
7. Progress reducing waste emissions
8. Challenges in meeting emissions targets

1. High level assessment of emission trends

Inventory data for 1990 to 2009

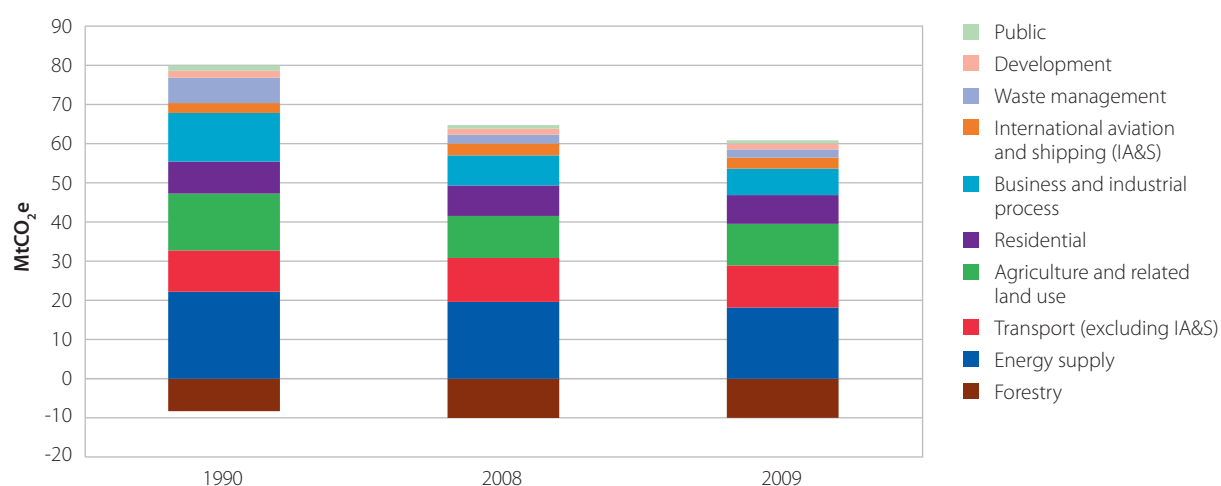
The latest inventory data for Scottish emissions relates to 2009⁴. It shows that energy supply is the largest emitter of GHGs in Scotland, followed by transport and then agriculture and related land use (Figure 1).

Overall, emissions have fallen by almost a third since the 1990 base year⁵ (Figure 2):

- In 2009, Scottish emissions of the basket of six GHGs covered by the Kyoto Protocol (including international aviation and shipping) were estimated to be 51.0 MtCO₂e, a fall of 29% since 1990 (not including trading in the EU ETS).
- When emissions are adjusted to take account of EU ETS trading, emissions in 2009 stood at 52.0 MtCO₂e (i.e. slightly above gross emissions, suggesting Scotland was a net seller of European Union Allowances in 2009), a 28% reduction from the 1990 base year.
- Since 1990, emissions have fallen in all sectors, except transport where emissions (including international aviation and shipping) are 4% higher than in 1990. Transport emissions excluding international aviation and shipping were 2% higher in 2009 than in 1990.

In 2009 total Scottish emissions (including international aviation and shipping but before EU ETS trading), fell by 7% (to 51.0 MtCO₂e).

Figure 1: Scottish GHG emissions by sector (1990, 2008 and 2009)



Source: NAEI (2011).

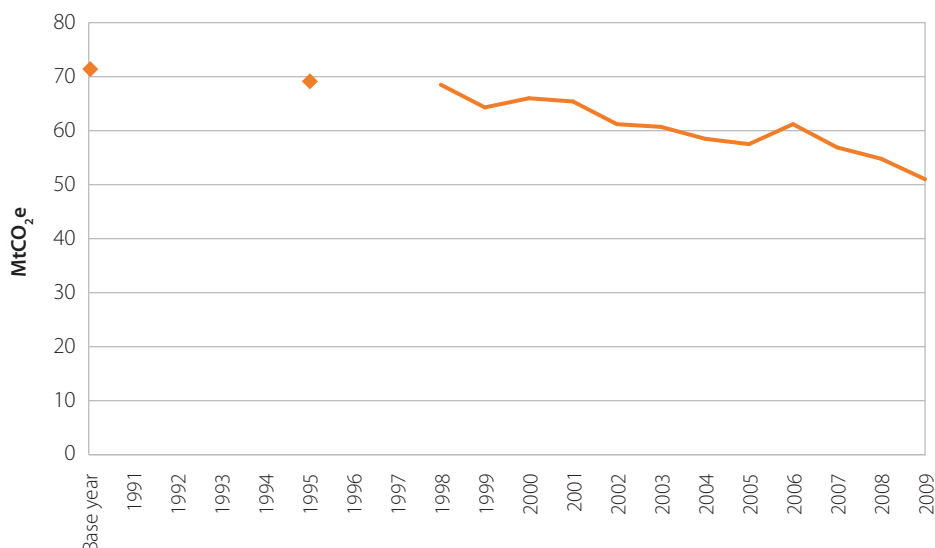
Note: Emissions are presented here before accounting for trading in the EU ETS.

⁴ National Atmospheric Emissions Inventory (NAEI) (2011) 'Greenhouse gas inventories for England, Scotland, Wales and Northern Ireland 1990 – 2009'. <http://naei.defra.gov.uk/reports.php>

⁵ 1990 in this report refers to the 1990/95 base year which uses 1990 for carbon dioxide, methane and nitrous oxide and 1995 for hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.



Figure 2: Scottish GHG emissions (1990-2009)



Source: NAEI (2011).

Notes: Emissions shown before accounting for EU ETS trading. Inventory GHG data is not available for Scotland for 1991-1994 or 1996-1997.

Emissions fell in all sectors⁶, with the largest reductions occurring in the public, and business and industrial process sectors (12%) followed by energy supply, waste and international aviation and shipping (all 7% – Figure 3).

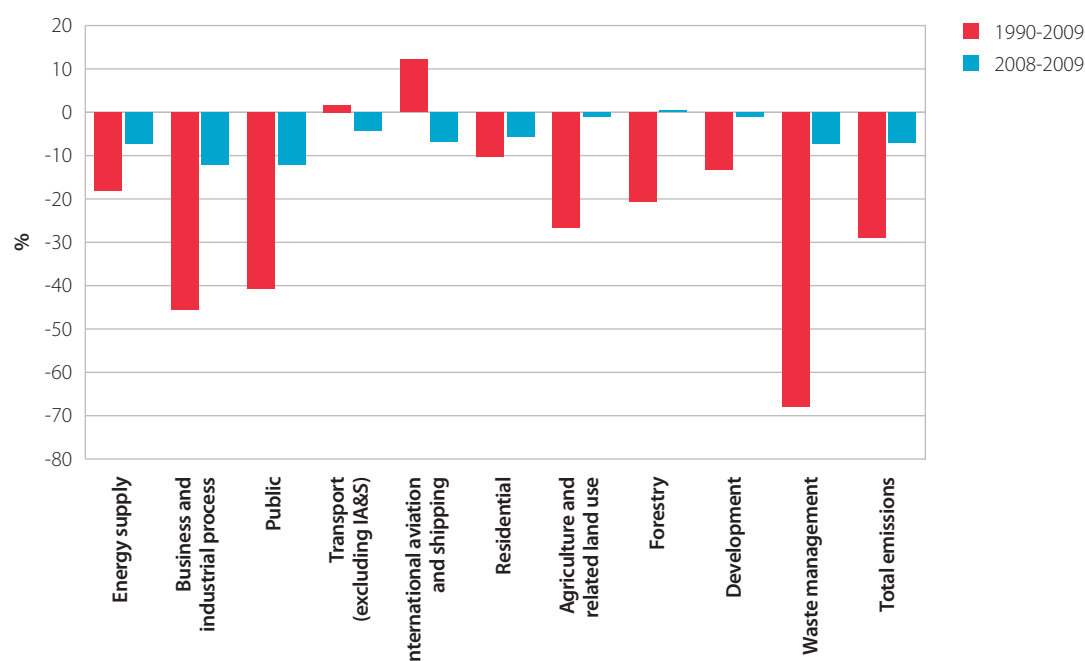
It is likely that much of this reduction was due to the recession, given that emissions fell in sectors where there was reduced output (Table 1) and that our analysis suggests implementation of measures can only account for some but not all, of the observed reduction in emissions. For example:

- In the residential sector, emissions fell 6%, or by around 0.40 MtCO₂. Only a small part of this reduction (approximately 0.030 to 0.045 MtCO₂) can be explained by the reduction in emissions expected from the insulation measures (loft, cavity and solid walls) achieved in 2009.
- In the transport sector, car emissions (which form the single largest proportion of the transport sector) fell 0.15 MtCO₂. Unlike the UK as a whole (where car vehicle km fell by 1.2% in 2009), car traffic increased slightly in Scotland (by 0.1%). Reductions in emissions from the two key supply side measures (increased penetration of biofuels and improvements in new car gCO₂/km) are estimated to account for reductions of 0.04 MtCO₂ and 0.02 MtCO₂ respectively. The remainder of the observed reduction (0.09 MtCO₂) is likely to be due to improvements in the overall fleet efficiency, reflecting fleet rollover.

⁶ The forestry sector was still a net sink of emissions in Scotland in 2009, however the size of the sink decreased in 2009 relative to 2008 which explains the positive bar in Figure 3 for 2008-2009.

1. High level assessment of emission trends continued

Figure 3: Percentage change in Scotland's emissions by sector (1990-2009 and 2008-2009)



Source: NAEI (2011).

Note: 'Development' is a category defined in the RPP to cover land use emissions from IPCC sector 5e (settlements).

Net emissions in 2009 of 52 MtCO₂e, were a reduction of 3.8% from 2008 net emissions of 54.0 MtCO₂e. Therefore 2009 net emissions are below the level of the first annual target for 2010 (53.652 MtCO₂e). However, as set out in the next section, it is likely that emissions will have increased in Scotland in 2010.

