



Reducing emissions in Scotland 2016 progress report

Committee on Climate Change
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Introduction and Executive Summary

This is our fifth report on Scotland's progress towards meeting emission reduction targets, as requested by Scottish Ministers under the Climate Change (Scotland) Act 2009.

The Scottish Act sets a long-term target to reduce emissions of greenhouse gases (GHGs) by at least 80% in 2050 relative to 1990, with an interim target to reduce emissions by 42% in 2020. Secondary legislation passed in October 2010 and October 2011 also set a series of annual emission reduction targets for 2010 to 2022 and 2023 to 2027 respectively. We advised the Scottish Government on annual targets for the period 2028 to 2032 in March 2016 and July 2016.

Emissions data for Scotland and the other devolved administrations are produced with a significant delay compared to the UK as a whole, and since our previous progress report in March 2015 comprehensive new data are available for 2013 and 2014. We therefore focus on progress against the 2013 and 2014 annual targets.

The Scottish Government published its second report on policies and proposals (RPP2) in 2013. This set out how targets for 2013 to 2027 could be met, including specific policies for reducing greenhouse gas emissions in key sectors, as well as a number of proposals for further consideration and development. The third report on policies and proposals covering 2028 to 2032 targets will be published by the end of 2016 and be referred to as the Climate Change Plan – the third report on policies and proposals. **We strongly recommend that for the Climate Change Plan the Scottish Government create a set of indicators to assess their progress.** In the absence of specific, measurable, achievable, relevant and time-bound ("SMART") indicators in the Climate Change Plan, we will develop our own set of indicators in the 2017 Progress report against which we will monitor progress in reducing emissions.

Scotland is performing well, especially compared to other countries in the UK and the UK as a whole, although much more needs to be done. Our key messages from this analysis are:

- **The annual target for 2014 was met:** Net emissions fell 13% in 2014 to 41.886 MtCO₂e which is 5.1 MtCO₂e below the target. Scotland therefore met its legislated target. Emissions in 2014 were 45.8% lower than 1990 levels. The fall in emissions was largely due to a fall in Scotland's share of the EU Emissions Trading System (ETS) and warmer than average winter temperatures reducing the demand for heating in buildings. However, a part of the reduction was from domestic action. The Scottish Government are on track to meet their 2020 target.
- **Scotland performed better than the UK as a whole in 2014:** Gross Scottish greenhouse gas emissions, including international aviation and shipping, fell 8.6% in 2014. This compares to a 7.3% fall for the UK as a whole. Since 1990, gross Scottish emissions have fallen nearly 40%, compared to nearly 33% at a UK level.
- **Scottish Government is largely implementing the Committee's recommendations from our 2015 progress report:** many of our 2015 recommendations are in the process of being implemented but there are notable exceptions in agriculture. The next set of policies and proposals will also have to address increased ambition required by Scottish targets (see below).
- **Scotland has made good progress in a number of areas and is often leading the UK:** There has been good progress in deploying renewable electricity generation capacity, and excellent progress in installing community and locally-owned energy projects (meeting their target for 500 MW of capacity early). Energy efficiency policy is well developed, especially compared to that in England, although this is yet to be reflected fully in emission reductions.

The Government is aiming for an integrated approach to reducing emissions from all buildings by reducing demand, improving energy efficiency and installing low-carbon heat. Progress has also been good in the waste sector with emissions falling 13% in 2014 and the introduction of a circular economy strategy and a Scottish Food Waste Reduction target.

- **To meet high ambition and tighter targets beyond 2020 much more will be required:** Whilst emissions have fallen by an average of 3.3% per year since 2009, this has been mostly due to progress in the power sector with reduced coal and expanded renewable generation. There has been little progress in reducing emissions from transport and agriculture and land use, and there is much further to go for renewable heat uptake:
 - In transport (excluding International Aviation & Shipping (IA&S)), emissions are largely unchanged from 1990 due to improved vehicle efficiency being offset by increased demand for travel as the economy has grown and fuel prices have fallen. There has been limited modal shift from cars to other forms of transport, and although electric vehicle sales are increasing, the Scottish share of UK EV sales is still lower than Scotland's share of total car sales.
 - In agriculture and land use, emission reductions have been slow. In forestry 8% fewer hectares of new trees were planted in 2014 compared to 2013 and annual targets have yet to be met.
 - There has also been a slow uptake of renewable heat with projects tending to be small-scale, although capacity is increasing and district heating is more advanced than other parts of the UK.
- **Need for stronger policies in the Climate Change Plan:** Table 1 sets out areas that must be addressed in order to keep Scotland on the lowest cost path to meeting the targets. We have found that in a number of areas there is no evidence of whether, and to what extent, actions are helping to achieve emission reductions set out in RPP2. Without monitoring and evaluation, it will not be possible to know whether the policies are having the desired effect and any money is being spent well. We therefore recommend that the next Climate Change Plan should:
 - **Set clear priorities and policies to meet climate targets**, including consideration of increased ambition pledged by the current government in a new or revised Climate Change Act.
 - **Ensure objectives are specific, outcome-focused, and measurable:** objectives should describe priority outcomes rather than centre on processes and activities.
 - **Focus on the core set of policies and actions that will have the biggest impact**, each with specific goals, responsibilities, timing and funding where necessary. Transport and agriculture will be the largest emitting sectors once power sector emissions fall rapidly in 2016, and current schemes are largely failing to deliver. There must be strong, credible policies for emission reductions in these sectors.
 - **Introduce effective monitoring and evaluation** to allow progress to be measured and effort increased if need be to ensure objectives are being achieved. This should include creating a set of indicators for the Climate Change Plan.
 - **Take into account wider benefits as well as the costs of climate change actions:** actions should be cost-effective and, as well as aiming to reduce emissions, provide opportunities to increase the well-being of Scottish communities (e.g. by improving

health, saving money, alleviating fuel poverty), preserve Scottish ecosystems and biodiversity, provide local jobs and services, and help the economy of Scotland grow.

The Paris Agreement in December 2015 reflects and marks significant global progress in the last year and demonstrates that Scotland and UK's efforts are part of international action. The aims of the Agreement (i.e. to limit the rise in global temperature to well below 2°C, to pursue efforts to hold it to 1.5°C and to reach net zero emissions in the second half of the century) are more ambitious than the basis of Scotland's statutory target for 2050 (which aims to limit temperature rise to around 2°C, implying a very low risk of a 4°C change). We will assess further the implications of this for UK climate policy in a report to be published later this year and advise on what it means for targets under a new Scottish Climate Change Act in our subsequent advice to the Scottish Government.

Domestically, the election in Scotland in May 2016 resulted in a new, SNP-led government. All political parties have been clear about the priority they place on tackling climate change. The SNP have committed to introducing a new Climate Change Act, with an ambitious new target of reducing emissions by more than 50% by 2020. We will advise the Scottish Government on aspects of a new Act later in the year. This priority on tackling climate change comes within a context of creating a fair, equal and prosperous nation with opportunities for all to grow. That may place added emphasis on the need to demonstrate the wider benefits of tackling climate change.

The recent vote to leave the European Union does not change Scotland's requirements to reduce emissions nor the required levels of reduction, which were legislated by the Scottish Parliament. However, it could have an impact on how Scottish targets are met. Until we know the range of possible impacts on the array of EU-derived policies, it is premature to determine the appropriate domestic policy response. But insofar as it leads to a removal of or weakening of policies that derive from the EU (e.g. new car emissions standards, the EU Emissions Trading System, Directives on waste and F-gases), Scottish and UK policies will have to be developed that deliver equivalent emissions reductions. The Committee will publish a report on the impact of leaving the EU on climate policy in the autumn. Reference to current EU agreements in this report should be read as indications of areas that future arrangements will need to cover so as to achieve similar objectives.

We set out the analysis underpinning these conclusions in the following seven chapters. In each chapter we first present a summary of progress against targets, followed by a consideration of emission trends. For transport we look in more depth at where Scotland could go further:

Chapter 1: Emission targets and trends

Chapter 2: Energy supply and consumption

Chapter 3: Homes and communities

Chapter 4: Business, industrial processes and the public sector

Chapter 5: Transport

Chapter 6: Agriculture, rural land use and forestry

Chapter 7: Waste

Table 1. Policy requirements for the Scottish Government's plan to meet future annual targets

Policy requirement	New policy required	Stronger implementation required
Energy supply and consumption		
Where devolved powers exist implement a clear and stable regulatory framework to encourage the widespread use of district heating where cost effective to do so, to support long-term funding of projects and customers.		x
Further promote the opportunities of the non-domestic RHI to Scottish businesses.		x
Ensure that generation from new renewable heat capacity is fully used with extra heat exported to other heat users.		x
Homes and communities		
Continue to develop energy efficiency and heat policy that support fuel poverty reduction by targeting measures at fuel-poor homes. Over two-thirds of bank G to E homes are fuel poor improving their energy efficiency while installing low-carbon heat would meet multiple objectives.	x	
Work to overcome the perceived challenges in getting agreement and securing finances for communal work on multi-tenanted properties.		x
Transport		
Promote local policies to reduce demand through shifts to public transport, cycling and walking.		x
Develop policies to meet 65% uptake of EVs in new car sales by 2030. Include support for upfront cost and roll-out of incentives such as preferential road access and free parking.		x
Set out a policy to promote efficient driving.	x	
Roll-out new policies to reduce emissions from HGVs under devolved powers, i.e. driver training, use of Urban Consolidation Centres, and a modal shift to rail.	x	

Table 1. Policy requirements for the Scottish Government's plan to meet future annual targets		
Policy requirement	New policy required	Stronger implementation required
Produce an aviation strategy which is in line with climate obligations and International Civil Aviation Organisation agreements.	x	
Agriculture, rural land use and forestry		
Stronger policy framework for agriculture emission reduction which aims to achieve cost-effective measures. This should include clear objectives, ways to monitor progress and how reductions will be achieved using the results from Scottish specific research where possible. If the government continues with voluntary measures must be clear how they will be judged and if found to not be working consider other options.	x	x
Implement plans for compulsory soil testing to see if this works to reduce fertiliser use voluntarily; otherwise consider a compulsory system.	x	
Address barriers to and awareness of agro-forestry.	x	
Consider private-sector investment for woodland creation, given uncertainty in CAP funding.		x
Waste		
Focus on encouraging recycling and introducing separate food-waste collections in rural and island communities.	x	
Ensure that structures are in place to handle the municipal biodegradable waste ban and to reduce emissions from non-municipal waste sent to landfill.		x



Chapter 1:

Emissions targets and trends

Summary of progress

Targets	
2050 and interim targets <p>The Climate Change (Scotland) Act 2009 sets a target to reduce emissions of greenhouse gases by at least 80% by 2050. The Act also establishes an interim target for 2020 of at least 42%.</p>	<p>Net Scottish emissions in 2014 were 45.8% lower than 1990 levels. This is beyond the level that would be required to meet the 2020 target.</p>
Annual target <p>Secondary legislation passed in October 2010 and October 2011 set annual emission reduction targets for 2010-2022 and 2023 to 2027 respectively.</p> <p>The 2013 target for net emissions is 47.976 MtCO₂e The 2014 target for net emissions is 46.958 MtCO₂e</p>	<p>At the time of reporting, net Scottish emissions in 2013 were 49.7 MtCO₂e therefore the target was missed.</p> <p>In 2014, net Scottish emissions were 41.9 MtCO₂e; therefore the target was met. This is the first annual target to be met.</p>
Domestic effort target <p>The Climate Change (Scotland) Act 2009 requires that reductions in net Scottish emissions of greenhouse gases account for at least 80% of the reduction in the net Scottish emissions account in any target year.</p>	<p>No credit purchases were made; therefore the domestic effort target was met.</p>

The Net Scottish Emissions Account

Under the current emissions accounting framework, Scotland's emissions targets are set on a net basis,¹ accounting for sales and purchases in the EU Emissions Trading System (EU ETS), which covers power stations and energy-intensive industries. The Net Scottish Emissions Account (NSEA) fell by 6.0 MtCO₂e (13%) from 2013 to 2014, with average annual falls of 5% between 2009 and 2014.

Net emissions in 2013 were reported in 2015 as being 49.725 MtCO₂e and so the target was assessed as being missed by 1.7 MtCO₂e, this was a 14% reduction from 2012. However, the 2013 target would have been met on the basis of the latest inventory.²

In 2014 net emissions were 41.886 MtCO₂e which is 5.1 MtCO₂e below the target. Scotland therefore met its legislated target (Figure 1.1). Emissions in 2014 were 45.8% lower than 1990 levels on a net basis, outperforming the reduction (42%) required by the 2020 target.³

¹ Net emissions in Scotland are calculated using the Net Scottish Emissions Account (NSEA) which comprises actual emission in sectors not covered by the EU ETS plus Scotland's share of the EU ETS cap.

² The Climate Change (Scotland) Act states that a target can only be assessed once as being met or not met. The 2013 target was confirmed by the Minister in autumn 2015 as being not met. Therefore the 2013 emissions reported here are from the inventory published in 2015 which was used to assess against the target.

A number of factors contributed to the 2014 target being met (Figure 1.2):

- Building emissions were considerably lower than would have been expected in a typical year. Adjusting for differences in winter temperature between 2014 and an average year, residential emissions would have been approximately 20% higher and non-residential emissions (from public and commercial buildings) 7% higher, equating to a difference of around 1.3 MtCO₂e overall.
- In 2014 some auctioned allowances were withheld from the EU ETS and placed into the Market Stability Reserve. This 'backloading' effect has reduced Scotland's share of the EU ETS cap by 3.2 MtCO₂e. This is not a permanent reduction and the allowances will be brought back in at a later date (expected to be 2017), having a reverse effect on the NSEA.

Without both effects, the NSEA in 2014 would have been around 46.4 MtCO₂e, with the target still being met by 0.6 MtCO₂e reflecting action in reducing emissions.

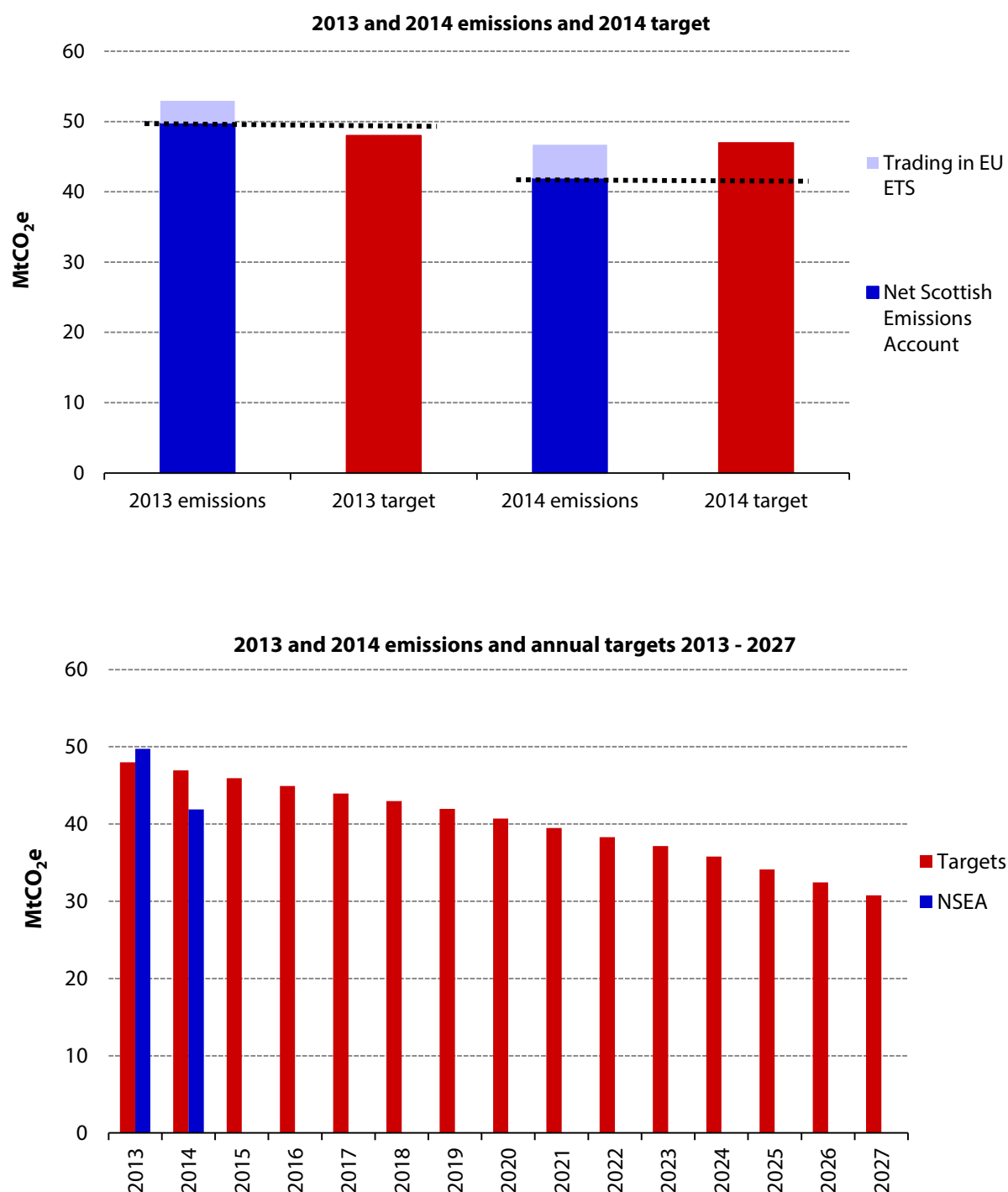
As discussed in our report in March 2016 Scottish targets for 2010-2013 were missed by a cumulative total of 17.5 MtCO₂e. The latest published inventory has reduced this to around 3 MtCO₂e.⁴ Our updated analysis, presented to inform the options in our letter of 6 July,⁵ suggests that targets for 2015 and 2016 could be met which would reduce or potentially eliminate the shortfall.

³ This target has not been met early, as it can only be met legally once in the relevant year. Changes could occur which mean by 2022, when the Scottish Government will be reporting on the 2020 target, the position has changed.

⁴ In the latest inventory emissions in 2010 to 2013 were revised downwards and therefore the amount that targets in those years were missed by was reduced by a combined 9.2 MtCO₂e. Alongside this emissions in 2014 were 5.1 MtCO₂e less than the target. This accounts for the 14.3 MtCO₂e change.

⁵ CCC (2016) *Letter to Roseanna Cunningham*, <https://documents.theccc.org.uk/wp-content/uploads/2016/07/CCC-response-to-Scottish-Government-request-for-updated-advice-on-Scottish-emissions-targets.pdf>

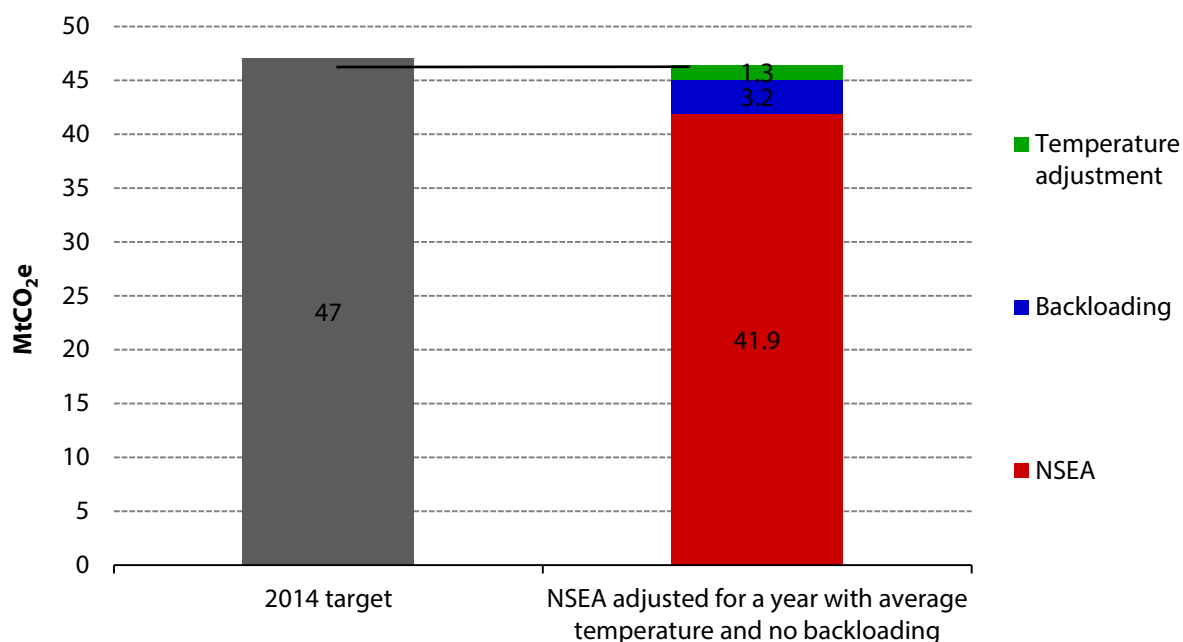
Figure 1.1. Scotland's net emissions in 2013 and 2014: comparison against targets and longer-term trajectory



Source: NAEI (2016) *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2014*, https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1606140853_DA_GHGI_1990-2014_Report_v1.pdf and NAEI (2015) *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2013*, https://uk-air.defra.gov.uk/assets/documents/reports/cat07/DA_GHGI_1990-2013_Report_v1.pdf and Scottish Government (2015) *Scottish Greenhouse Gas Emissions 2013*, <http://www.gov.scot/Publications/2015/06/1939/downloads>

Notes: The NSEA data presented for 2013 are those published in 2015, against which the target was assessed.

Figure 1.2. Impact of temperature and backloading on 2014 annual target



Source: NAEI (2016) *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2014*, https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1606140853_DA_GHGI_1990-2014_Report_v1.pdf and CCC analysis.

Scottish territorial emissions

Actual Scottish emissions on a territorial or gross basis (i.e. not including sales and purchases in the EU ETS), including Scotland's share of international aviation and shipping emissions, fell by 1.6 MtCO₂e (3.0%) to 51.1 MtCO₂e between 2012 and 2013 using the latest inventory due to falls in emissions from the power sector. Following this emissions fell 4.4 MtCO₂e (8.6%) to 46.7 MtCO₂e between 2013 and 2014, with average annual falls of 3.3% per year between 2009 and 2014. This compares to falls for the UK as a whole of 2.2% in 2013 and 7.3%⁶ in 2014.

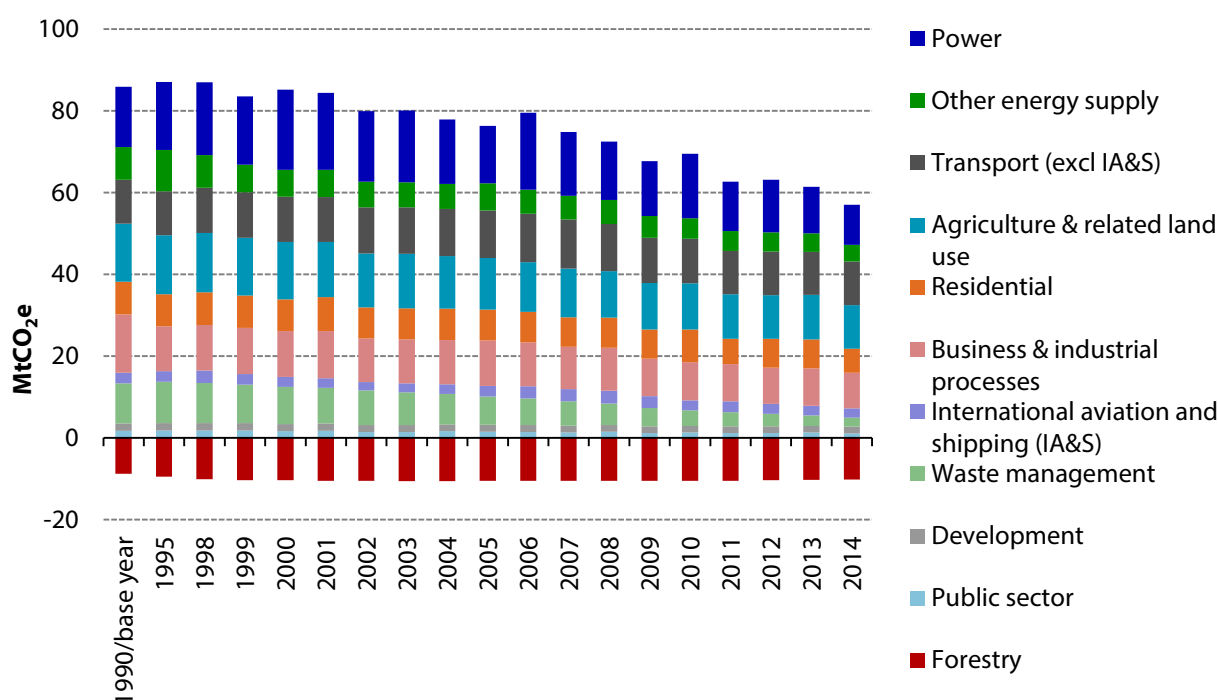
Reductions in gross emissions were driven by decreases in power and residential buildings (Figure 1.3). In 2014:

- Power sector emissions fell by 1.6 MtCO₂e (14%), compared to 5% average annual falls between 2009 and 2014, due to increased renewable generation and reduced use of coal.
- Residential emissions fell by 1.2 MtCO₂e (16%), in line with the UK change, compared to 3% average annual falls between 2009 and 2014. This can be largely attributed to decreased heating demand from milder winter temperatures than average.
- There were small decreases in emissions from other energy supply, business and industrial processes, waste, public buildings, agriculture and rural land use, and international aviation and shipping, while there were increases in emissions from transport and forestry.

⁶ This figure includes international aviation and shipping and therefore differs from that reported in our 2015 progress report.

The reasons behind these emission changes are considered in the following chapters.

Figure 1.3. Scottish GHG emissions by sector (1990-2014)



Source: NAEI (2016) *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2014*, https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1606140853_DA_GHGI_1990-2014_Report_v1.pdf

Notes: Emissions are presented here before accounting for trade in the EU ETS. As part of the release NAEI have revised all figures since the previous publication of data in June 2015, to incorporate methodological improvements and new data. Comparing these 2014 emissions data with those for 2013 that were published in 2015 will therefore give an incorrect year-on-year percentage change.

In 2014, Scotland accounted for 8% of total UK emissions, slightly higher than its 7.7% share of UK Gross Value Added (GVA) and in line with its 8% share of population. There are some important differences between the Scottish and wider UK economies:

- The relatively larger share of agriculture in Scotland as a proportion of total emissions (23% compared to 9% at a UK level);
- The size of the forest sink in Scotland, which in 2014 is equivalent to 55% of the total UK sink.

Overall, Scottish gross emissions in 2014 were 39.5% lower than in 1990, compared to a 32.7% decline for the UK as a whole.

Inventory changes

There have been several revisions to the Scottish greenhouse gas inventory since annual targets were legislated in 2009. These changes reflect improvements in the methodology for estimating emissions. Such improvements are welcome. In previous years they have made the annual targets difficult to achieve because the targets were set on an absolute (MtCO₂e) basis.

In 2014 the inventory changes reduced estimated emissions for the first time, by 1.8 MtCO₂e for 2013 and by 3.5 MtCO₂e for 1990. These revisions have mostly occurred due to corrections in estimating emissions from drainage of grasslands on organic soils and the impacts of research to derive more representative emission factors for nitrous oxide.

Change in 2015

For 2015, while emissions data are available at a UK level, data relating to Scotland are due to become available in June 2017. To the extent possible, we are planning to report on 2015 emissions data for Scotland and the other devolved administrations in our June 2017 progress report to the UK Government. In this section, we draw on other data that can provide an indication of what is likely to have happened to emissions in Scotland in 2015.

In 2014 gross emissions were 46.7 MtCO₂e; with temperature adjustments for residential and non-residential buildings these would have been around 1.3 MtCO₂e higher, at 48.0 MtCO₂e.

Emissions data for the UK show that economy-wide emissions fell by 3% in 2015. This was driven by progress in the power sector, particularly reduced use of coal and increased renewable generation. However, 2015 was cooler than 2014,⁷ thus resulting in increased heating-related emissions. In our 2016 progress report to the UK Parliament, we concluded that without the impact of the weather, emissions might have fallen by 4%.

We have considered contextual data available for Scotland for 2015, and expect that Scottish emissions are also likely to have decreased, to a similar extent to that for the UK as a whole:

- Temperatures in Winter 2014/15 and 2015/16 were above the long-term average (Figure 1.4), but were lower than in 2014 leading to an increase number of heating days compared to 2014.
- There was an increase in overall economic activity in Scotland, with total GVA up nearly 2.5% (in line with the UK). Growth was largest in the construction sector (10%) in 2015.