Temperature and sectoral data for 2010

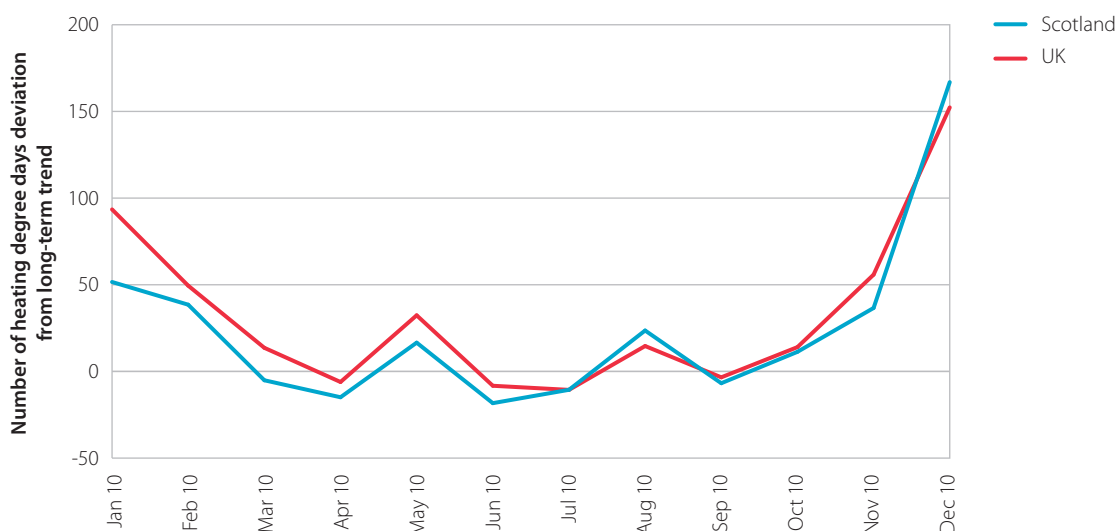
Although the 2010 emissions inventory will not be available until later in 2012, temperature and sectoral data suggest that emissions are likely to have increased in 2010 relative to 2009:

- **Temperature data.** UK emissions rose by 3% in 2010, largely due to increased use of fossil fuels to heat buildings in the colder than average months at the start and end of 2010. It is likely that there has been a similar effect in Scotland, where there was also significant deviation from long-term average temperatures (Figure 4⁷).

⁷ Heating degree days (HDDs) are calculated relative to a baseline temperature, typically 15.5°C, which is the outside temperature above which a building needs no heating. One HDD is the number of degrees centigrade deviation from the base temperature of the actual temperature on a given day (e.g. if the temperature was 5.5°C for one day the number of HDD would be 10).



Figure 4: Deviation from long-term average in heating degree days in 2010 – Scotland and UK



Source: DECC (March 2011). CCC calculations.

Note: The long-term mean is the 1971-2000 average.

- **EU ETS data.** Data from the EU ETS⁸ show a significant increase in verified emissions (9%) for Scotland between 2009 and 2010. This is much higher than the increase in UK EU ETS emissions (2%), even though the economic recovery was weaker in Scotland than for the UK as a whole (Table 1). This implies switching to more carbon-intense fuels in Scotland in 2010.

Table 1: Overall and sector GVA, percentage change in output from previous year – Scotland and UK – 2009 and 2010

	Total GVA		Production		Construction		Service sector	
	2009	2010	2009	2010	2009	2010	2009	2010
Scotland	-4%	+1%	-6%	0%	-13%	+12%	-3%	0%
UK	-5%	+2%	-9%	+2%	-14%	+8%	-3%	+1%

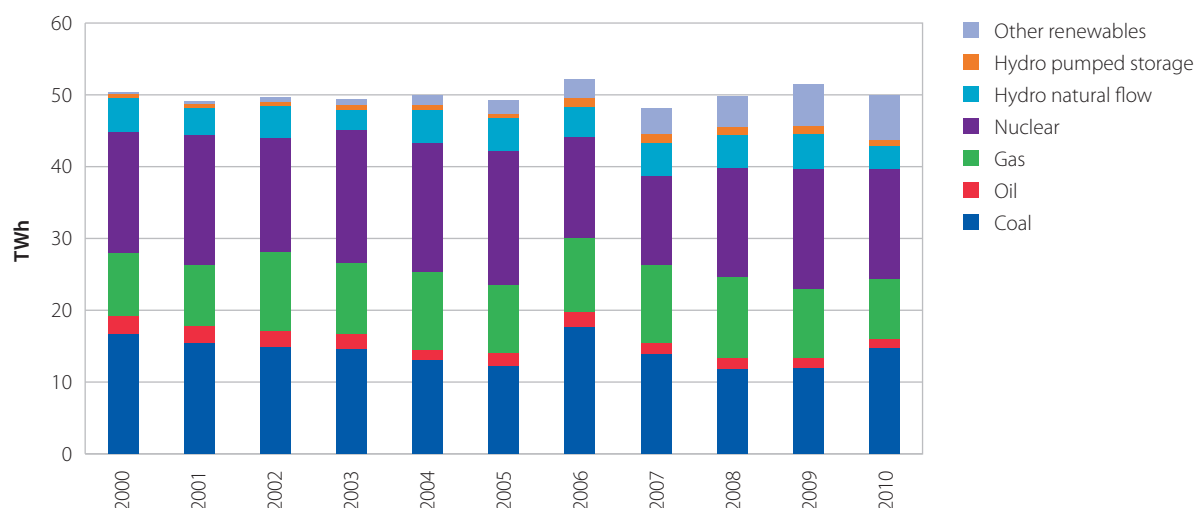
Source: Scottish Government 'Gross Domestic Product Indices'. Available from: <http://www.scotland.gov.uk/Topics/Statistics/Browse/Economy/GDP/Download>

⁸ European Commission (2011) 'EU ETS registries': http://ec.europa.eu/clima/policies/ets/registries/documentation_en.htm

1. High level assessment of emission trends continued

- **Power generation.** Data on electricity generation in Scotland⁹ suggests that power sector emissions will have increased in 2010, with the impact of reduced demand offset by the increased carbon intensity of power generation (see section 2).
 - Overall generation fell by 3% in 2010 relative to 2009. However, coal generation increased by 23%, to make up for reduced nuclear generation due to outages, and reduced renewables generation mainly due to low hydropower production as a result of low rainfall (Figure 5). We estimate that this will have resulted in power sector CO₂ emissions increasing from 13.4 MtCO₂ in 2009 to around 15.5 MtCO₂ in 2010.

Figure 5: Power generation by fuel in Scotland (2000-2010)



Source: DECC (2011) and Scottish Government (2011).

⁹ DECC (2011) 'Electricity generation and supply figures for Scotland, Wales, Northern Ireland and England, 2004 – 2010': http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/source/electricity/electricity.aspx

2. Energy supply



The Scottish Government's strategy for meeting emission reductions¹⁰ (the 'Report on Proposals and Policies' – RPP) sets out an energy supply sector and within that the power sector, renewable heat and total energy consumption. Here we consider overall progress against the milestones set out for each of these but discuss more detailed sector level progress in energy efficiency for example, within the relevant individual sectors.

Power sector

Total power generation in Scotland is sensitive to the operation of individual plant, which explains the substantial year to year variation (Figure 6). However, emissions intensity of generation in Scotland has been on a generally reducing trend. This has led to overall carbon intensity in Scotland being lower than the rest of the UK (Table 2 and Figure 7).

Figure 6: Historic trends in electricity generation, emissions intensity and total emissions – Scotland (2000-2010)



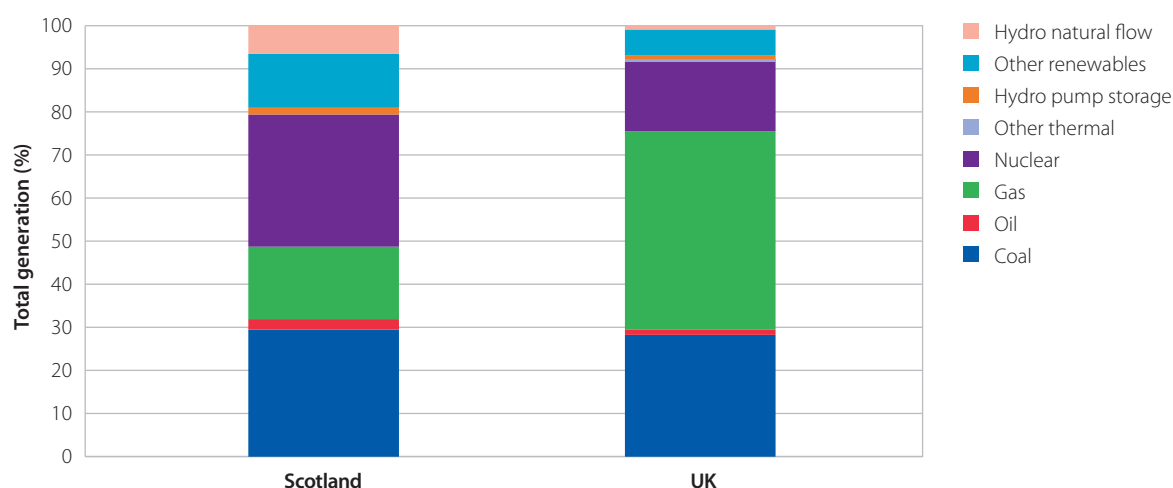
Source: CCC calculations based on data from DECC (2011) & Scottish Government (2011) for generation data and NAEI (2011) for emissions in 2000-2009.

Notes: NAEI Inventory data for 2010 is not available for the power sector in Scotland. We have estimated 2010 emissions based on available data on generation by fuel type and emission factors for each fuel/station type.

¹⁰ Scottish Government (2011) 'Low carbon Scotland: Meeting the emission reduction targets 2010-2022 – the report on proposals and policies: <http://scotland.gov.uk/Topics/Environment/climatechange/scotlands-action/lowcarbon/rpp>

2. Energy supply continued

Figure 7: Generation by fuel type Scotland and UK (2010)



Source: DECC (2011) CCC calculations.

Table 2: 2009 emissions intensity of generation (major power producers (MPPs) only)¹¹

	Scotland	Wales	Northern Ireland	England	UK total
Power generation emissions (ktCO₂e)	13,384	11,255	3,671	122,563	150,873
GWh generated by MPPs	45,314	30,637	7,628	257,888	341,467
ktCO₂e/GWh	0.2954	0.3674	0.4813	0.4753	UK average: 0.4418

Source: NAEI (2011)

One driver of carbon intensity reductions in Scotland has been investment in renewables, which now account for around 20% of total generation (Figure 8):

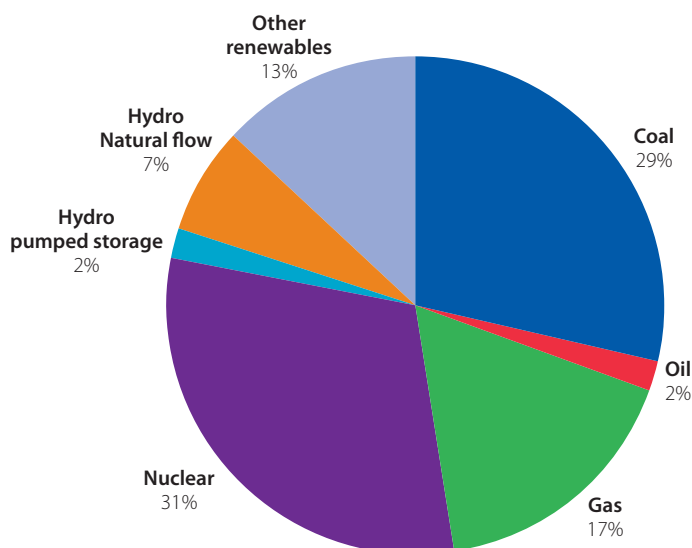
- Generation from renewables increased by 155% in Scotland between 2003 and 2010, from 3.7 TWh to 9.5 TWh, with installed capacity increasing 160% from 1.7 GW to 4.4 GW over the same time¹².

¹¹ The data in Figure 6 is based on CCC calculations on DECC generation data and NAEI emission data and represent total generation in Scotland and all power sector CO₂. The figures in Table 2 are from the NAEI and cover total GHGs from the power sector (CO₂e) and are based on generation from major power producers only.

¹² These are annual figures, last published by DECC in December 2011. Scottish Renewables (<http://www.scottishrenewables.com/>) produces more frequent updates of installed capacity in Scotland, with the latest update showing 4.6 GW as at 29 November 2011.



Figure 8: Percentage of total power generation by fuel, Scotland (2010)



Source: DECC (2011).

- Wind generation increased almost ten-fold over the same period, from 0.5 TWh to 4.9 TWh, and accounted for 48% of the UK's wind generation in 2010.
- In 2010 Scotland's renewables accounted for 37% of total UK renewable generation.

Going forward, the Scottish Government has set a target that the equivalent of 100% of Scotland's gross electricity consumption should be met through renewable generation by 2020.

This would contribute to meeting both Scottish emission targets and UK carbon budgets.

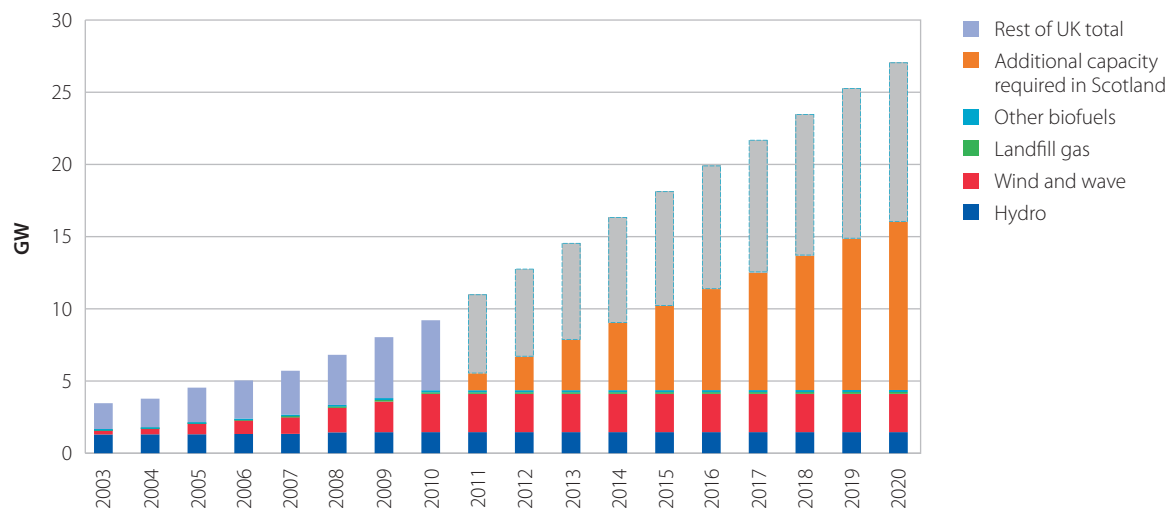
However, in both respects, it is important to consider the wider generation mix in Scotland as there is likely to be significant thermal generation still on the system in Scotland in 2020. While the 100% target is compatible with what is required to meet emission targets and carbon budgets, this is subject to reductions in fossil fuel generation either through closing of plant or fitting of CCS (see below). This will also be required to meet the longer-term aim set out by the Scottish Government for a largely decarbonised electricity generation sector by 2030.

The Scottish Government has indicated that the 100% target could be achieved by adding around 10-12 GW of renewables capacity from now to 2020, which implies the need to sustain the rate of increase in renewables capacity achieved between 2003 and 2010 (average increase in capacity of 15% per annum – Figure 9). The 2020 Routemap for Renewable Energy in Scotland¹³ indicated that as at August 2011 there was 1.2 GW of renewables under construction, 2.1 GW consented, 4.1 GW in the planning system and 15.4 GW at the scoping stage.

¹³ Scottish Government (2011) '2020 Routemap for Renewable Energy in Scotland'. <http://www.scotland.gov.uk/Publications/2011/08/04110353/0>

2. Energy supply continued

Figure 9: Historic deployment of renewables in Scotland to 2010 and estimated increase required to 2020 to meet 100% scenario



Source: DECC (2011). CCC calculations.

Note: The total renewable capacity in the UK required to meet the Committee's UK scenario for 2020 is shown for context.

The key policy here will be the UK Electricity Market Reform, which will provide support for renewable technologies. There will be an important role for the Scottish Government in contributing to the development of this policy at the UK level, and ensuring that there are sufficient planning approvals to support required investment.

The Scottish Government has also committed to demonstrate CCS on a Scottish coal-fired power station by 2020, with a view to roll-out in the 2020s to all coal and gas-fired stations.

However, progress has stalled in this respect due to the failure of the Longannet demonstration project within the UK's first CCS funding competition. Pro-active involvement of the Scottish Government in moving forward the UK programme of CCS demonstration projects could help to ensure progress in this crucial area.

In the meantime, the Scottish Government has put in place planning requirements for thermal power stations in respect of CCS-readiness, and a regulatory regime covering each stage in the CCS chain (capture, transport, and storage). Longannet remains one of three Scottish applicants in the EU's NER300 CCS funding programme. Another of these three applications is attached to a proposal to build a new coal-fired power station in Scotland.



In this respect, our previous recommendation¹⁴ to the UK Government is relevant. We set out that coal-fired power stations should not be built beyond a certain date without CCS (e.g. 2020) and any built before that date should be CCS-ready and given a deadline for CCS-retrofit (say 2020-2025). It should be clear that any plants that choose not to retrofit should be allowed to generate for a very limited number of hours.

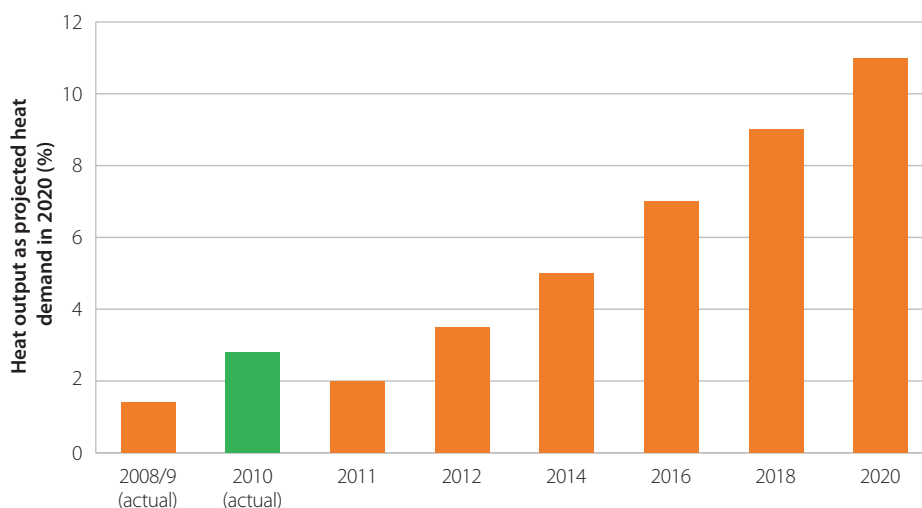
Renewable heat

The RPP sets out an ambition for 11% of Scotland's heat demand to come from renewable sources by 2020. This is broadly commensurate with ambition at the UK level to achieve 12% renewable heat penetration in 2020.

The second survey of renewable heat in Scotland¹⁵ shows that in 2010, an estimated 0.441 GW of renewable heat capacity was operational in Scotland, producing an estimated 1,696 GWh of renewable heat energy.

This is an almost doubling of output since the previous estimate in 2008/09¹⁶, and is equivalent to 2.8% of Scotland's forecast non-electrical heat demand in 2020. This puts 2010 progress ahead of the indicative interim milestone¹⁷ towards the 2020 target (Figure 10).

Figure 10: Estimated output of renewable heat in 2010 against indicative interim milestones to 2020 target



Source: Energy Saving Trust (2011).

Note: Indicative milestones are as set out in the Scottish Government's Renewable Heat Action Plan (2009).

¹⁴ See Committee on Climate Change (2009) 'Meeting carbon budgets – the need for a step change'.