It can therefore be expected that emissions in Scotland in 2015 will have fallen, perhaps by around 3%. On a net basis, due to the outperformance in 2014 and the continuing effect of backloading in the EU ETS the 2015 target may have been met.⁸

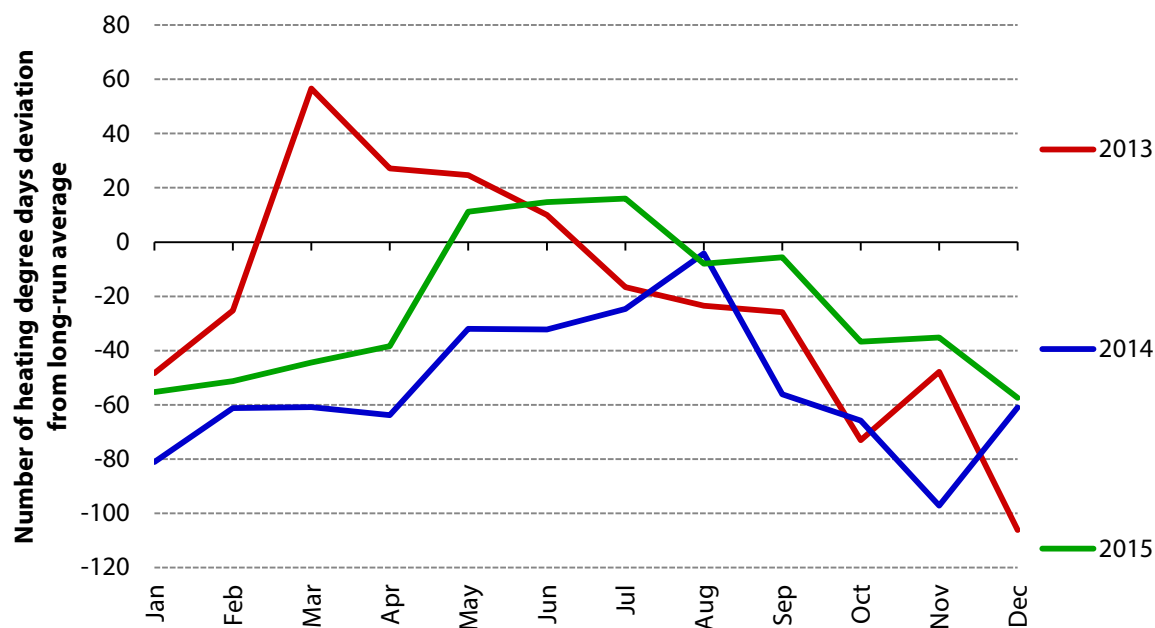
Scotland's annual target for 2015 is 45.9 MtCO₂e. This implies that if the NSEA does not change from 2014 to 2015 then the target would be met. In the non-traded sector, emissions in 2014 were 28.2 MtCO₂e, and are required to be below 31.4 MtCO₂e in 2015.⁹

⁷ Globally, 2015 was the warmest year on record however, in the UK mean temperatures were warmer in 2014, <http://www.metoffice.gov.uk/climate/uk/summaries/actualmonthly>

⁸ On a territorial basis we would expect emissions to fall much more in the next few years given the closure of Longannet coal power station.

⁹ Assuming a 2015 traded sector cap of 14.5 MtCO₂e,

Figure 1.4. Scottish Temperature data - number of heating degree days variation from the long-run average (2013-2015)



Source: Degree day data (2016) Vesma, www.vesma.com/ddd/

Notes: 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). Points above the x-axis reflect colder than average temperatures, and points below indicate higher than average temperatures.



Chapter 2:

Energy supply and consumption

There is a very close relationship between the issues discussed in this chapter and Chapters 3 and 4. This chapter discusses energy supply and covers both electricity supply and heating supply. The next chapter discusses homes and communities, while Chapter 4 discusses non-residential buildings, both of which create the demand for electricity and heating.

It is important that the policy relating to supply and demand are closely linked, particularly when it comes to combining energy efficiency measures (such as improved insulation) with the development of low-carbon heat (such as heat networks, heat pumps). Often the two are most cost-effectively done together. Furthermore, doing them together minimises disruption to household and businesses. The write-up of demand and supply separately in this report is for ease of presentation only and is aligned with the Scottish Government's previous approach in RPP2, but policy needs to consider the two together. We pick that up in our recommendations.

Summary of progress

Table 2.1. Summary of progress	
Milestone	Progress
Deliver the equivalent of at least 100% of gross electricity consumption from renewables by 2020, with an interim target of the equivalent of 50% of gross electricity consumption from renewables by 2015.	<p>In 2015, Scotland's generation from renewables was equivalent to 54% of Scotland's gross electricity consumption. This was an increase from 50% in 2014 and means the 2015 target has been outperformed.</p> <p>To meet the 2020 target, the average rate of deployment from 2015 onwards will need to increase to 1.3 GW per year. This is higher than the maximum achieved in any year to date (1.0 GW in 2012). However, if those projects currently under construction or consented (8.9 GW) are built, then the target will be met.</p>
Enable local and community ownership of at least 500 MW of renewable energy by 2020.	By the end of November 2015 the 500 MW target had been reached, with an estimated 508 MW of community and locally-owned renewable energy capacity. This is an increase of 41% on the estimate for the previous year. ¹⁰
At least 100,000 homes to have adopted some form of individual or community renewable heat technology for space and/or water heating.	Community energy is progressing in Scotland. The Scottish Government's Heat Policy Statement includes a target, for 1.5 TWh of heat to be delivered by district heating by 2020. In addition, the Scottish Government is committed to connect up to 40,000 homes to heat networks by 2020.
Seek transmission system upgrades and increased interconnection capable of supporting the projected	Transmission infrastructure is likely to be able to accommodate 2020 renewable output despite some delays in transmission and interconnection projects. This assumes

¹⁰ Energy Saving Trust (2015), Community and locally-owned renewable energy in Scotland at September 2015, http://www.energysavingtrust.org.uk/sites/default/files/reports/Community%20and%20locally%20owned%202015%20report_final%20version%20171115.pdf

Table 2.1. Summary of progress	
Milestone	Progress
growth in renewable capacity.	upgrades to the transmission network will go ahead in Scotland and Northern England.
Demonstrate carbon capture and storage (CCS) at commercial scale in Scotland by 2020, with full retrofit across conventional power stations thereafter by 2025-30.	In November 2015, the UK Government announced that the Commercialisation Programme funding would no longer be available. In our June 2016 progress report to UK Parliament we said that this must be addressed urgently if the UK targets are to be met at least cost.
Source 11% of heat demand from renewable sources by 2020, and have a largely decarbonised heat sector by 2050. Milestone of 3.5% in 2012.	Renewable heat accounted for 2.7% of Scotland's non-electrical heat demand in 2013, missing the 2012 milestone of 3.5%. It is estimated renewable heat accounted for 3.7-3.8% of heat demand in 2014. The current pipeline of projects does not provide enough capacity to achieve the 2020 target. However, Scotland is progressing faster than the rest of the UK.
Meet at least 30% of overall energy demand from renewables by 2020.	Scotland is over a third of the way to meeting this target with 13.1% of energy demand met from renewables in 2013. There needs to be better progress in renewable heat for this target to be met in 2020.
Reduce final energy demand in Scotland by 12% by 2020 relative to the 2005-2007 average demand, covering all fuels and sectors.	Consumption in 2013 was 144 TWh, 14% below the 2005-2007 average baseline, therefore currently outperforming the 12% reduction by 2020 target.

Emission trends and drivers

The delay in providing official emissions statistics affects the assessment of the energy sector, and particularly the power sector, given recent developments (e.g. closure of Longannet). In line with the requirements of this Progress Report this section focuses on the latest official data which go to the end of 2014. However, more recent developments should be reflected in the Climate Change Plan and we take them into account in formulating our recommendations.

Energy supply¹¹ was still the largest source of emissions in Scotland in 2013 and 2014. It accounted for 13.8 MtCO₂e (30%) of total greenhouse gas emissions in 2014. Emissions from energy supply fell by 11% between 2012 and 2013 and by 13% between 2013 and 2014, with an average reduction of 4% per year between 2009 and 2014. Emissions were 39% lower than in 1990 in 2014.

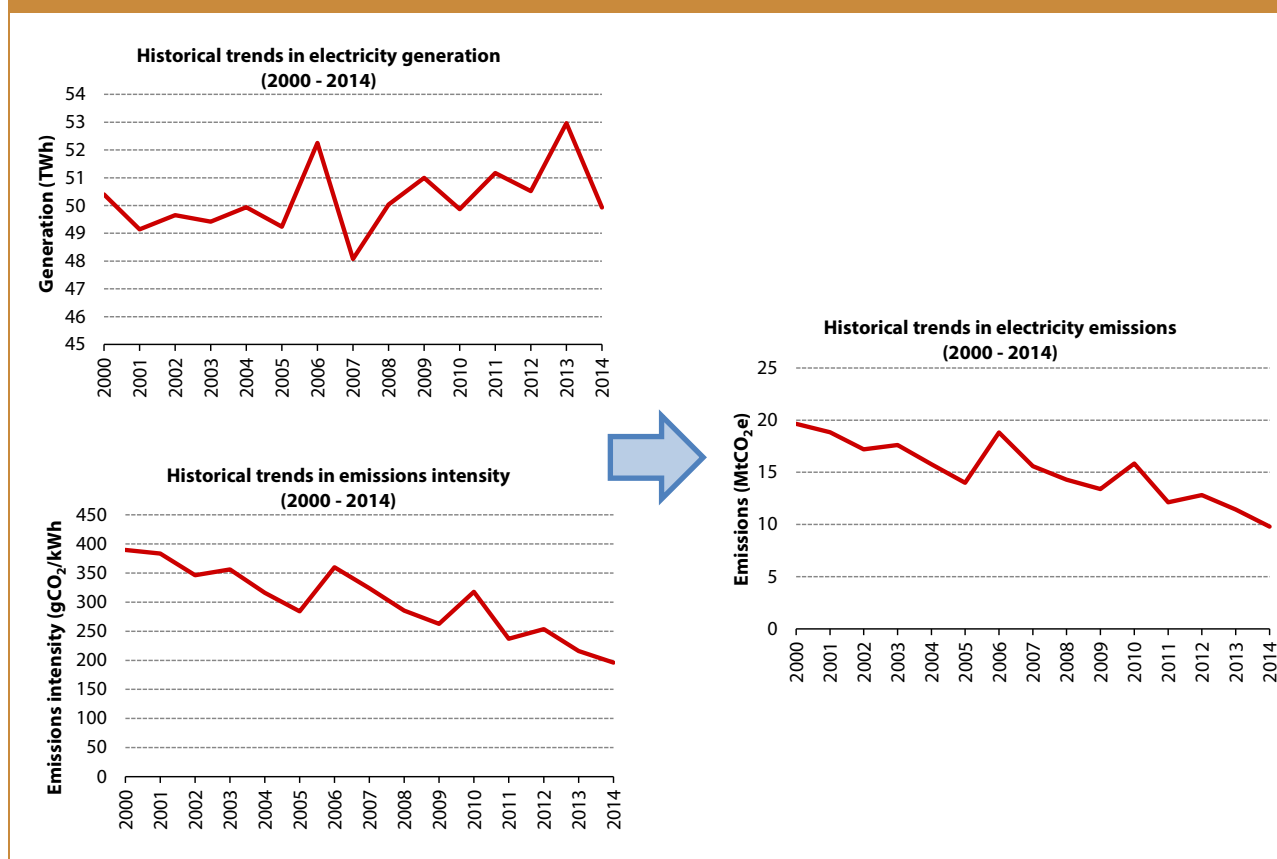
¹¹ The energy supply sector includes emissions predominantly from fuel combustion for electricity, but also includes other energy sources.

Power generation accounted for 9.8 MtCO₂e (71%) of energy supply emissions in 2014. Emissions can have large annual variations depending on the operation of a single plant or operating conditions for renewables (Figure 2.1). In 2014:

- The reduction in emissions reflected overall reduced generation (down 6% on 2013) as well as a reduction in carbon-intensive fuels for generation such as coal (6% fall), and gas (50% fall due to outages at Peterhead in 2014).
- Electricity generation from renewables increased by 2.1 TWh (12%) to 19 TWh. Wind power increased by 0.6 TWh (5%) in 2014 and a further 20% to 14 TWh in 2015 reflecting increased generating capacity.

More recently, Scotland's last large coal-fired plant, Longannet, closed in 2016. Due to this, power sector emissions will fall substantially for 2016 (for which data will be available in 2018). In our annual targets advice we estimated that emissions from power generation in 2016 would fall to 1.7 MtCO₂e.

Figure 2.1. Historical trends in electricity generation, emissions intensity and total emissions (2000-2014)



Source: NAEI (2016) *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2014*, https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1606140853_DA_GHGI_1990-2014_Report_v1.pdf
 DECC (2016) Energy Trends table 6.1, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/533822/Energy_Trends_June_2016.pdf and CCC calculations.

Opportunities for reducing emissions

Scottish emissions reduction targets go further than those that apply to the UK. Provided policy is implemented effectively, Scotland has the potential to lead the UK in renewable energy and low-carbon heat.

Our scenario for power sector emission reductions to 2030 presented in our annual targets advice to the Scottish Government in March 2016¹² shows that power sector emissions could decrease to 1.7 MtCO₂e in 2016 and remain roughly at this level to 2030. This would correspond to an average emissions intensity of generation below 20gCO₂/kWh, outperforming the Scottish government's intensity target of 50g/kWh and that which is possible at a UK level.

Our power scenarios include the closure of Longannet which occurred in March 2016, as well as the closure of the last remaining two nuclear power stations after 2020, as this is Scottish Government policy. The majority of the abatement potential is from wind generation; our scenarios outperform the Scottish Government's target for renewable generation equivalent to 100% of Scottish electricity consumption by 2020.

For heat, those same scenarios identified opportunities for 2.6 TWh/year from low-carbon heat networks to 2030. Heat supplied via these networks would be skewed towards public and commercial buildings, which improve the overall cost-effectiveness of schemes and are more prevalent in built-up areas. Further low-carbon heat deployment in our scenarios includes 430,000 heat pumps in homes, of which 150,000 are new build properties. Heat pumps could also be rolled out extensively across non-residential properties not connecting to heat networks.

The Scottish Government plans to publish a new, energy strategy, taking a 'whole system view' by the end of year, alongside the Climate Change Plan.

Energy consumption

The Scottish Government has set a target to reduce final energy consumption by 12% by 2020, relative to a baseline of 2005-2007 consumption. The target (and series of targets to 2020) was published in the Energy Efficiency Action Plan in 2010 and established under the Climate Change (Scotland) Act 2009.

The latest data show that total final energy consumption in Scotland fell by 2.9 TWh (2%) in 2013, a reduction of 14.1% compared to the 2005-2007 average baseline, already outperforming the target of a 12% reduction for 2020 (Figure 2.2). This is the highest reduction across the UK.