¹⁵ Energy Saving Trust (2011) 'Renewable heat in Scotland'. <http://www.energysavingtrust.org.uk/scotland/Take-action/Business-funding/Renewable-Heat-in-Scotland>

¹⁶ Sustainable Development Commission (2009) 'Renewable Heat in Scotland'. <http://www.sd-commission.org.uk/news.php/288/scotland/developing-scotlands-renewable-heat-potential>

¹⁷ As set out in Scottish Government (2009) 'Renewable Heat Action Plan for Scotland'. <http://www.scotland.gov.uk/Publications/2009/11/04154534/0>

2. Energy supply continued

The key determinant of future investment in renewable heat will be the Renewable Heat Incentive, for which funding for the second phase should be confirmed by the UK Government to resolve current uncertainties. There is a potentially important role for the Scottish Government to play in closely monitoring deployment under the RHI, and to address non-financial barriers to uptake.

Energy consumption

The Scottish Government's Energy Efficiency Action Plan¹⁸ (EEAP 2010) set out the target to reduce Scottish final energy consumption by 12% by 2020 against a baseline of average energy consumption over 2005-2007 (on the basis of the latest figures this is 159,770 GWh – requiring a reduction to 140,600 GWh by 2020). The latest available data shows that in 2009, total final energy consumption in Scotland was 146,800 GWh, which outperforms the trajectory for 2009 (set out in the EEAP as a annual straight line trajectory from the baseline to the 2020 target) (Figure 11).

Figure 11: Total energy consumption in Scotland in 2009 against indicative trajectory to 2020 target



Source: Scottish Government (2011), DECC (2011), CCC calculations.

Notes: Indicators follow the methodology as set out in the Scottish Government's Energy Efficiency Action Plan (2010), updated with the last published baseline and 2020 target (in the Scottish Government's 1st progress report on the EEAP (Oct 2011)). Subsequent revisions to historic figures (as published by DECC (2011)) may impact baseline and 2020 target further.

¹⁸ Scottish Government (2010) 'Energy Efficiency Action Plan'. <http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Action/energy-efficiency-policy/ActionPlan>

3. Residential sector



Residential buildings emission trends

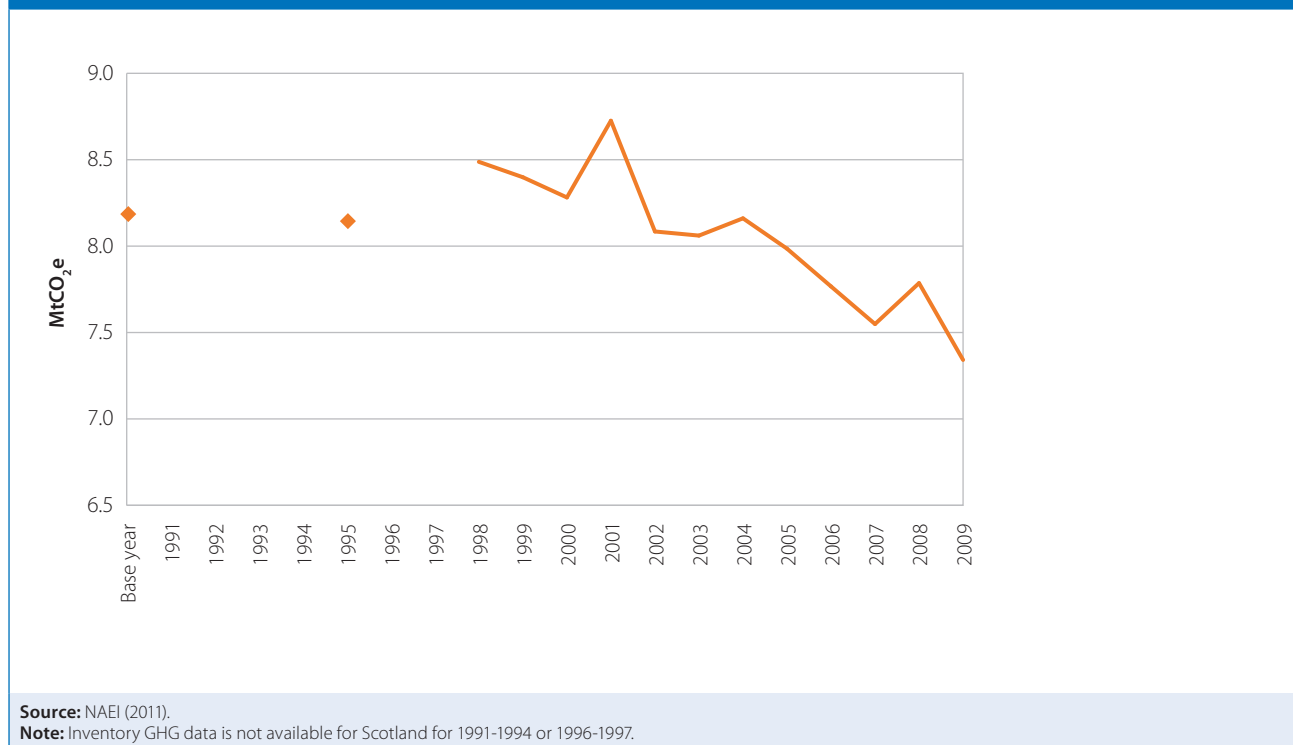
In 2009, emissions in the residential sector amounted to 7.3 MtCO₂e (14% of Scotland's total GHG emissions in 2009), 10% lower than in 1990 (Figure 12).

Between 2008 and 2009, residential emissions fell by around 6%. This is likely to be due to a combination of implementation of insulation measures, a reduction in heating use during the recession (which coincided with a 13% rise in real gas prices in Scotland¹⁹), and a temperature impact (Figure 13). Residential sector emissions are particularly sensitive to weather – although December 2009 was colder than the long-term average, the rest of the year was warmer than average.

At the UK level, emissions from the residential sector increased by 13% in 2010, mainly due to increased energy consumption for heating through the particularly cold periods in early and late 2010.

As noted in Section 1 above, although comparable emission data is not yet available, it is likely that there was a similar temperature-related effect as temperatures in Scotland were also very low during those months.

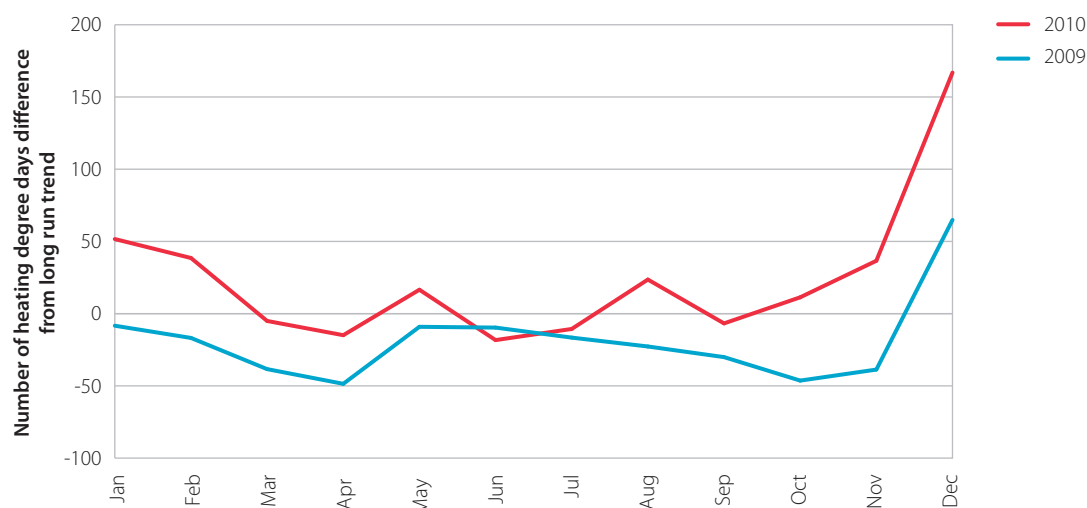
Figure 12: Historic residential sector emissions in Scotland (1990-2009)



¹⁹ DECC (2011) 'Average annual domestic gas bills for UK countries': http://www.decc.gov.uk/en/content/cms/statistics/energy_stats/prices/prices.aspx

3. Residential sector continued

Figure 13: Heating degree days in Scotland – difference from long-term average (2009 and 2010)



Source: CCC calculations based on data provided by DECC.
Notes: Long run trend is 1971-2000.

Sector milestones/targets

The Scottish Government's strategy to meet emissions targets sets out a number of milestones for the residential sector in 2020:

- Every home to have loft and cavity wall insulation, where this is cost-effective and feasible, plus simple measures such as draught-proofing and pipe lagging;
- Every home heated with gas central heating to have a highly efficient boiler with appropriate controls; and
- At least 100,000 homes (approximately 4% of Scotland's building stock) to have adopted some form of individual or community renewable heat technology for space and/or water heating

The RPP anticipated that the range of policy measures in place (across Scottish and UK Government) would achieve abatement of 0.685 MtCO₂ by 2020, with the deployment of additional proposals taking this up to 1.1 MtCO₂ by 2020. This is in line with the Committee's estimated abatement potential in the UK Extended Ambition Scenario²⁰, pro-rated to Scotland in 2020 (1 MtCO₂; 0.64 MtCO₂ from energy efficiency and 0.34 MtCO₂ from renewable heat).

²⁰ The Extended Ambition (EA) scenario was initially defined in the Committee's 2008 Report ("Building a low carbon economy": <http://www.theccc.org.uk/pdf/TSO-ClimateChange.pdf>) recommending the first three carbon budgets at the UK level. It reflects the abatement potential to 2020 from policies that are broadly committed to in principle (but where further definition and implementation is required). It is characterised by widespread insulation of lofts and cavities, some insulation of solid walls, significant penetration of low carbon heat, deep cuts in emissions from transport and some lifestyle changes in homes and transport. From the UK level analysis, we estimate Scotland's abatement through to 2020, taking into account, as far as possible, Scottish-specific circumstances. At the time of the Committee's first report to Scottish Ministers, which recommended the level of the first batch of emission targets and set out options for the 2020 interim target, the EA as pro-rated to Scotland combined with a 20% EU target for 2020 would result in a gap of 4 MtCO₂e from the proposed 42% reduction in 2020. However the latest indicative projections suggest that, where progress is accelerated and measures implemented in line with the EA scenario, together with impacts of the recession, the 42% target could be met with EA measures (similar to the UK overachieving the 'Interim' budget, and achieving the 'Intended' budget in the non-traded sector).