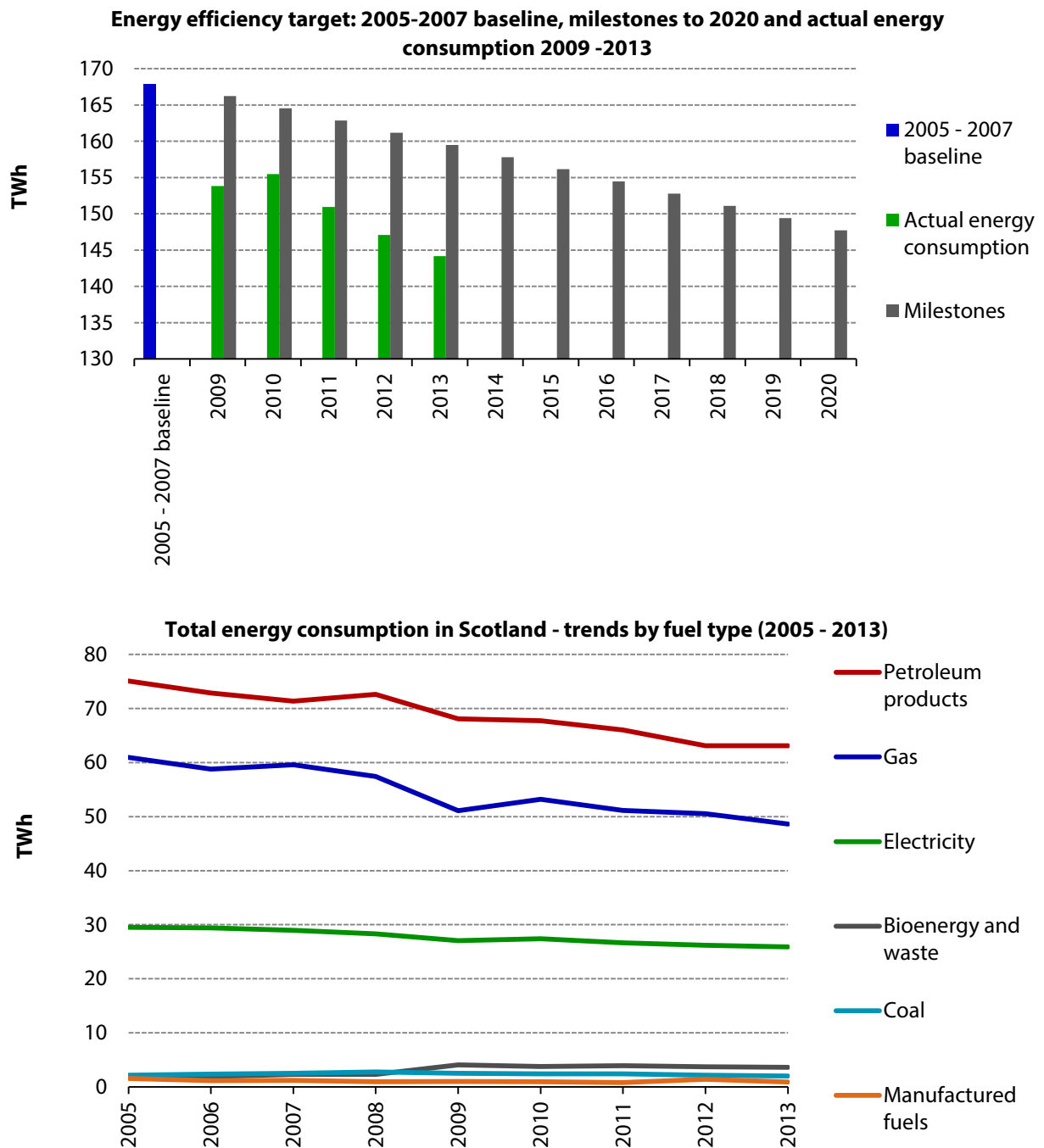
The main driver of the reduction in energy consumption in 2013 has been a large fall in consumption of gas and a small fall in consumption of electricity,¹³ which together account for 52% of total energy consumption in Scotland. There was no change in consumption of petroleum products which account for a big share of Scotland's consumption (44%).

The Scottish Government has set a further target to meet at least 30% of overall energy demand from renewables by 2020. Total energy consumption (including all fuels and consuming sectors) in 2013 was 144 TWh, 13.1% of which was from renewables.

¹² CCC (2016) *Scottish emissions targets 2028-2032*, <https://documents.theccc.org.uk/wp-content/uploads/2016/03/Scottish-Emissions-Targets-2028-2032.pdf>

¹³ It should be noted that the gas consumption data are weather corrected and therefore these figures do not reflect the large increases in actual consumption caused by winter months being colder than average. For other sub-national consumption data, no temperature adjustment has been made.

Figure 2.2. Energy consumption in Scotland



Source: DECC (2016) *Sub-national total final energy consumption in the United Kingdom 2005-2013*, <https://www.gov.uk/government/collections/total-final-energy-consumption-at-sub-national-level>

Notes: Covers coal, manufactured fuels, petroleum products, electricity, bioenergy and wastes in the commercial, industry, residential and transport sectors.

Low-carbon heat

Overview

Heat accounts for over half of Scotland's total energy use, but between 2005 and 2013 the demand for heat fell by 20%. This reduction was greater for industrial and commercial sectors than for the residential sector.

Low-carbon heat is supported through a combination of GB-wide policy (primarily the Renewable Heat Incentive, with some support under the Energy Company Obligation for district heating), and Scottish Government financing which aims to boost low-carbon heat uptake, promote district heating and community heat, as well as tackle fuel poverty. In addition, low-carbon heat can be promoted through building regulations and the planning system, both of which are devolved.

In Scotland, about 15% of homes are not on the gas grid, including more than half of households in rural Scotland. These dwellings are more likely to be using higher-carbon fuels (e.g. heating oil) or electricity for heating. The residential sector in Scotland has significant opportunity and scope for savings from low-carbon heat such as heat pumps, although the current low price of heating oil has reduced the cost incentive to switch. Non-residential buildings have greater scope for connection to heat networks.

The Climate Change (Scotland) Act 2009 requires Scottish Ministers to produce a plan for the use of renewable sources and to report regularly on progress. A Renewable Heat Action Plan was published in November 2009 and refreshed in 2011 with new actions and details. The Heat Policy Statement published in June 2015 sets out how low-carbon heat can reach more householders, businesses and communities and provides a framework for investment aiming to fully decarbonise the heat sector by 2050.

There is a major link between developing low-carbon heat and improving the energy efficiency of buildings (Chapters 3 and 4). Improving both with ambitious, integrated policies and action can help to alleviate social inequality in Scotland, and increase the well-being of Scottish communities. More efficient buildings and cost-effective heating has the potential to improve health, save money, alleviate fuel poverty, and help the economy grow by boosting industry and jobs.

Progress against targets

The Scottish Government's target is to source 11% of heat demand from renewable sources by 2020, and to have a largely decarbonised heat sector by 2050.

In 2014, Scotland had just over 1 GW of operational renewable heat capacity,¹⁴ producing over 3 TWh of delivered heat. This represents a 42% increase in renewable heat capacity and a 36% increase in heat generated from renewable sources compared to 2013. A significant portion of the generation increase was due to the useful renewable heat provided by RWE Markinch to the Tullis Russell paper mill, as well as feeding power into the grid.¹⁵ The added capacity was mostly

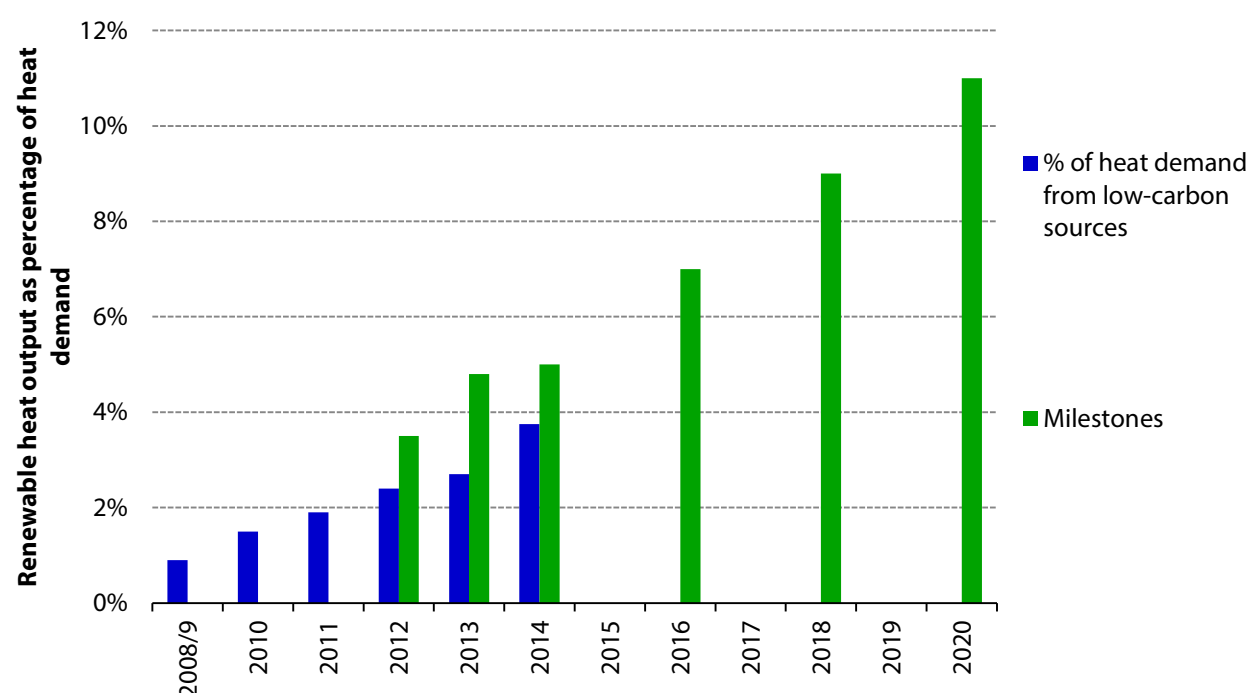
¹⁴ Energy Saving Trust (2015) *Renewable Heat in Scotland 2014*, http://www.energysavingtrust.org.uk/sites/default/files/reports/EST%20RH%20Report%202014_final%20OCT.pdf

¹⁵ Since spring 2015 the Tullis Russell paper mill has gone into administration. In 2016 Fife Council secured funding to use the heat in a district heating scheme for Glenrothes town.

through biomass boilers and biomass CHP which accounted for 84% of capacity. Highland areas accounted for 18% of total renewable heat output in 2014 (0.5 TWh) and 13% of the overall operational capacity (0.13 GW).

Based on a range of estimates, in 2014 between 3.7% and 3.8% of heat demand was met from renewable sources (Figure 2.3), up from 2.7% in 2013.¹⁶ The next milestone towards the 2020 targets set out in the Scottish Government's Renewable Heat Action Plan, is to source 7% of heat demand from renewable sources by 2016.

Figure 2.3. Estimated output of renewable heat (2008-2014) and targets to 2020



Source: Energy Saving Trust (2015) *Renewable Heat in Scotland 2014*, http://www.energysavingtrust.org.uk/sites/default/files/reports/EST%20RH%20Report%202014_final%20OCT.pdf, Scottish Government (2009) *Renewable Heat Action Plan*, <http://www.gov.scot/Resource/Doc/290657/0089337.pdf>

The pipeline of large-scale renewable heat projects (mainly biomass and CHP) could potentially bring total heat output to around 4.5 TWh per year:

- There is an estimated 0.10 GW of capacity under construction, which could provide a further nearly 500 GWh of renewable heat. This mostly includes waste energy projects such as the Polmadie energy waste site near Glasgow and Viridor's plants in Dunbar.
- A further 0.18 GW capacity is either consented but not built, or submitted to local planning authorities for planning permission, which could provide around 900 GWh. The Speyside

¹⁶ Final estimates will be reported in October 2016 when non-electrical heat component of final energy consumption data for 2014 is available.

biomass CHP plant which will supply heat to the nearby Macallan distillery in Moray contributes significantly to these numbers.¹⁷

It is not known how many of these projects will become operational. However, allowing for these projects in full then around 7.5% of heat demand would be from renewable sources in 2020,¹⁸ falling short of the 11% target.

A report¹⁹ by the Energy Saving Trust suggests that operational heat capacity in Scotland is growing faster than the annual heat output from the operational sites. This implies that, although some systems will not be needed all year round, there is some underuse of the potential heat available for export to other heat users. If authorities were to use their full powers to encourage heat networks (where feasible to do so) this could make a difference to heat security in Scotland and meeting Scotland's renewable heat targets.

Progress in developing policy to reduce emissions and meet targets

Scotland has performed well compared to the GB average in terms of deployment of renewable heat under the Renewable Heat Incentive (RHI). This provides payments to those who generate and use renewable energy to heat their buildings:

- The first phase of the RHI focused on the industrial and commercial sectors. By June 2016, over 600 MW of renewable heat capacity had been accredited under the scheme, with 20% of this capacity in Scotland. This is a greater proportion than would be expected based on either GVA or population (both 8%). The RHI has made biomass boilers very attractive to hotels and estates. While uptake is well above the GB on a pro-rata basis, uptake across GB has been lower than expected.
- The second phase from April 2014 covered additional technologies and extended to the residential sector. The total number of applications in the residential sector by June 2016 was over 53,000 with 20% (10,800) of these in Scotland. This is a higher proportion than would be expected from Scotland's share of the GB housing stock (9%). In Scotland 87% of the installations were in off-grid properties, compared to 73% across Great Britain.
- The Scottish Government is making good progress promoting the domestic RHI :
 - In the past two years supplier workshops and Energy Saving Trust webinars have helped to promote the RHI and renewable heat. This has included a 'Feel the Heat' campaign where letters and emails were issued to 40,000 households and 55,000 email addresses over the summer 2014. In 2014/15 a further 100,000 promotional letters were issued with 90 local promotion events (targeting off-gas areas).
 - Home Energy Scotland Advice Centre also promotes this to the consumer when asked for advice. In 2014/15 more than 4,100 households were given advice on the domestic RHI.
- The Highland local authority area is leading in the deployment of micro-generation systems, with 20% of the domestic RHI installations in Scotland located in this area.

¹⁷ Speyside renewable energy partnership, <http://speysiderenewableenergy.co.uk/>

¹⁸ Assuming overall heat demand falls to 60 TWh.

¹⁹ Energy Saving Trust (2015) *Renewable heat in Scotland 2014*, http://www.energysavingtrust.org.uk/sites/default/files/reports/EST%20RH%20Report%202014_final%20OCT.pdf

In June 2015 the Scottish Government published a Heat Policy Statement (HPS),²⁰ setting out its approach to working towards decarbonising the heat system (Box 2.1). The statement has designated energy efficiency as a National Infrastructure Priority, with Scotland's Energy Efficiency Programme (SEEP) providing support to all buildings (Chapter 3). The statement also includes a target for district heating, to have 1.5 TWh of heat by 2020 and 40,000 homes connected by 2020.

The Low Carbon Infrastructure Transition Programme (LCITP) (Chapter 4) provides a range of support mechanisms including project development, expert advice and funding to support the development of substantive private, public and community low-carbon projects across Scotland. It goes further than programmes across the UK for encouraging innovation.

Box 2.1. Heat Policy Statement

The Heat Policy Statement sets out the Scottish Government's future policy direction for addressing three key aspects of the heat system: first, reducing the need for heat through better insulated buildings; secondly, ensuring an efficient heat supply; and lastly, through the effective use of renewable or low-carbon heat sources. Challenges facing Scotland are to: largely decarbonise the heat system by 2050, to reduce GHG emissions, diversify sources of heat generation and supply to reduce the reliance on fossil fuels and reduce the pressure on household and business energy bills through reducing heat demand and providing affordable heat, in particular supporting the fuel poor.

The statement sets out actions being taken by the Scottish Government to tackle the challenges through regulation, incentives, finance and behaviours:

- Regulation: heat metering, specialist working group on district heating regulation
- Incentives and finance: district heating loans fund, Salix loans, SME loans, RHI
- Behaviours : Home Energy Scotland for household advice, and Resource Efficient Scotland for business advice and support

The delivery of the policy statement requires partnerships from public sector, private and community groups.

The Scottish Government has committed to introduce a Warm Homes Bill during this parliamentary term (2016 to 2021) to support the work to tackle fuel poverty and improve energy efficiency.

A number of additional funds are in place to support low-carbon heat in Scotland across residential and non-residential buildings:

- The District Heating Loan Fund (DHLF) is open to local authorities, registered landlords, small and medium-sized enterprises (SMEs) and energy service companies (ESCOs). It provides loans of up to £500,000 per project for low-carbon, and renewable technologies. Since 2011, more than £10m has been lent to 40 different projects.
- On the residential side, the £50m Warm Homes Fund provided funding for renewable energy projects to support communities in fuel poverty. The scheme is now closed. Support for housing association and community district heating and renewable energy projects is

²⁰ Scottish Government (2015) *Heat policy statement*, <http://www.gov.scot/Resource/0047/00478997.pdf>

available from the DHLF and the Community And Renewable Energy Scheme (CARES). Home Energy Efficiency Programmes (HEEPS) loans (Chapter 3) are available to help owner-occupiers and private-sector landlords looking to improve energy efficiency.

- The Home Energy Scotland Renewables Loan Scheme provides interest-free loans of up to £10,000 for renewable heat installations for owner-occupiers. In 2015/16 the scheme supported 759 renewable system applications totalling £6.6m.
- The Local Energy Challenge Fund and Geothermal Energy Challenge Fund provide grant and loan funding for major demonstration projects providing transformative and innovative local energy solutions.

An evaluation of the projects supported by the Scottish Government's District Heating Loan Fund and Warm Home Funds found that nearly 9,000 tCO₂ was saved across 36 projects, supplying heat to 850 homes and buildings.²¹ The evaluation was carried out by Databuild on behalf of the Energy Saving Trust. They examined 22 projects and aimed to answer a number of strategic questions surrounding impact, satisfaction, issues and solutions and how the Scottish Government could achieve a greater impact towards the 2020 target. Where appropriate the Scottish Government should commission further similar evaluations of other schemes.

There has also been good progress recently in meeting recommendations made in our 2015 progress report to consider further action to facilitate heat networks especially at a local level (Box 2.2), as well as completing actions proposed in the Scottish Government's District Heating Action Plan (2013).²² This has included:

- Setting up of the Scottish Heat Networks Partnership and Practitioner Group, a range of public sector, non-profit and commercial organisations actively developing or operating heat networks in Scotland. It runs a programme of support to guide local authorities through the process of developing a district heating strategy.
- Implementation of a Scottish heat map²³ to identify opportunities, assess who needs heat and where sources of heat may be supplied and connected.
- Updating the Scottish Planning Policy (SPP) in 2014 to include a national planning policy context for delivering heat networks. The SPP states that local development plans should identify where heat networks, heat storage and energy centres exist or would be appropriate and include policies to support their implementation.
- Introducing heat network metering and Billing Regulations, working with the UK Government.
- Completing 19 out of 23 actions from the District Heating Action Plans, including work with Local Authorities to develop a series of modules to provide authorities with support and knowledge sharing. Ongoing actions include engaging with the UK Government on industry standards and regulations.

²¹ Energy Saving Trust (2015) *District Heating Loan Fund Evaluation*, <http://www.energysavingtrust.org.uk/sites/default/files/Heat%20-%20District%20Heating%20Loan%20Fund%20-%20Evaluation%20-%20EST%20Summary%20Report%20-%20Final....pdf>

²² Scottish Government (2015) *Progress on the District Heating Action Plan*, <http://www.gov.scot/Resource/0047/00479151.pdf>

²³ Scottish Government (2016) *Heat Map*, <http://heatmap.scotland.gov.uk/>

Box 2.2. Fife Council's Energy Programme

Fife Council is committed to tackling climate change and reducing carbon emissions. It has set targets in line with those Scottish wide - 42% reduction by 2020 and 80% reduction by 2050 with a 3% reduction per year from a 2006/7 baseline until 2050. It aims to do this through climate change policy and Fife's Community Plan.

Fife Council have their own Energy Programme, with the aim of reducing emissions through four project clusters including energy efficiency, wind, other renewables and district heat. A district heat network is operational in Dunfermline with an average of 75% of the heat consumed annually by the properties connected to the network coming from the low-carbon waste heat recovered from landfill gas. In 2013/14 Fife Council worked with the Scottish Futures Trust and NHS Fife on the technical, financial and legal feasibility to extend the existing network to Queen Margaret Hospital.

The LCITP awarded Fife Council in May 2016 funding to develop plans for £20m Glenrothes District heating scheme to use 'green' heat from RWE Biomass CHP power plant. The innovative partnership project aims to address a number of Scotland's most significant energy challenges: decentralised low-carbon heat, energy storage and local generation to support grid constraints and tackling fuel poverty. The project is an initial step in developing Fife's plan for Glenrothes to become a carbon-neutral town and an exemplar project as to how the Scottish Government's long-term climate change targets can be tackled at a community level. The heat load from the network will supply low-carbon heat to a wide range of customers including industrial uses, the local shopping centre, council housing tenants and the local school.

In November 2015 the Levenmouth project secured £4m of funding from the Local Energy Challenge Fund. The project aims to position Levenmouth as a global leader in clean energy through developing the Hydrogen Office Project in Methil into a world-class demonstrator of hydrogen applications, generated from renewable sources. This includes establishing one of Europe's largest fleets of hydrogen-powered vehicles.

In 2013/14 Fife spent £1.9m on energy programmes, with major capital investment planned in 2015/16 and 2016/17.

Source: Invest in Fife (2016), <https://www.investinfife.co.uk/news/news/scottish-governments-low-carbon-infrastructure-transition-programme-awards-fife-council-fu/>

Scotland is performing well relative to the rest of the UK on low-carbon heat uptake, but is falling short of its targets. Whilst Scotland is aiming for a similar level of low-carbon heat uptake in 2020 to the UK (11%, compared to a 12% UK-wide ambition), current RHI uptake figures show an above-average share of take-up in Scotland, particularly in non-domestic applications. Local authorities are playing a key role in uptake, utilising local development plans (Box 2.2). The National Planning Framework, Scottish Planning Policy, planning advice, and strategic and local development plans all play their parts in supporting low-carbon heat projects across Scotland and the Scottish Government has supported this with the development of the heat map.

Despite this progress, further actions are required if the 2020 heat target is to be achieved. There are a number of areas where the Scottish Government could further promote the uptake of low-carbon heat:

- Continuing to utilise local planning and delivery, local authorities could play a pivotal role, for example by providing anchor loads for district heating schemes.

- The public sector could play an exemplar role in installing low-carbon heat systems, for example connection of public sector buildings to existing heat networks as part of retrofit work (Chapter 4).

The Scottish Government's Special Working Group for district heating has highlighted the need for a step change in the rate and scale of district heating installations in Scotland.²⁴ District heating, whilst growing and more advanced than other parts of the UK, is still small in scale. The group have looked at the current regulatory environment in Scotland and made recommendations regarding changes that could help support and promote district heating. These include the Scottish Government implementing a clear and stable regulatory planning framework to encourage the widespread use of district heating where cost effective to do so, in order to support long-term funding of projects and customers.

Progress decarbonising the power sector

Although the latest official emissions data are only available up to the end of 2014, the analysis and recommendations here reflect the current situation in Scotland (i.e. including significant developments in the Scottish power sector up to July 2016).

Renewable energy

Scotland has provisionally exceeded its interim target for electricity generation equivalent to 50% of consumption by 2015, with electricity generation from renewables showing a continuing upward trend:

- Between 2003 and 2014, generation from renewables in Scotland increased from 3.7 TWh to 19 TWh, accounting for 29% of total UK renewable generation in 2014. Generation increased further to an estimated 22 TWh in 2015.
- In 2015, Scotland's renewable generation was equivalent to 57.7% of Scotland's gross electricity consumption (Figure 2.4). This was an increase from 49.7% in 2014.

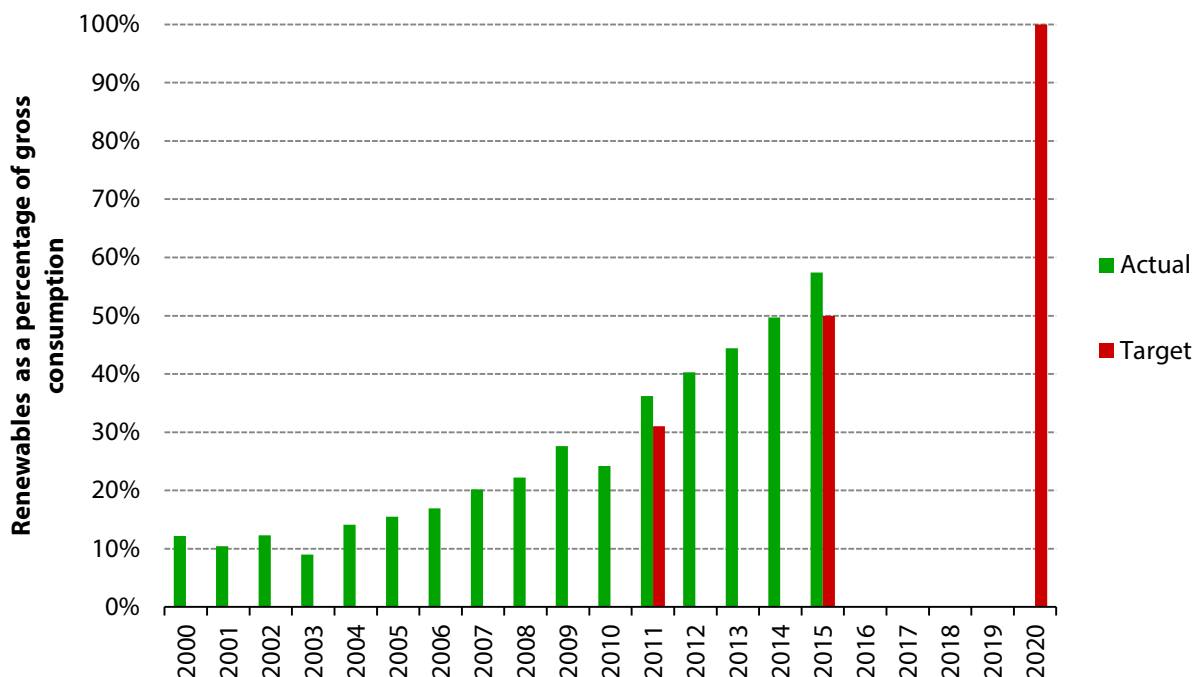
Installed renewable capacity in Scotland increased by 0.7 GW in 2014 to 7.3 GW and provisionally a further 0.4 GW to 7.7 GW in 2015. Scottish renewable plant accounted for 26% of the UK's renewable installed capacity in 2015, a decrease from 30% in 2014. Wind capacity in Scotland was 5.6 GW in 2015, which accounted for 39% of the UK's wind capacity.

It is estimated that between 14 and 16 GW of installed renewable capacity will be needed in 2020 to generate the equivalent of 100% of Scotland's electricity consumption. To achieve this, the pace of increase in capacity and renewable generation will need to rise:

- The average rate of deployment between 2008 and 2013 was 0.5 GW per year.
- To meet the target, the average rate of deployment from 2016 onwards would need to increase significantly to 1.3 GW per year. This is higher than the maximum achievement in any year to date (1 GW in 2012).

²⁴ Scottish Government (2016) *Report on the Special Working Group on Regulation*, <http://www.gov.scot/Resource/0049/00497892.pdf>

Figure 2.4. Renewable generation as a percentage of gross consumption: actual (2000-2015) and targets (2011, 2015 and 2020)



Source: Scottish Government (2016) *Energy in Scotland*,
<http://www.gov.scot/Topics/Statistics/Browse/Business/Energy/EIS2016data>

There is a sufficient pipeline of projects either consented or under construction to meet this target (Figure 2.5). As of March 2016 there is 2 GW under construction, nearly 7 GW consented and a further 4 GW in planning. However, the rate of conversion from consented to operational status is not certain:

- The main funding mechanism in Scotland for renewable energy is the GB Renewables Obligation (RO). Recent developments from the UK Government include:
 - Early closure of the RO to solar projects below 5 MW, which essentially removes all price support beyond April 2016 for solar projects above 1 MW. While sub-5 MW projects can still accredit under feed-in tariffs, expected revenues under these are lower than they were under the RO.
 - Closure of the RO to onshore wind in 2016, one year early. However, there is a grace period up to April 2018 for onshore wind developers who had committed significant investment by the date of the announcement.

With 71% of planned onshore wind farms in the UK located in Scotland, increased policy risks could have a differentially greater impact on future developments in Scotland than for other areas of the UK.

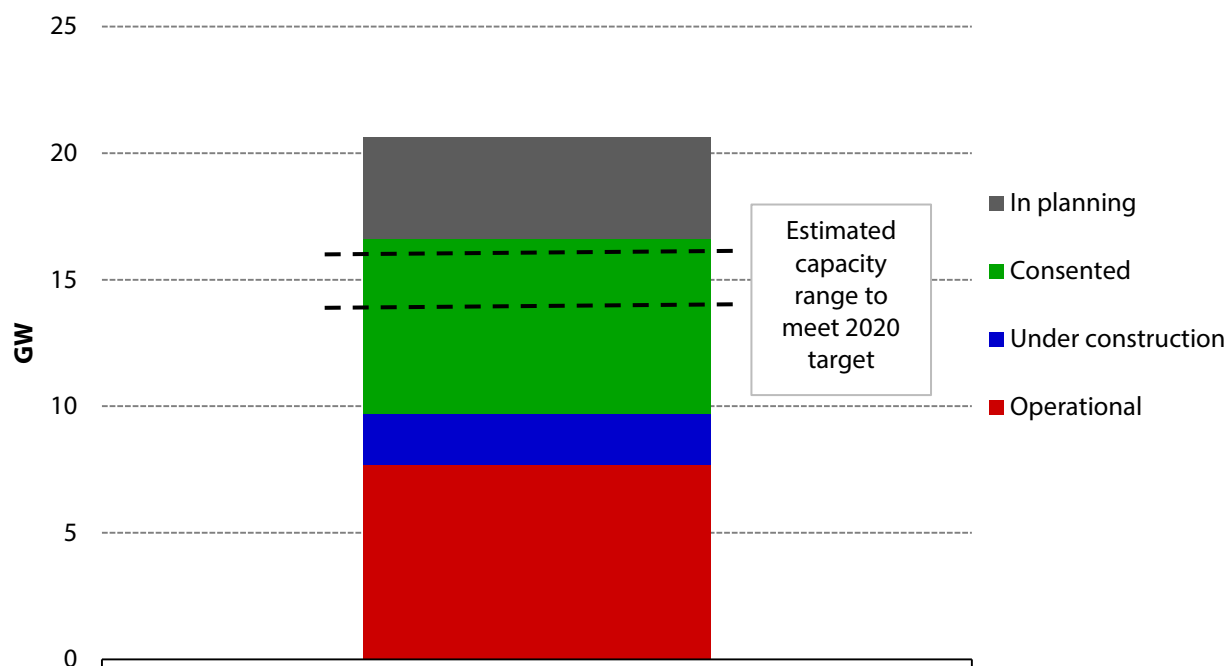
- Beyond the closure of the RO, low-carbon generation will be secured by contracts for difference (CfDs). However, as there are currently no planned auctions for CfDs for large-scale solar or onshore wind projects the changes to the RO have eliminated the only route to market for these projects.