Progress against targets

There has been good progress against targets for energy efficiency improvement, boiler replacement, and community heating projects:

- **Energy efficiency improvement.** CERT data (see Table 3) suggests that the share of measures deployed in Scotland reflects its share in the Great Britain (GB) housing stock (9%), with a higher share for implementation of CESP measures. The Scottish Government has also provided additional support for energy efficiency improvement.

Table 3: CERT measures in Scotland and GB, years 1-3 (1 April 2008 – 31 March 2011)

CERT years 1 – 3	Number of insulation measures	
	Lofts	Cavity walls
Scotland	144,202 (8% of GB)	117,483 (9% GB)

Source: Energy Saving Trust (2011) 'CERT Summary Report Q12 – HEED database'. <http://www.energysavingtrust.org.uk/Professional-resources/Existing-Housing/Homes-Energy-Efficiency-Database/CERT-reports-from-HEED>

- **The latest Community Energy Saving Programme (CESP)** report²¹ shows that as at June 2011, 1,531 dwellings in Scotland had been treated under the scheme (12% of GB total) with a total of 2,863 measures (11% of total GB measures).
- **Scottish Government programmes:** The Scottish Government's area-based Home Insulation Scheme (HIS), has to date, been administered by 29 local authorities, covering 400,000 homes. An Energy Assistance Package (EAP) targets those in fuel poverty. The first end of year report²² found that together, the EAP and HIS installed 11,502 heating systems and 26,110 insulation measures (though there is some overlap with the CERT statistics as these figures include CERT referrals).
- **Boiler replacement:** Over three phases, around 14,000 households with inefficient boilers were upgraded under a £6m Scottish Government boiler scrappage fund. However at present there is not detailed data on how many inefficient boilers require replacing to meet the 2020 target.
- **Community heating:** The Scottish Government has funded a £1.9m district heating scheme which will provide nine community biomass heating systems for 280 homes as well as businesses and community facilities.

²¹ Ofgem (2011) 'CESP Update 03 September 2011'. <http://www.ofgem.gov.uk/Sustainability/Environment/EnergyEff/cesp/Pages/cesp.aspx>

²² Scottish Government (2010) 'Home Energy Schemes 2009-10: Energy Assistance Package and Home Insulation Scheme: End Year Report'. <http://www.scotland.gov.uk/Publications/2010/12/22153754/0>

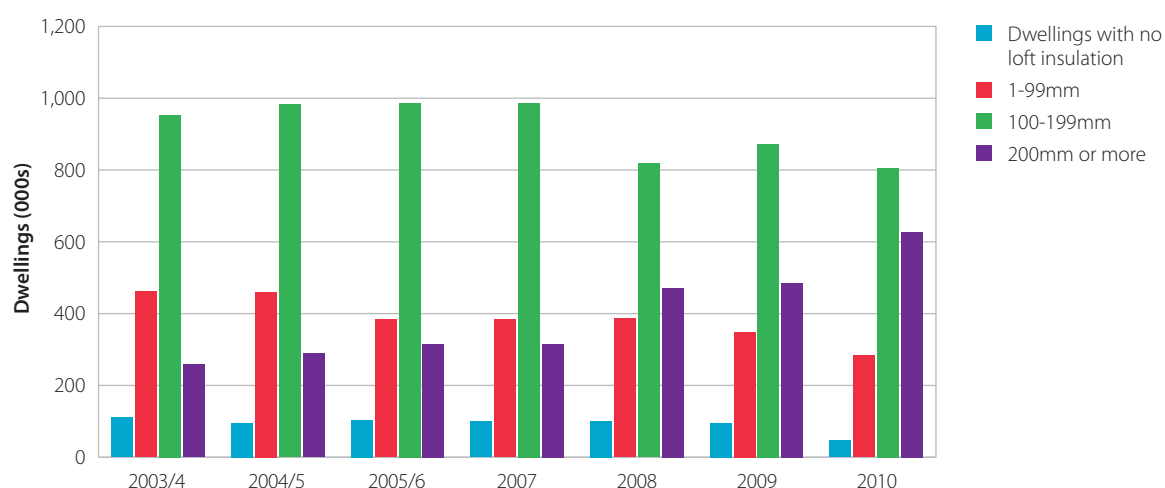
3. Residential sector continued

However, there still remains significant scope for future energy efficiency improvement, including loft top-ups (Figure 14)²³ and cavity wall insulations²⁴, together with boilers. The extent to which implementation of measures can be sustained to meet targets will depend on new policies currently under development, both at UK and Scottish levels.

Policies to drive continued implementation of measures

The key policy to drive future emissions reductions will be the Green Deal and the Energy Company Obligation (ECO), which will operate in the whole of Great Britain. We have set out our views on the design of this policy in a letter to the Secretary of State for Energy and Climate Change²⁵. Whatever the final design, there will be a potentially important role for the Scottish Government in supporting Green Deal/ECO implementation.

Figure 14: Dwellings with no loft insulation and depth of loft insulation, Scotland (2003-2010)



Source: Scottish House Condition Survey for 2010.

Note: In 2010 there was a further 593,000 dwellings where loft insulation is not applicable.

²³ The Energy Saving Trust recommended depth of loft insulation is 275mm.

²⁴ Of the 2.4m dwellings in Scotland there are 671,000 dwellings without cavity wall insulation of which it should be possible to insulate 544,000. (Scottish House Condition Survey 2010: <http://www.scotland.gov.uk/Topics/Statistics/SHCS>).

²⁵ Committee on Climate Change (December 2011): <http://www.theccc.org.uk/news/latest-news/1134-ccc-expresses-concern-about-green-deal-proposals-20-december-2011>

4. Public and business sectors



Emission trends from public and business sectors

This class of emissions covers those from public and commercial sector buildings, and from non-energy intensive industry (i.e. outside the EU ETS).

Emissions from these sectors were 3.8 MtCO₂e in 2009, down from 4.4 MtCO₂e in 2008. Much of this 15% reduction is likely to have resulted from recession-related reduction in demand (e.g. commercial output fell by 3% in 2009, and industrial output by 6%).

Sector targets/milestones

The RPP sets out a number of milestones for public and business sectors in 2020:

- The public sector will have reduced its energy consumption by at least 12%.
- Individual public bodies will have set and will monitor their own ambitious annual energy efficiency targets.
- All businesses will have access to consistent energy and resource efficiency advice.

The RPP targets abatement of 1.4 MtCO₂e from the public and business sectors, which is consistent with our estimates of potential (e.g. as set out in our 2011 report on Scottish emissions targets²⁶).

Policies to drive progress reducing public and business sector emissions

A number of measures have progressed to lay the foundations for future action to reduce emissions:

- A public bodies duty came into force 1 January 2011, implementing a provision under Scotland's Climate Change Act. It places a statutory obligation on any public body to "*exercise its functions in the way best calculated to contribute to delivery of the Act's emission reduction targets*". It does not require public bodies to set targets but they are 'expected' to identify their own ambitious targets that should echo the national targets.
- 130 (of a total of 154 in Scotland) public bodies now have Carbon Management Programmes as certified by the Carbon Trust.
- A £20m central energy efficiency fund has been established to support the public sector (local authorities, NHS, Scottish Water etc) to improve its own estate.
- An energy and resource service for business was launched by the Scottish Government as a virtual service in 2011, to be fully operational in 2013-2014.

²⁶ Committee on Climate Change (2011): 'Advice to the Scottish Government on emission targets for 2023-2027 and credit use in 2013-2017' <http://hmccc.s3.amazonaws.com/CCC%20letter%20to%20Stewart%20Stevenson%20-%20targets%20and%20credit%20advice%201%20July%202011.pdf>

4. Public and business sectors continued

UK level policies, including the Carbon Reduction Commitment, roll-out of smart meters, and Climate Change Agreements, should also encourage energy efficiency improvement in the public and business sectors.

In addition to these policies, there are two key areas where policy innovation is required:

- **Public sector.** Full roll-out and implementation of carbon management programmes could help to achieve further public sector emission reductions. The Scottish Government should play a crucial leadership role in this regard.
- **SMEs.** New incentives are required to encourage uptake of energy efficiency measures by SMEs, including roll-out of EPCs/DECs and possible regulating of minimum performance standards.

Approaches in both of these areas are within the remit of the Scottish Government under the balance of reserved/devolved powers.

5. Transport emissions



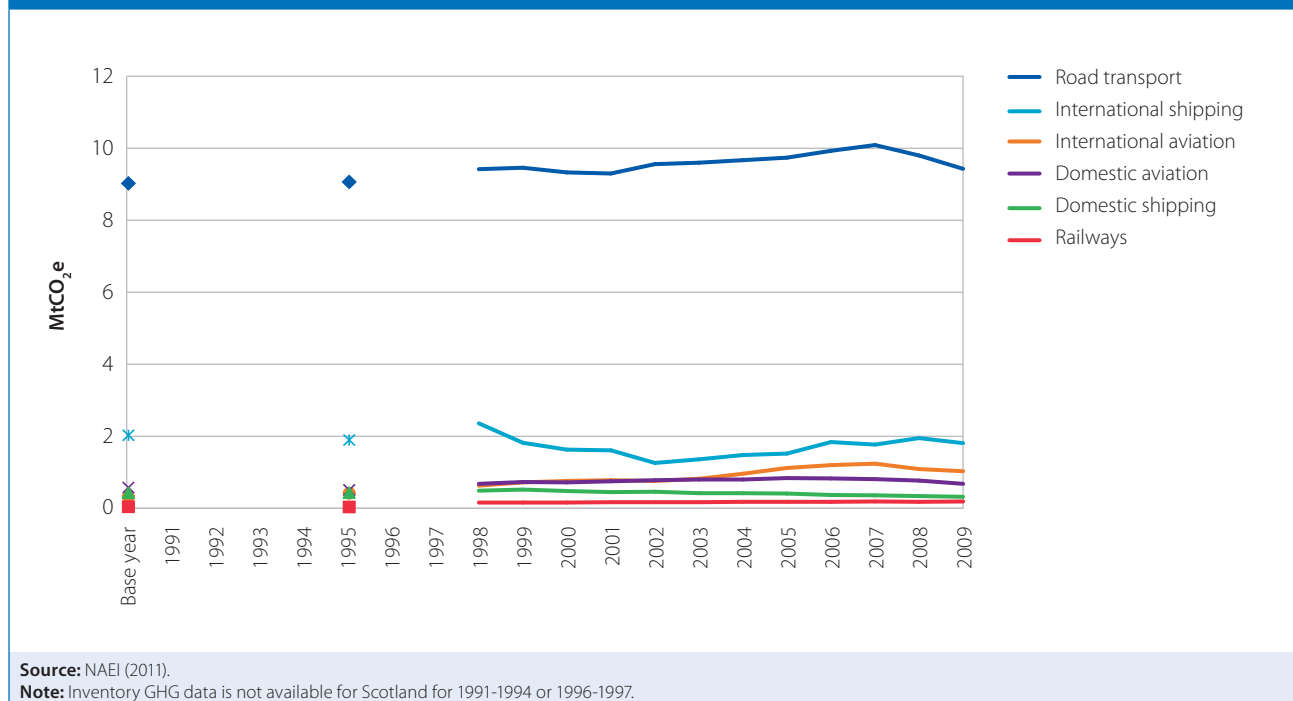
Transport emissions trends

Total transport emissions in 2009 amounted to 13.6 MtCO₂e, the majority (9.5 MtCO₂e) of which was from road transport. Overall, emissions (including international aviation and shipping) have increased 4% since 1990 (Figure 15) and within that:

- Road transport emissions increased 4% from 1990 levels
- International shipping emissions were 14% lower in 2009 than in 1990
- International aviation emissions were 144% higher in 2009 than in 1990

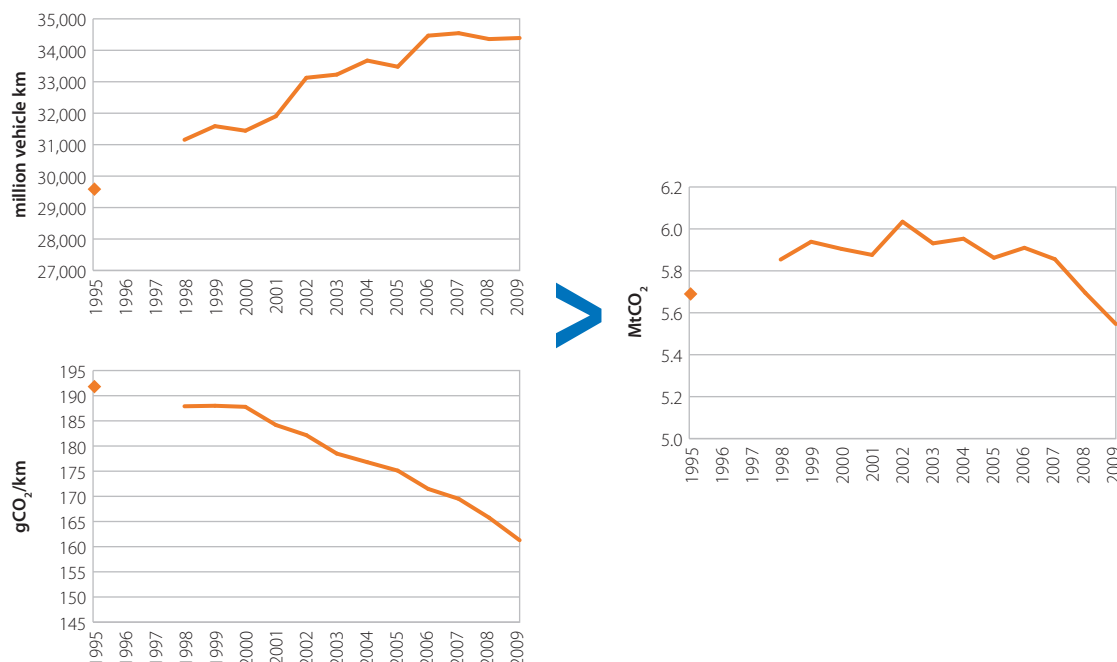
Car emissions account for 59% of surface transport emissions in Scotland, and 41% of all transport emissions (including international aviation and shipping). Car emissions in Scotland have remained fairly level since 1998 as reductions in the fleet average gCO₂/km have been offset by an increase in vehicle km over the same time (Figure 16).

Figure 15: Scottish transport GHG emissions (1990-2009)



5. Transport emissions continued

Figure 16: Historic trends in car vehicle km, gCO₂/km and car emissions, Scotland (1995-2009)



Source: NAEI (2011), Scottish Transport Statistics No. 29 – 2010 edition, chapter 5: road traffic. CCC calculations.

Note: Inventory GHG data is not available for Scotland for 1996-1997.

Overall transport emissions fell by 5% in 2009, mainly due to falling surface transport emissions:

- Surface transport emissions fell by 4% in 2009 (including a 3% fall in car emissions), partly due to a fall in vehicle km travelled (across all vehicle types overall) of 1%. New car vehicle efficiency also fell from a mean of 156 gCO₂/km in 2008 to 148 gCO₂/km in 2009. It is likely that surface transport emissions will have fallen further in 2010 given there was a larger reduction in vehicle km (2% fall overall from 2009) and new car CO₂ fell to 143 gCO₂/km in Scotland.
- International aviation emissions fell by 5% in 2009 due to reduced aviation demand in the recession.
- International shipping emissions fell by 7% in 2009, which is consistent with the substantial drop in the volume of overseas exports of manufactured goods from Scotland in 2009²⁷ (9% overall, and a 15% drop in exports from engineering and allied industries which account for almost half of Scotland's manufactured exports) and the general decline in world trade in 2009²⁸.

²⁷ Scottish Government (2011) Quarterly index of manufactured exports: <http://www.scotland.gov.uk/Topics/Statistics/Browse/Economy/Exports/IMEIntroduction>

²⁸ I.e. world merchandise trade volumes fell 12% in 2009 – World Trade Organisation (2010): 'International Trade Statistics', http://www.wto.org/english/res_e/statistics_e/its2010_e/its10_toc_e.htm



Milestones/targets for reducing transport emissions

The RPP sets out several milestones for the transport sector for 2020:

- A mature market for low-carbon cars, resulting in average efficiencies for new cars of less than 95gCO₂/km.
- An electric vehicle charging infrastructure in place in Scottish cities.
- Personalised travel planning advice provided to all households.
- Effective travel plans in all workplaces with more than 30 employees.
- At least 10% of all journeys made by bicycle.

The abatement potential associated with the full range of Scottish policies and proposals is around 2.5 MtCO₂ in 2020 (1.4 MtCO₂ from current policies and a further 1.1 from proposals), which is consistent with our assessment of cost effective abatement potential.

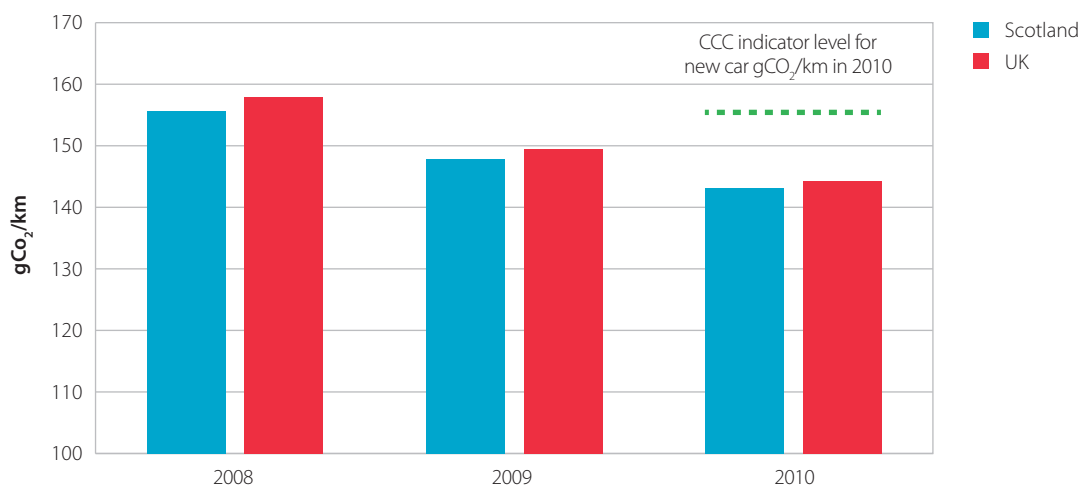
Progress reducing emissions

There has been progress on new car emissions, electric vehicle markets, smarter choices programmes and cycling programmes:

- **New car emissions** in Scotland were below the UK average and below the level in our indicator framework in 2010 (Figure 17). This suggests good progress towards reaching the 95 gCO₂/km target in 2020. But close monitoring is required to see whether the positive results to 2010 were the result of policy levers/industry responses, rather than the recession/increased fossil fuel prices.
- **Electric vehicles:** The Scottish Government is funding a £4.2m Electric Vehicle Procurement Scheme for the public sector in 2011/12. This follows a £4.3m scheme in 2010/11 which resulted in public services purchasing 145 low-carbon vehicles and in conjunction with Plugged in Places funding, installation of 74 charging points. The 2011/12 phase is due to assist with the purchase of a further 120 electric vehicles and deliver 120 charging points. An additional 140 charging points are planned under Plugged in Places for 2012/13.
- **Smarter Choices:** The Smarter Choices Smarter Places demonstration programme 2008-2012 is due for full evaluation in 2012 to inform future policy. The Energy Saving Trust and Sustrans are currently funded to provide support, including for travel planning to organisations and schools respectively. Funding for 2012/13 is currently under consideration.

5. Transport emissions continued

Figure 17: Mean new car gCO₂/km – Scottish and UK average and CCC indicator level for 2010 (UK)



Source: The Society of Motor Manufacturers and Traders (2012).

- **Cycling programmes:** Cycling Scotland will undertake its first assessment of progress in 2012. The organisation will have funds of £2.2m in 2011/12 to promote cycling while Sustrans has £5m to further improve cycling infrastructure in conjunction with local authorities. The recently announced Future Transport Fund has allocated a total of £2.75m for cycling infrastructure over 2012/13 and 2013/14. Currently around 1% of journeys in Scotland are made by bicycle against the 2020 10% target. Future progress on this challenging measure is contingent on future Scottish Government/local authority funding availability.