- In the first CfD auction round Mainstream Renewable Power was awarded a 15-year CfD for the Neart na Gaoithe offshore wind farm. However, in July 2016 following a judicial review around process, planning consent was removed for the project alongside three others totalling 2.2 GW capacity. The developers and the Scottish Government have appealed the decision.
- Since our last report there have been no further auction rounds, so the project pipeline for large-scale renewables is unchanged. The next round is due by the end of 2016. However, there is a concern that of the three rounds of CfDs planned before 2021 will not all go ahead if there is insufficient competition.
- Appropriate investment in grid infrastructure and generating assets alongside implementation of CfDs for generation on the islands is essential if the current 600 MW of consented projects on Orkney Isles, Shetland Isles and Western Isles are to proceed:
 - A report by Baringa²⁵ for the Scottish Government identified that Scottish island economies could benefit from up to £725m over the next 25 years from renewable projects such as wind, wave and tidal, with the potential to supply 5% of total electricity demand in GB by 2030. However, the Scottish Affairs Committee have highlighted²⁶ that there are currently inadequate connections between islands and the mainland, which is a significant barrier to growth of renewables and emerging technologies.
 - Uncertainty also surrounds whether island-based onshore wind projects will be able to bid in the next round of CfD auctions.
- Wave generation is making limited progress. The Scottish Government has recently awarded a further £10m for 2016/17 to Wave Energy Scotland, a body set up to speed up and encourage private investment in the marine energy industry.
- The world's largest planned tidal energy project, MeyGen, will be built in the inner Pentland Firth in Scotland. Currently only 86 MW of this is consented, although it intends to deliver up to 400 MW of capacity by the early 2020s.

²⁵ Baringa (2016) *Economic Opportunities of Renewable Energy for Scottish Island Communities*, <http://www.gov.scot/Resource/0049/00495193.pdf>

²⁶ House of Commons Affairs Committee (2016) *The renewable energy sector in Scotland, First Report of Session 2016 - 17*, http://www.publications.parliament.uk/pa/cm201617/cmselect/cmsscota/83/83.pdf?utm_source=83&utm_medium=module&utm_campaign=modulereports

Figure 2.5. Pipeline of renewables: capacity at various stages of project planning



Source: DECC (2016) *Renewable Energy Planning Database March extract*,
<https://www.gov.uk/government/collections/renewable-energy-planning-data>

While most renewable power generation is incentivised through GB-wide schemes such as the RO, some additional financial instruments are available:

- The Scottish Government's £103m Renewable Energy Investment Fund (REIF) was created in 2012 to support renewables in Scotland, providing loans, equity and guarantees. Priorities for the fund are currently marine, community and district heating projects.
- In 2016/2017, there is provision for £17m of Highlands and Islands Enterprise investment in low-carbon.

It is possible that progress towards the 2020 target is now off track, due to UK-wide changes. The additional Scottish funding instruments are useful but are relatively small in scale compared to funding under the RO and CfDs. However, the Scottish Government can also play an important role in planning and providing confidence to investors.

Local and community generation

Community and locally-owned energy can play a useful role in progress towards meeting carbon targets as it serves to raise awareness of climate change and improves acceptance of renewable energy.²⁷ The Scottish Government has a target for local and community ownership of at least 500 MW of renewable energy by 2020. This has been met five years early. At the end of September 2015:

- An estimated minimum of 508 MW of community and locally-owned renewable capacity was operational in Scotland, an increase of 41% on the estimate for the previous year.²⁸ This total capacity in 2015 was split between 301 MW of electrical capacity, 199 MW of thermal capacity, 7 MW of combined heat and power and the remainder from 'unspecified' technologies or energy categories.
- The largest proportion (41%) of operational community and locally-owned capacity is on Scottish farms and estates.²⁹ Community groups own 12% of total operational capacity.
- Wind turbines provide the greatest contribution towards capacity, at 245 MW (48%). The second largest category is energy from woody biomass, at 138 MW (27%). Installations of biomass boilers and wind turbines on farms and estates typically have very large capacities (over 2 MW), leading to the farms and estates owning the largest share of installed operational capacity.
- A further 609 MW of community or locally-owned renewable energy capacity is in various stages of development. In September 2015, 79 MW was under construction, 359 MW was consented but not built, 84 MW was in planning, and 86 MW was in scoping.
- The 359 MW of capacity that is consented but not yet built includes the Viking Energy Wind Farm, which accounts for 167 MW of community owned wind capacity. The project is currently scheduled to begin major construction works in 2016 and it is planned that it will be connected to the national grid in 2021.³⁰

The main financial incentive to encourage the uptake of small-scale renewable electricity generation is the GB-wide Feed in Tariff (FiT) scheme. The majority of residential technologies qualify for the scheme, including solar (PV), wind turbines, hydroelectricity, anaerobic digesters and micro combined heat and power (micro-CHP). In 2015 the UK Government introduced changes to the FiT including removal of 'pre-accreditation', such that tariffs are now applicable

²⁷ Evidence from other countries suggests that increased engagement of communities increases acceptance and support for large low-carbon infrastructure. This can translate to greater understanding, less opposition and a quicker, cheaper development process. There may also be additional benefits such as increased awareness of energy and climate change issues and strengthening communities. DECC (2014) *Community Energy Strategy*, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/275169/20140126Community_Energy_Strategy.pdf

²⁸ Energy Saving Trust (2015) *Community and locally-owned renewable energy in Scotland at September 2015*, http://www.energysavingtrust.org.uk/sites/default/files/reports/Community%20and%20locally%20owned%20015%20report_final%20version%20171115.pdf

²⁹ Within these statistics 'ownership' of renewable projects is not restricted to cases where the organisation owns the entire renewable installation. It also includes cases where a community group or farmer has helped to meet part of the cost in return for some benefit, such as a share in the income generated. In such cases, a percentage of the installation's capacity equal to the share owned by the community or local owner is counted towards the target. Ownership does not include cases where the only benefit to the farmer or community group is a land rental payment from the owner or developer of the installation, or installations that generate community benefit payments but that are fully owned by another organisation.

³⁰ Viking Energy (2016), <http://www.vikingenergy.co.uk/the-project>

from the date of installation, rather than the date of accreditation. Installers under FiTs now risk receiving lower than expected tariffs in the event of a delay to installation, as tariffs decrease over time. In light of this the Scottish Government should ensure that challenges to community energy are addressed, in particular the higher capital costs and longer lead times and frequent delays in connecting to the grid.

Alongside FiTs, the Scottish Government has a number of programmes and policy to support community energy:

- The Community and Renewable Energy Scheme (CARES) provides support, advice and loans to community groups and rural businesses that want to generate renewable energy.
- In 2015, the Scottish Government finalised a Community Energy Policy (CEP) statement,³¹ which sets out its record of support for community energy, as well as new ambition for holistic local energy solutions. The strategy makes community energy a central part of energy ambitions.
- The Scottish Government has also introduced a £250,000 Challenge Fund to support research into exploring Scotland's geothermal capacity to meet the energy needs of local communities.

The Scottish Government has made a commitment to increase the target for community and locally-owned energy to 1 GW by 2020 and 2 GW by 2030 with an ambition that 50% of consented projects should have a shared ownership element by 2020. To achieve this they are committed to establish a government-owned energy company to support local and community energy. This indicates a desire on the part of the Scottish Government to fully reach its potential in community and locally-owned energy.

Overall, Scotland has made excellent progress on community and locally-owned energy and the recent capacity increase has been much faster than elsewhere in the UK.

Transmission and interconnection

To support delivery of Scotland's 2020 energy targets, the RPP2 set an objective for the Scottish Government to seek transmission system upgrades and increased interconnection capable of supporting the projected growth in renewable capacity.

Investment in electricity infrastructure is crucial to realising Scotland's renewable energy potential, allowing power to flow from remote areas of high resource, where grid connections are often weak to major centres of demand. This is particularly the case for the Highland & Islands, where weak or non-existent connection to the mainland grid network has been a challenge to the deployment of renewable technologies.

To support the future growth of renewable generation, large-scale investment into Scotland's transmission system is being delivered by a series of network development and reinforcement projects, for example:

- In 2013, National Grid and Scottish Power began construction on the £1bn Western Link HVDC 'bootstrap' project. The project, including the construction of two converter stations, is expected to conclude in summer 2017. The new link with a capacity of 2.2 GW will support

³¹ Scottish Government (2015) *Community Energy Policy Statement Final Version*, <http://www.gov.scot/Resource/0048/00485122.pdf>

the export of renewable energy from Scotland to homes and businesses in England and Wales and bolster energy security across GB.

- The Beaulieu-Denny 400kV replacement line, designed to upgrade grid capacity in the area and support Scotland's onshore and offshore renewables potential, was completed and commenced full operation in 2015.
- Work commenced on the £1bn Caithness-Moray project in 2015. Following completion in 2018 the link will enable the connection of 1.2 GW of new renewable electricity in the North of Scotland.
- As part of the Dumfries and Galloway Strategic Reinforcement Project, Scottish Power Energy Networks (SPEN) will build new 132kV transmission infrastructure in southern Scotland. Once completed, this reinforcement will modernise the existing transmission network and connect new generation in the area.

Challenges remain, in particular for the Scottish Islands. The Western Isles, Shetland and Orkney have the potential to meet up to 5% of GB demand by 2030 but strategic grid reinforcements would be required to unlock this renewable generation potential. In 2012 the UK and Scottish Governments established an intergovernmental working group to explore ways to overcome the islands' grid access and revenue support issues.

Despite some delays in transmission and interconnection projects the transmission infrastructure is likely to be able to accommodate renewable output to 2020. In our 2014 UK progress report, we highlighted that a further 22 GW of transmission infrastructure would be required UK-wide beyond 2020 in order to accommodate increasing levels of low-carbon generation cost-effectively. Upgrades to the transmission network would be required in Scotland and Northern England, as this is where the majority of the renewable generation is expected.

Coal

The 2.4 GW Longannet plant, one of the largest in Europe, closed in March 2016. The plant emitted 9.9 MtCO_{2e} in 2013, and the reduction in emissions will be seen in the inventory for 2016, published in 2018. Longannet was the last major coal plant in Scotland.

CCS

Carbon Capture and Storage (CCS) has a very important role to play in cost-effective decarbonisation of the UK economy. It allows for continued use of some fossil-fuel-fired power generation and has a crucial role in decarbonising heavy industry. Additionally, it provides the potential for negative emissions if used in conjunction with bioenergy, and can open up other decarbonisation pathways. In Scotland, decarbonisation of the power sector is not reliant on CCS potential and there is little heavy industry. The scenarios in our annual target advice included 25 TWh (21%) of generation from other low-carbon sources in 2030, which could be CCS plants. However, as generation in Scotland will be greater than demand this could be used as an opportunity to store emissions from the rest of the UK and help with further UK and international decarbonisation efforts.

Following years of slow progress, in 2013 the Peterhead CCS project in Aberdeenshire was chosen as one of two projects to take forward to the front-end engineering and design (FEED) stage, as part of the UK Government's CCS Commercialisation Programme. However, in

November 2015, the UK Government announced that the Commercialisation Programme funding would no longer be available. In our June 2016 progress report to UK Parliament we recommended that this must be addressed urgently if the UK targets are to be met at least cost. We recommended that the UK Government set out an approach to commercialise CCS through planned clusters, including a strategic approach to transport and storage infrastructure.

The North East of Scotland has been identified as one of the best places in Europe to develop CCS and a new study³² of 'clusters' of industrial facilities in Scotland found that Scotland's legacy of gas pipelines, both on and offshore, offer a way to reduce the capital cost of CO₂ transport. Work is underway by Scottish Enterprise to identify possible CCS locations.

The Scottish Government are waiting for direction from the UK Government on new policies with a stakeholder engagement session being held in September 2016.

³² Scottish Energy News (2016), <http://www.scottishenergynews.com/scotlands-carbon-capture-clusters-hold-key-to-reducing-uk-costs-in-tackling-climate-change/>

Recommendations

Progress in previous recommendations is shown in Table 2.2. The Scottish Government should also:

- Where devolved powers exist implement a clear and stable regulatory framework to encourage the widespread use of district heating where cost effective to do so, to support long-term funding of projects and customers.
- Ensure new renewable heat capacity has a high utilisation, with extra heat exported to other heat users.
- Further promote the opportunities of the non-domestic RHI to Scottish businesses.

Further work on heat and energy efficiency at a UK level is being completed by the Committee and a report will be published in October 2016. This will include recommendations for the UK and Devolved Governments.

Table 2.2. Recommendations from 2015 progress report	
Recommendation	Progress
Review and address barriers within the public sector to ensure that opportunities for low-carbon heat are taken up, including access to finance, lack of awareness, capacity and lack of knowledge and skills.	Ongoing.
Work with local authorities and community groups to promote the domestic RHI to householders alongside the finance under the Warm Homes Fund and Home Energy Scotland Renewables Loan. Consider further roll-out of roadshows to demonstrate renewable heat technologies.	Ongoing. Letter, emails, roadshows and webinars have taken place to promote renewable heat and available funding.
Consider further action to facilitate heat networks, for example through a Scottish equivalent of the Heat Networks Delivery Unit, requiring consideration of district heating in new developments; and obliging local authorities to connect to existing heat networks where technically possible to provide anchor loads.	On track. The Heat Network Partnership has been introduced, there is evidence of use of local development plans and a heat map has been developed for local authorities. There was also an update to local planning policy to consider heat networks.



Chapter 3:

Homes and communities

In this section we now consider the demand side for residential buildings: measures to cost-effectively address the demand from households for heat and electricity. As noted at the beginning of Chapter 2, in practice these demand-side issues need to be considered alongside the supply-side issues discussed in the preceding chapter. For example, efforts to improve insulation should consider whether low-carbon heat options could be cost-effectively installed at the same time to minimise disruption to households and allow a whole building solution to be developed.

Summary of progress

Table 3.1. Summary of progress	
Milestone	Progress
Every home to have loft and cavity wall insulation, where this is cost-effective and technically feasible, plus simple measures such as draught-proofing and pipe lagging.	<p>The Scottish House Condition Survey 2014 (SHCS)³³ shows that, for those houses where loft insulation is applicable, 62% of homes have loft insulation of more than 200mm (close to the recommended level of 275mm³⁴).</p> <p>There are 15,000 dwellings which do not have loft insulation, but would be suitable, and at least a further 671,000 could benefit from topping up levels of loft insulation to the recommended level.</p> <p>The SHCS indicates that in 2014, the number of properties with cavity wall insulation increased by 69,000 to 1.8m (71% of cavity wall properties) but remain a further 518,000 (29%) remain uninsulated.</p>
Sustainable Housing Strategy (SHS) aims to make sure that no-one in Scotland has to live in fuel poverty, as far as practicable, by November 2016.	In 2014, fuel poverty in Scotland fell to 34.9% (around 845,000 households) from 35.8% in 2013. In June 2016 the Scottish Government announced that this target would not be met.
SHS aims to deliver a step-change in the provision of energy efficient homes to 2030 through retrofit of existing housing and improved building regulations for new build homes.	From October 2015, new building regulations came into effect which means new buildings (both residential and non-residential) will be more energy efficient. For new-build homes, the regulations are more stringent than in England and Wales. Homes have benefited from retrofits under ECO and HEEPS.

³³ Scottish Government (2015) *Scottish Household Condition Survey: 2014 Key Findings*, <http://www.gov.scot/Resource/0049/00490947.pdf>

³⁴ As recommended by the Energy Saving Trust (EST).

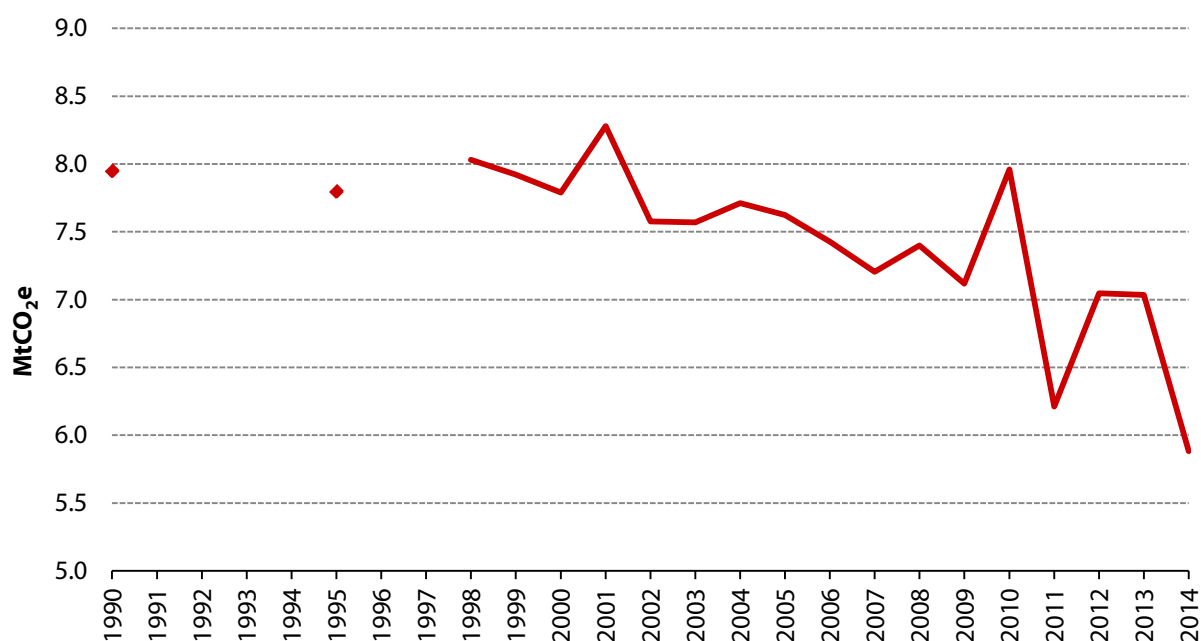
Emission trends and drivers

In 2013, emissions from the residential sector in Scotland were unchanged from 2012 at 7.0 MtCO₂e. In 2014 they fell to 5.9 MtCO₂e, 16% lower than 2013, similar to the UK-wide reduction (17%).

The large fall in emissions in 2014 can be attributed primarily to the higher temperatures in 2014 compared to a cooler 2013 (Figure 1.3), which led to reduced heating demand. Adjusting for temperature changes, emissions from the residential sector would have fallen less (around 8%) in 2014. Emissions fell 3% per year on average between 2009 and 2014 on an unadjusted basis, but only by 0.8% per year on a temperature-adjusted basis.

Residential emissions account for 13% of total emissions in Scotland in 2014, and were 27% below their 1990 level (Figure 3.1).

Figure 3.1. Residential sector emissions in Scotland (1990-2014)



Source: NAEI (2016) *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2014*, https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1606140853_DA_GHGI_1990-2014_Report_v1.pdf

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

Overview

Policy to address residential sector emissions is partially devolved. Minimum energy efficiency standards for electrical appliances are set at EU level, while the main energy efficiency schemes aimed at improving the thermal performance of existing homes, (the Energy Company Obligation – ECO) is GB-wide, as is the Renewable Heat Incentive (Chapter 2). Under the new devolution proposals, the implementation of ECO would be devolved to Scotland. The Scottish Government provides funding for additional energy efficiency and renewable heat programmes. Furthermore, building regulations and fuel poverty are devolved matters, although Scotland is also covered by the fuel poverty-focused elements of the ECO.

This section focuses on fuel poverty and energy efficiency; however these work together with the need to use low-carbon heat (Chapter 2).

The Scottish Government has set out a number of 2020 milestones for the residential sector:

- Every home to have loft and cavity wall insulation, where this is cost-effective and technically 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 to have adopted some form of individual or community renewable heat technology for space and/or water heating.

The 2013 Sustainable Housing Strategy (SHS) set out a vision for warm, high quality, affordable, low-carbon homes and a housing sector that helps to establish a low-carbon economy across Scotland. The strategy aims to:

- Make sure that no-one in Scotland has to live in fuel poverty, as far as practicable, by 2016;
- Deliver a step-change in the provision of energy efficient homes to 2030 through retrofit of existing housing and improved building regulations for new-build homes.

Scotland has a high number of households in fuel poverty due to a range of factors including incomes and housing stock, and heating requirements. Fuel poverty is more likely to occur in households not connected to the gas grid. In Scotland 15% of homes are not on the gas grid (59% of rural homes compared to just 6% in urban areas), and there is greater scope for low-carbon heating (Chapter 2).

In the following sections, we consider progress in installing insulation measures and the schemes that aim to reduce emissions in the residential sector and alleviate fuel poverty.

Opportunities to reduce emissions

In our advice on annual targets to the Scottish Government, our High Ambition scenario³⁵, which is consistent with meeting existing annual targets, includes insulation of all cavity walls and full take-up of top-up loft insulation by 2030 (800,000 of each). A total of 200,000 solid wall properties are also insulated by 2030. Although solid wall insulation is generally a high-cost route to reducing carbon emissions (with average costs greater than the UK Government central carbon values) it is important for alleviating fuel poverty. We also included in our scenario a number of other measures (e.g. floor insulation, and improved glazing) that reduce the demand for space heating, hot water use and electricity, as well as behaviour change (e.g. use of heating controls). Combined, the uptake of all residential energy efficiency measures in our scenario delivers 0.7 MtCO₂ of direct abatement by 2030.³⁶

Implementation of insulation measures

The proportion of Scottish homes with insulation has increased steadily in recent years. However, there is still significant potential for an increased rate of loft and cavity wall insulation. Furthermore, 86% of dwellings with solid and other types of walls, which account for 25% of the housing stock, currently do not have insulation (Figure 3.3). In 2014:

- **Loft insulation.** The Scottish House Condition Survey 2014 (SHCS)³⁷ shows that, for those houses where loft insulation is applicable, the proportion of homes with loft insulation of more than 200mm (close to the recommended level of 275mm³⁸) was 62%, the same as 2013. For insulation of 300mm or more the proportion of dwellings increased by 3 percentage points to 27% in 2014 (an increase of 22% since 2010). There are still at least a further 671,000 dwellings which could benefit from topping up levels of loft insulation to the recommended level. However, the number of dwellings with no loft insulation (but would be suitable) has fallen 44% in 2014 to just 15,000 dwellings (1% of total).
- **Cavity walls.** The SHCS indicates that in 2014, the number of properties with cavity wall insulation increased by around 70,000 to nearly 1.3m (71% of cavity wall dwellings), but there remain a further 518,000 (29%) uninsulated.
- **Solid walls.** Around one quarter of properties in Scotland have solid or other types of walls (including timber frame) compared to a third of properties in the UK as a whole. Of these dwellings, the proportion insulated has improved by 3 percentage points to 14% (85,000 dwellings). In 2014 14,000 properties were insulated but there remain 528,000 uninsulated.
- **Gas and oil boilers.** The percentage of homes with gas and oil boilers installed has increased 3 percentage points to 85% since 1998, when the European Boiler Efficiency Directive

³⁵ CCC (2016), *Scottish Emissions Targets 2028-2032*, <https://documents.theccc.org.uk/wp-content/uploads/2016/03/Scottish-Emissions-Targets-2028-2032.pdf>, page 56. The High Ambition scenario is based on our UK 'Max' scenario for the 5th carbon budget and adapted in line with specific Scottish circumstances, such as the make-up of the Scottish building stock, existing industrial installations and power plants, agricultural activity and land-use, Scottish driving patterns, and more ambitious Scottish plans for forestry and waste disposal. The High Ambition scenario is what is required to be on the way to meeting existing annual targets. It is stretching and goes beyond what is required at the UK level by the fifth carbon budget.

³⁶ 'Direct' abatement refers to reducing actual emissions from burning fossil fuels directly in buildings, in contrast to 'indirect' abatement, which refers to emissions savings from reducing electricity use.

³⁷ Scottish Government (2015) *Scottish House Condition Survey: 2014*, <http://www.gov.scot/Resource/0049/00490947.pdf>

³⁸ As recommended by the Energy Saving Trust (EST).

Minimum came into effect. In 2014, 48% of gas and oil boilers were condensing (5 percentage point increase) and 41% (3 percentage point increase) meet the minimum efficiencies specified by the current Building Standards.

In 2013, there was a change in GB-wide energy efficiency policy, from the Carbon Emission Reduction Target (CERT) programme to the Green Deal (now closed) and Energy Company Obligation (ECO). This led to much lower installation numbers in 2013 compared to 2011 and 2012, although installation numbers have increased in 2014.

The latest ECO statistics show that up to 31 December 2014, 150,000 measures had been installed in Scotland, equating to nearly 12% of the total measures delivered under the scheme (higher than Scotland's 9% share of the housing stock).

Delivery of insulation measures has been particularly difficult in some of the more remote areas of Scotland. The lowest delivery rates under the ECO in the whole of the UK in 2014 were in the Shetlands and Orkney Island.

Figure 3.3. Loft, cavity and solid wall insulation (2009- 2014)

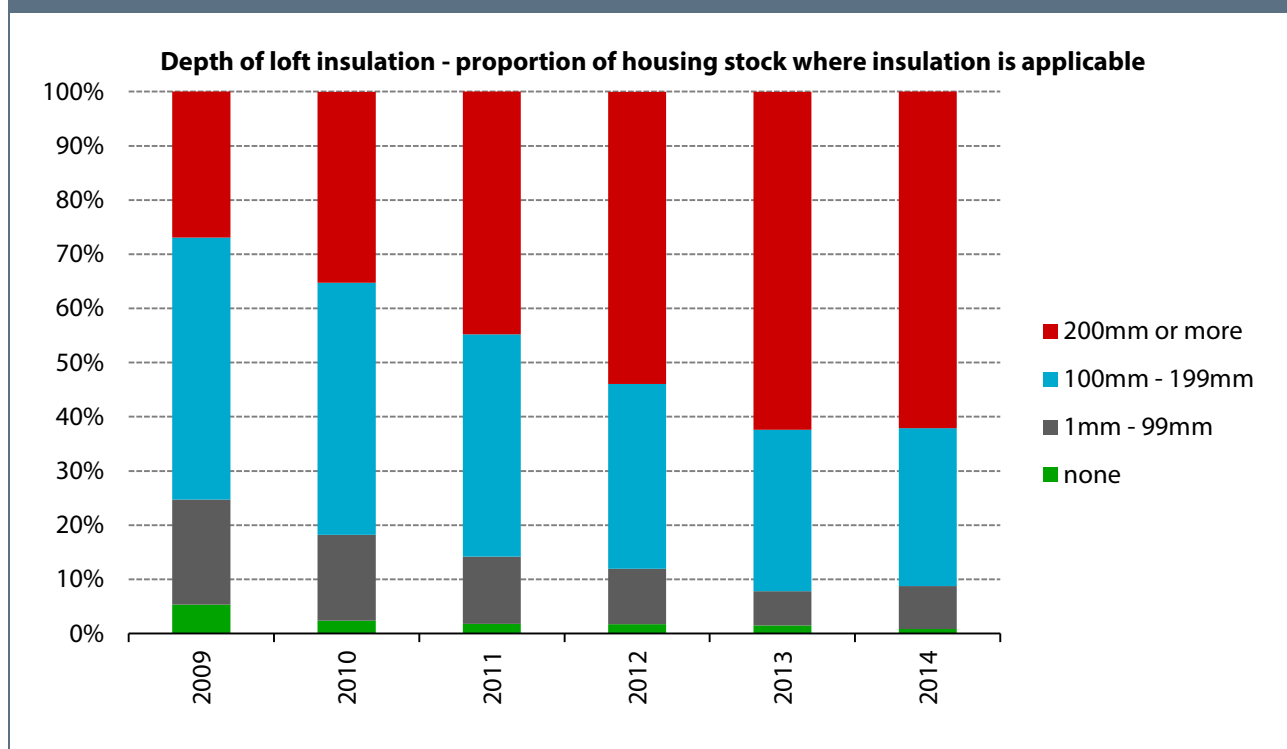
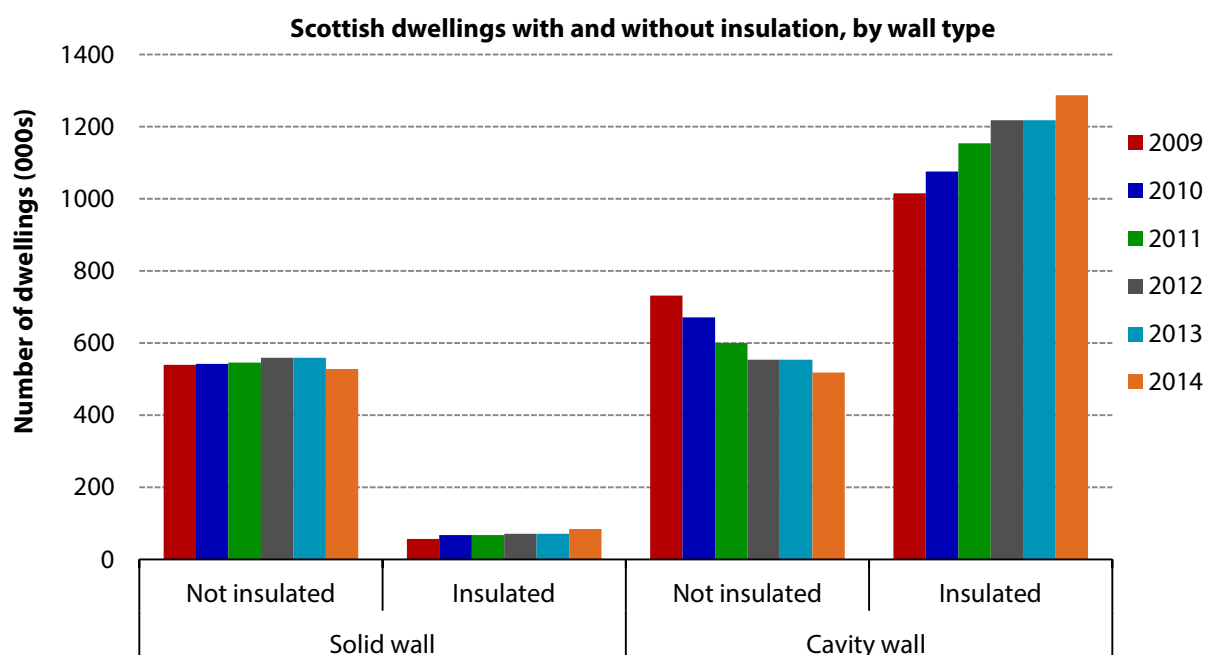