Policies to drive future emissions reductions

The key policies to drive new car efficiency improvement will operate at the EU and UK levels (i.e. regulatory standards, information provision, and fiscal levers).

There will be a crucial role for the Scottish Government in supporting development of electric vehicle markets, particularly as regards supporting investment in battery charging infrastructure.

There is also a crucial role on supporting demand side improvements such as roll-out of Smarter Choices programmes. Such programmes will require appropriate funding if emissions targets are to be met.

6. Agriculture and related land use and forestry



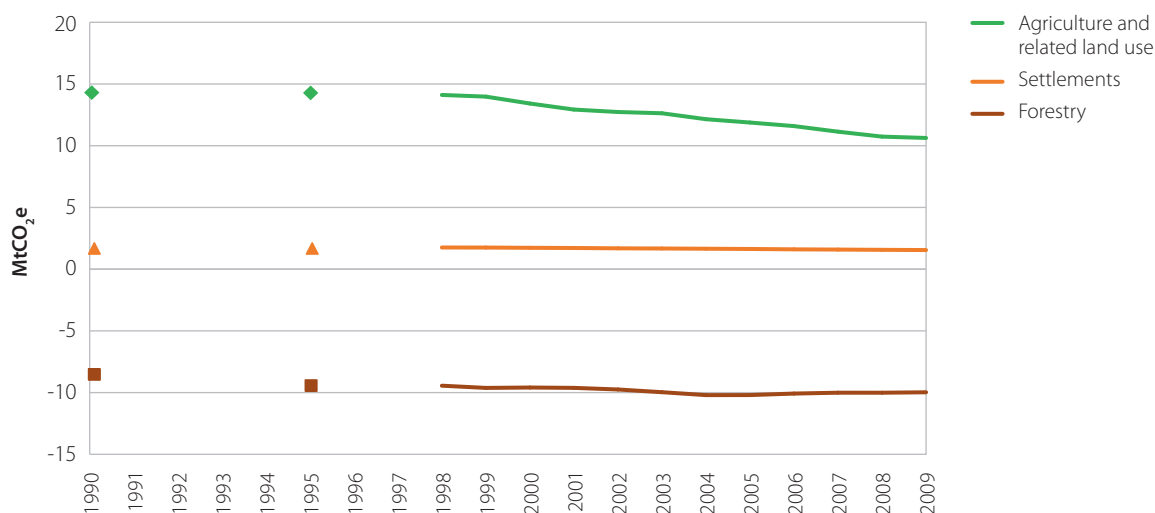
Emission trends

Emissions from the agriculture and related land use sector stood at 10.6 MtCO₂e in 2009, accounting for 21% of total Scottish GHGs:

- Since 1990, agriculture and related land use emissions have fallen 27%, due to a reduction in livestock numbers in that time and a reduction in emissions associated with agricultural land use (Figure 18).
- In 2009 emissions from agriculture accounted for 10.6 MtCO₂e, having stayed flat from 2008.
- Agriculture-related land use emissions stood at 2.8 MtCO₂e in 2009, falling 4% from 2008 due to lower emissions from land converted to cropland and an increased sink from grassland.

The forestry sector in Scotland is a net sink for emissions. The size of the sink has increased between 1990 and 2009, from -8.3 MtCO₂e to just under -10 MtCO₂e in 2009. However, since 2004, the forestry sink has seen a slight decrease due to a drop off in historic planting rates.

Figure 18: Emissions from agriculture and related land use and forestry in Scotland (1990-2009)



Source: NAEI (2011).

6. Agriculture and related land use and forestry continued

As highlighted by the Adaptation Sub-Committee's first report on Scotland's preparedness for climate change²⁹, Scottish peatlands are an important carbon store. 60% of the UK's total peatland is in Scotland, while the 1.8 billion tonnes of carbon in Scotland's deep peat soils alone is equivalent to around 4% of Europe's total peat carbon store. Peatlands are vulnerable to climate change, as warmer average summer temperatures could dry out wetland habitat, while high rainfall events may further erode bare peat surfaces – which results in release of CO₂ into the atmosphere.

Sector targets/milestones

The RPP sets out the need for further research in the agriculture sector to develop a set of indicators to measure the progress of the main policies as well as set milestones.

It also sets out a target to reduce agriculture emissions by 0.65 MtCO₂e in 2020.

This is relatively high compared to UK ambition, but lower than the level of feasible and cost effective abatement suggested by our analysis (0.8 – 1.3 MtCO₂e).

Other milestones related to peatlands and forestry are:

- Subject to the UN Framework Convention on Climate Change adopting wetland management as an optional reporting item in the international greenhouse gas inventory process, the RPP suggests that the Scottish Government will incorporate consideration of peatland restoration into the methodology for calculating the net Scottish emissions account.
- To plant 100 million trees by 2015.

²⁹ Adaptation Sub-Committee (2011) 'How well is Scotland preparing for climate change?': <http://www.theccc.org.uk/reports/adaptation/asc-scotland>



Progress reducing emissions

Currently work is underway to build on the results of scoping research³⁰ which investigated the options for monitoring its programme to encourage emission reduction measures by farmers ('Farming for a Better Climate' – FFBC). The study identifies the availability of data to measure the uptake and GHG impact of the mitigation measures proposed on the FFBC website to allow a monitoring framework to be developed. At this stage therefore we are unable to fully assess progress in implementing this key policy, but we will return to this in future reports once the framework has been established.

Further to the RPP, an action plan on land use recently³¹ set out a more detailed set of actions and timescales for accounting for and managing land-based carbon-rich soils ahead of the conclusion of the IPCC development of international reporting rules (mid/late 2013). These include identifying pilot areas for peatland restoration and more detailed mapping of carbon stocks linked to land use patterns in Scotland. We will return to reviewing progress on the implementation of these actions in future reports.

On woodland creation, the planting rate for 2010/11 was 5,000 hectares. Based on grant approvals to date, 2011/12 is currently expected to deliver 7,500 ha of additional woodland. This would need to increase further to meet the annual afforestation rate required under the current woodland creation target (10,000 ha per year by 2015).

Policy to drive future emissions reductions.

It will be important to closely monitor agriculture emissions reductions and to consider the full range of policies as appropriate (i.e. if emissions reductions are below targeted levels).

- On peatlands, as outlined in the ASC's report to the Scottish Government³² in November 2011, restoring degraded peatlands can reduce losses of CO₂ into the atmosphere, as well as help deliver adaptation benefits (such as managing water flow and building biodiversity resilience). As noted we will continue to monitor the development of the approach to peatland management in Scotland.
- On forestry, the Scottish Government has proposed to increase forestry planting rates to 15,000 ha per year by 2015. Considering the current rate is only half this, it remains to be seen whether this is feasible. It is likely to require private funding and new funding mechanisms.

30 Scottish Government (2011) 'Monitoring the implementation of Farming for a Better Climate and associated greenhouse gas emission reductions – A scoping Study'. <http://www.scotland.gov.uk/Publications/2011/12/16110745/0>

31 Scottish Government (2011) 'Land use strategy for Scotland: Action plan'. <http://www.scotland.gov.uk/Resource/Doc/365706/0124378.pdf>

32 Adaptation Sub-Committee (2011) 'How well is Scotland preparing for climate change'. <http://www.theccc.org.uk/reports/adaptation/asc-scotland>

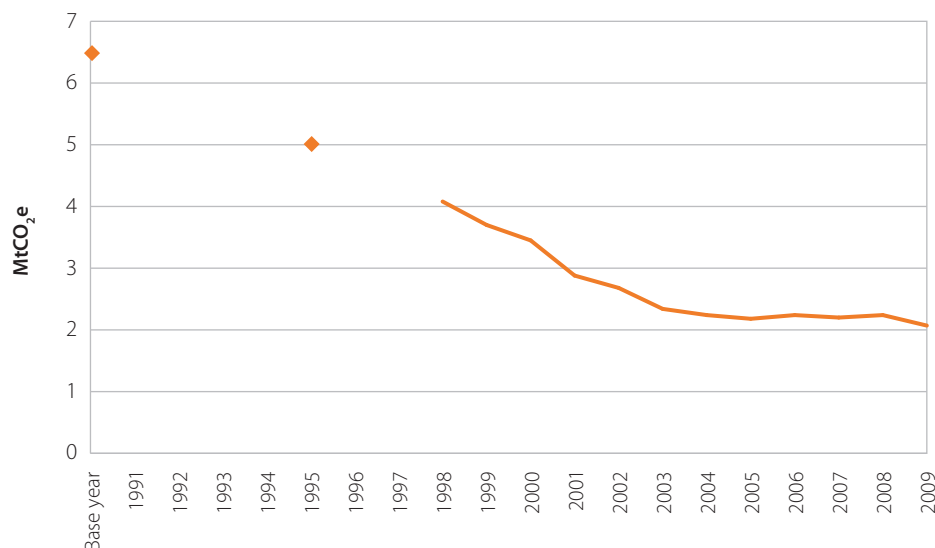
7. Progress reducing waste emissions

Emission trends

Waste sector emissions in Scotland stood at 2.1 MtCO₂e in 2009, accounting for 4% of total GHGs. Emissions in 2009 were 68% below 1990 levels, with the reduction over this period due mainly to an increase in methane recovery systems at landfill sites (Figure 19).

Emissions fell by 7% in 2009. There was a 40% drop in waste sent to landfill in Scotland in 2009 (largely driven by a fall in construction waste, consistent with the reduction in housing and overall construction output in the recession – Figure 20, though household waste sent to landfill also fell 9% by 160,000 tonnes at the same time as the proportion of municipal waste recycled or composted increased). However, the fall in 2009 cannot be directly attributed to these factors as the emission data in 2009 reflects a time series of landfilled waste and a path of degradation and methane release.

Figure 19: Scottish waste GHG emissions (1990-2009)



Source: NAEI (2011).

Notes: Inventory GHG data is not available for Scotland for 1991-1994 or 1996-1997.



Sector targets/milestones

The RPP sets out milestones for limiting waste to landfill:

- To agree and implement measures to ban disposal of organic waste from landfill and require certain priority wastes to be sorted at source and collected separately or, as appropriate, treated after collection – and to introduce secondary legislation on this in 2011.
- Phased introduction of bans on materials that may be landfilled: food waste and dry recyclables from 2015; and all biodegradable waste by 2017.

The RPP estimates that the combination of EU policies on waste and landfill plus the Scottish Government Zero Waste Plan and above-mentioned landfill bans will reduce emissions by 0.52 MtCO₂e by 2020.

Progress reducing waste emissions

The Scottish Government's Zero Waste Plan³³ was published in 2010, setting out targets for the waste sector and how the sector would contribute to Scotland's greenhouse gas targets. The focus of this plan is recycling and reuse, with residual waste being used for energy production where feasible.

In October 2011, the Scottish Government set the Zero Waste Regulations³⁴, (provisions being rolled out from the end of 2013 onwards) which require:

- A ban on municipal biodegradable waste going to landfill; the first of its kind in the UK;
- A ban on material collected for recycling going to landfill or incineration;
- New requirements to remove key recyclables from unsorted waste prior to incineration; and
- New requirements on businesses to present recyclable material for collection.

The latest data on waste in Scotland³⁵ shows that household recycling or composting rates have increased from 18% in 2004-2005 to 38% in 2009-2010, with a corresponding reduction in waste sent to landfill (Figure 20).

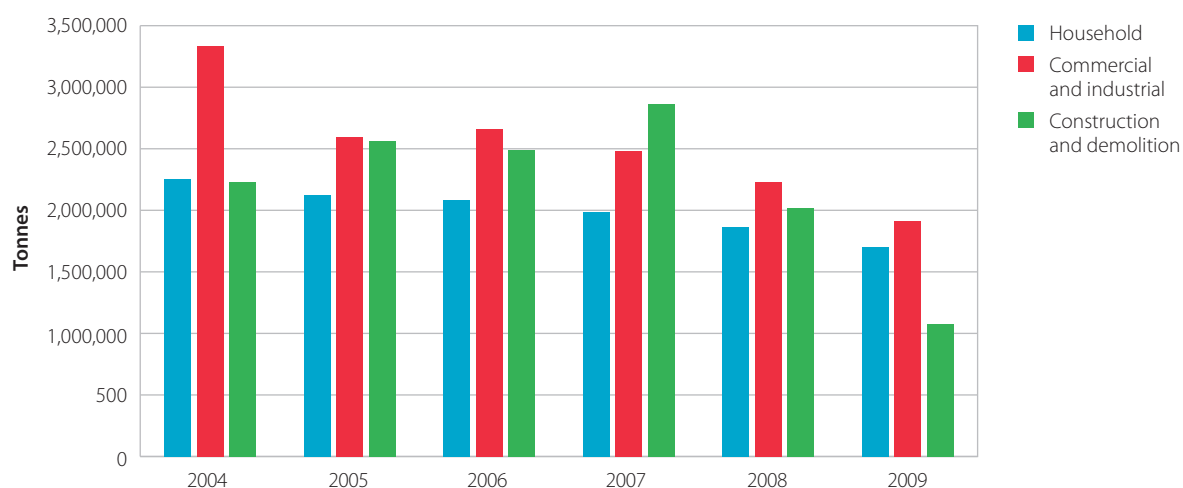
³³ Scottish Government (2010) 'Scotland's Zero Waste Plan'. <http://www.scotland.gov.uk/Resource/Doc/314168/0099749.pdf>

³⁴ Scottish Government (2011) 'Zero Waste Regulations'. <http://www.scotland.gov.uk/News/Releases/2011/10/14140755>

³⁵ SEPA (2011) 'Zero waste plan data'. http://www.sepa.org.uk/waste/waste_data/zero_waste_plan_data.aspx

7. Progress reducing waste emissions continued

Figure 20: Scottish waste landfilled (2004-2009)



Source: SEPA (2011).

Policy to drive further waste emissions reduction

The key policy to drive further reductions in waste emissions will be the Zero Waste Regulations, which are due to come into force from 2013 onwards, alongside a carbon metric for councils to use to prioritise the waste they recycle versus sending to landfill.

8. Challenges in meeting emissions targets



The Scottish target for 2020 is to reduce emissions by 42% compared to 1990 levels. The first batch of annual targets (2010 – 2022) was legislated in 2010, and the second batch (covering 2023-2027) late last year.

The current RPP sets out the Scottish Government's strategy to meet legislated targets to 2022, while the second RPP, refreshing the first and extending to 2027, is due later this year.

Projections in the current RPP suggest that if all the identified abatement potential is addressed, and assuming the current EU ETS cap, then emissions in 2020 will be 38% below 1990 levels.

Since then, the Committee commissioned an update to the emission projection model for CO₂ in Scotland³⁶ which took account of updated projections for fossil fuel prices, household growth, energy use, and economic growth for example. These projections were then subsequently updated to reflect the latest 2009 outturn emission data in Scotland. New agriculture and LULUCF projections have also been produced for Scotland since the RPP, although aside from agriculture, non-CO₂ projections remain as previous (2007-based) as new DA level projections are not currently available.

These projections and estimates of abatement will be updated with new information for the next RPP, (due later this year). Based on current figures (Figure 21), which should be treated as provisional:

- Under current policies and the current EU ETS cap it is likely that targets towards the end of the first target period will be missed. Turning all proposals into firm policies means that targets could be met under the current EU ETS cap – but very narrowly towards the end of the projection period.
- If the EU moves to a 30% target and tightens the EU ETS cap accordingly, targets to 2022 could be met with current policies only.

Two things follow from this:

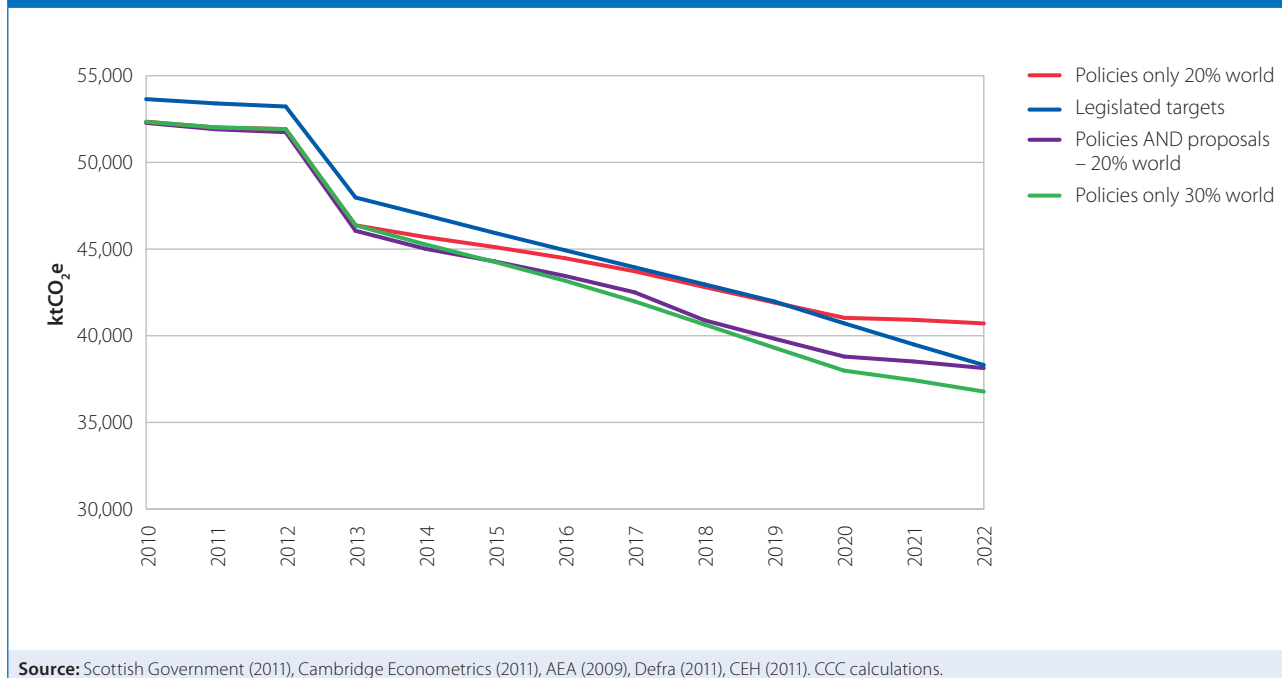
- It is of key importance that currently identified potential is addressed.
- Meeting the target will require a tightening of the EU ETS cap, or additional effort to reduce domestic emissions. Our analysis suggests that the main area where there may be further scope for emissions reduction is agriculture and land use. However, this is uncertain and scope should be looked at across sectors.

The appropriate approach is therefore to focus on policy development and implementation to address currently identified potential, and to explore scope for further emissions reductions in the event that the EU ETS cap is not tightened.

³⁶ Cambridge Econometrics (2011) 'STEPS model update: A report for the Committee on Climate Change', <http://downloads.theccc.org.uk/s3.amazonaws.com/ScotlandLetter/STEPS%20update%20-%20final%20report%20-%20march%202011.pdf>

8. Challenges in meeting emissions targets continued

Figure 21: Legislated targets in Scotland to 2022 against various projection scenarios



Longer-term targets

RPP1 also set out longer-term milestones:

- A largely decarbonised electricity generation sector by 2030;
- A largely decarbonised heat sector by 2050, with significant progress by 2030;
- Almost complete decarbonisation of road transport by 2050 with significant progress by 2030;
- A comprehensive approach to ensure that carbon (including the cost of carbon) is fully factored into strategic and local decisions about rural land use.

For 2023 – 2027, the legislated targets reflect a pathway recommended by the Committee which is both cost-effective (at the projected carbon price) and feasible through the 2020s. However, as more detailed information about how the Scottish Government intends to meet the next batch of annual targets (2023-2027) will not be available until later in the year, it is difficult to comment at this time on whether these targets are likely to be met.

The 2050 target in Scotland for an 80% reduction from 1990 levels includes international aviation and shipping. How this impacts on what is required of other sectors will be set out in more detail at UK level by the Committee in March and should allow implications for meeting this target in Scotland to be drawn out.





Committee on Climate Change

7 Holbein Place
London
SW1W 8NR

www.theccc.org.uk