Figure 3.3. Loft, cavity and solid wall insulation (2009- 2014)



Source: Scottish Government (2015) *Scottish House Condition Survey: 2014*, <http://www.gov.scot/Resource/0049/00490947.pdf>

Notes: In 2014 there were 611,000 dwellings where loft insulation is not applicable.

Fuel poverty

Fuel poverty in Scotland is more pronounced than for the UK as a whole. In 2014, fuel poverty in Scotland fell nearly one percentage point 34.9% (845,000 households).³⁹ According to the SHCS, average fuel prices increased by 3.5% between 2013 and 2014. However, the impact on fuel poverty was mitigated by a 2.7% nominal increase in average household incomes, improvements in the overall energy efficiency of the housing stock and policy schemes delivering fuel-bill rebates.

Fuel poverty depends on a range of factors, including energy prices, household incomes, heating requirements and the characteristics of the dwelling. Households that are not on the gas grid are more likely to be in fuel poverty, as are those with electrically-heated homes (Table 3.2).

³⁹ Under the '10% definition', a household is said to be in fuel poverty if it needs to spend more than 10% of its income on fuel to maintain an adequate level of warmth (typically defined as 21 °C for the main living area and 18 °C for other occupied rooms). Under the LIHC definition, a household is considered to be fuel poor if they have required fuel costs that are above average (the national median level) and were they to spend that amount, they would be left with a residual income below the official poverty line.

Table 3.2. Latest fuel poverty statistics in Scotland by dwelling characteristic			
Dwelling characteristic		2013	2014
Primary heating fuel	Gas	31%	30%
	Electricity	55%	60%
Urban/Rural	Urban	32%	32%
	Rural	53%	50%
Gas grid	On gas grid	33%	34%
	Not on gas grid	48%	43%
EPC Band	B to C	24%	19%
	F to G	85%	73%
Source: Scottish Government (2015) <i>Scottish Household Condition Survey: 2014</i> , http://www.gov.scot/Resource/0049/00490947.pdf			

Scotland has a higher proportion of electrically-heated homes (13%) than the UK (7%). These are mostly smaller properties, in particular flats, with a large proportion in the rental sector and high levels of fuel poverty. Our December 2014 report⁴⁰ on energy prices and bills found that, as the costs of support for low-carbon investment is currently passed through electricity bills, these households pay a higher proportion of their energy bill towards low-carbon policy costs than dual-fuel homes (this cost will rise from £90 in 2013 to £360 in 2030). Homes in the North of Scotland are affected most, because they already have the highest per-unit prices of all the public electricity supply regions of the UK. Targeting electrically-heated homes in these regions with energy efficiency measures and low-carbon heat is particularly important for fuel poverty alleviation.

The Scottish Government's target to eradicate fuel poverty by November 2016 will not be achieved. It should therefore continue to develop energy efficiency and heat policy that support fuel poverty reduction by targeting measures at fuel-poor homes. Nearly two-thirds of F- to G-rated homes are fuel poor (Table 3.2), and improving their energy efficiency while installing low-carbon heat would meet multiple objectives.

⁴⁰ CCC (2015) *Energy prices and bills - impacts of meeting carbon budgets*, <https://documents.theccc.org.uk/wp-content/uploads/2014/12/Energy-Prices-and-Bills-report-v11-WEB.pdf>

Progress in developing policy to reduce emissions and fuel poverty

Energy efficiency policy is more comprehensive in Scotland than in England. The Scottish Government runs its own energy efficiency schemes which work to leverage ECO funding, as well as providing additional measures:

- The **Home Energy Efficiency Programmes** for Scotland (HEEPS) has been in operation since April 2013 and prioritises fuel-poor and vulnerable households. It operates within a broader landscape of UK Government energy efficiency programmes and has provided continuity and certainty, especially for installation of more challenging measures such as solid wall insulation, in the face of UK Government changes to ECO. In 2014/15 it delivered over 32,000 measures with 41% of those for solid wall insulation. It includes:
 - **Area Based Schemes** (ABS) delivered by local authorities and providing a range of insulation measures. Funding in 2016/17 for ABS is £50m from the Scottish Government, although working in tandem with ECO there is potential to level in a further £120m per year. In 2014/15 HEEPS delivered measures to 18,500 households, including over 3,000 of cavity wall insulation in hard-to-treat cavities. We previously recommended that the Scottish Government carry out an evaluation of current energy efficiency programmes (especially ABSs) to help determine the best way to implement supplier obligations as they become devolved. The Energy Agency in Scotland is currently conducting an evaluation project to investigate the success of insulation schemes funded by the Scottish Government in alleviating fuel poverty. Households receiving insulation in 2016 under Area Based Schemes will be monitored. A report will be available early 2017⁴¹ and we will consider this further in our next progress report. The Scottish Government is currently developing a proposal for the evaluation of HEEPS.
 - **Loans Scheme** available to owner-occupiers and registered private landlord. The scheme makes available interest-free, unsecured loans of up to £15,000 to householders for installing a variety of measures such as insulation, double glazing or a new boiler. Funding for 2016/17 is £24m.
 - **Warmer Homes Scotland** which has succeeded the Energy Assistance Scheme. In April 2015 the Scottish Government announced the scheme would have a budget of £224m (over seven years from September 2015). The scheme aims to target funds at installing insulation, heating and low-carbon or renewable measures in up to 238,000 fuel-poor homes. It also includes micro-generation measures to offer a wider range of heating options to off-gas households, and a separate Islands region for delivering measures.
- Energy efficiency has been deemed a **National Infrastructure priority** as part of the Scottish Government's Heat Policy Statement (Chapter 2). A cornerstone of this is a £14m fund which aims to allow councils across Scotland to make homes, public buildings and businesses more energy efficient. The programme, **Scotland's Energy Efficiency Programme** (SEEP), will start in 2018 and run for 15 to 20 years. SEEP will help local authorities to pilot new and innovative approaches to energy efficiency with community groups and businesses. The projects will build upon and integrate existing schemes and bring together support from the Scottish Government's Low Carbon Infrastructure Transition Programme and HEEPS: ABS, but will also seek to leverage further private investment. The programme will also look to

⁴¹ Energy Agency (2016), http://www.energyagency.org.uk/en/free-insulation-scheme-case-studies_46663/

introduce multi-year funding that will give certainty to deliver ambitious or difficult energy efficiency projects.

Recent issues with energy efficiency programmes include:

- ECO will devolve to Scottish Government although it is not yet clear where investment will be focused. Evidence to the Committee from the Energy Saving Trust suggests that when devolution takes place the Scottish Government would be able to diverge from the approach in England and Wales by targeting and encouraging activity, measures, property types, areas, and tenures to meet Scotland's needs. To add the most value, supplier obligations must join up with the existing energy efficiency policy framework, which could be delivering the cheapest and easiest improvements to all householders, complementing existing fuel poverty schemes which focus on delivering more expensive and hard-to-treat properties. Other options to consider would be maintaining a rural sub-obligation and additional measures to encourage delivery in areas with higher delivery costs.
- Funding timescales under HEEPS have been challenging, especially for more complex projects.
- Area-based schemes have been important for developing local skill sets, although in some remote areas delivery has been difficult (e.g. due to lack of accommodation for contractors). The schemes do provide a way of bringing heat and energy efficiency policy together, which can help ensure that solutions are 'whole-house' rather than partial, improve performance standards, reduce delivery costs and simplify the number of interventions over time.⁴²
- With flats making up 38% of the Scottish housing stock, more effective policies are needed for multi-tenanted properties where residents are seen as unlikely to proactively push for communal measures due to perceived challenges in getting agreement and securing finances.⁴³ HEEPS: ABS funding can 'unlock' larger mixed tenure schemes if the owner-occupied and private rental flats meet certain criteria, with social landlords and local authorities being able to access ECO to cover social tenant contributions. There is also scope to coordinate energy efficiency improvements with district heating based on heat mapping (Chapter 2) and encouragement to social landlords to pool ECO and RHI finance and work with public authorities to implement a coordinated approach for their stock.

In addition to financial incentives, the Scottish Government has implemented standards for energy efficiency performance:

- The new **Energy Efficiency Standard for Social Housing (EESH)** was published in March 2014. Achievement of EESH by social landlords will mean that the 600,000 social houses in Scotland will be either EPC band C or D by 2020, far quicker than regulatory targets in England and Wales.
- A consultation on **regulations for minimum energy efficiency** standards for owner-occupied and privately rented properties was planned for spring 2015, although due to uncertainty in funding from UK Government this has been delayed until the next Parliamentary session. If implemented this has potential to go further than England and

⁴² National Energy Foundation (2014) *Breaking Barriers*, http://www.nef.org.uk/themes/site_themes/agile_records/images/uploads/BreakingBarriers_SummaryReport.pdf

⁴³ Citizens Advice (2013) *Communal Improvements Energy efficiency in tenements in Scotland*, <http://www.consumerfutures.org.uk/files/2013/05/Communal-improvements.pdf>

Wales where only privately rented homes will be required to be a minimum rated band E for energy efficiency by 1st April 2018.

- Building regulations for new-build homes were changed in October 2015 to relate to improvement in specified performance to deliver emission reductions.⁴⁴

Scottish energy efficiency policy is more developed and more comprehensive than that available in England and other devolved administrations. Nonetheless, fuel poverty remains a serious problem, and the impact on emissions from residential buildings may not appear in the GHG inventory for a few years.

Recommendations

Progress on previous recommendations is shown in Table 3.3. The Scottish Government should also:

- Continue to develop energy efficiency and heat policy that support fuel poverty reduction by targeting measures at fuel-poor homes. Over two-thirds of band G top E homes are fuel poor improving their energy efficiency while installing low-carbon heat would meet multiple objectives.
- Work to overcome the perceived challenges in getting agreement and securing finances for communal work on multi-tenanted properties.

Further work on heat and energy efficiency at a UK level is being completed by the Committee and a report will be published in October 2016. This will include recommendations for the UK and devolved Governments.

Table 3.3. Recommendations from 2015 progress report	
Recommendation	Progress
Carry out an evaluation of current energy efficiency programmes (especially the area-based schemes) to help determine the best way to implement supplier obligations as they become devolved.	On track. Evaluations for area-based schemes due to be published end of this year and Scottish Government is developing a proposal for a full evaluation.
Develop effective energy efficiency schemes for multi-tenanted properties (e.g. 'tenement action areas'), as flats make up 38% of the Scottish housing stock.	Ongoing. HEEPS: ABS funding can 'unlock' larger mixed-tenure schemes if the owner-occupied and private rental flats meet criteria, with social landlords and local authorities being able to access ECO to cover social tenant contributions. However, residents are unlikely to proactively push for communal measures due to perceived challenges in getting agreement and securing finances. More can be done by Scottish Government to overcome this, as well as bring in options to coordinate district heating and

⁴⁴ Scottish Government (2015) *Section 6 (energy) 2015 - Domestic*, <http://www.gov.scot/Topics/Built-Environment/Building/Building-standards/techbooks/s62015>

Table 3.3. Recommendations from 2015 progress report	
Recommendation	Progress
	energy efficiency.
Make energy efficiency funding available over a sufficiently long timescale to ensure that complex projects can be completed.	SEEP will aim to introduce multi-year funding for projects. Funding and finance arrangements are being considered as part of ongoing work to design SEEP.
Ensure that policies effectively target electrically-heated homes both in terms of energy efficiency improvement and incentives for low-carbon heat.	Ongoing. Warmer Homes Scotland, which has succeeded the Energy Assistance Scheme, aims to target funds at installing insulation, heating and low-carbon or renewable measures in up to 238,000 fuel-poor homes. It also includes micro-generation measures to offer a wider range of heating option to off-gas households, and a separate Islands region for delivering measures.
Adopt ambitious minimum energy efficiency standards in both owner-occupied and privately rented sector housing within the regulations planned for consultation in spring 2015.	The setting of standards is one of the key elements of the ongoing development of Scotland's Energy Efficiency Programme (SEEP). The Scottish Government is considering the appropriate timing for consultation.



Chapter 4:

Business, industrial processes and the public sector

In this chapter we now consider the demand side for non-residential buildings: what measures might cost-effectively address the demand from businesses, industry and public buildings for heat and electricity. As noted at the beginning of Chapter 2, in practice these demand-side issues need to be considered alongside supply-side issues. For example, efforts to improve energy efficiency should consider whether low-carbon heat options could be cost-effectively installed at the same time to minimise disruption and costs to businesses and allow a whole building solution to be developed.

We include brief consideration of F-gases in this chapter, which for our advice on annual targets in March 2016 we split out for analysis of future abatement. However, we do not comment on them separately in this progress report.

Summary of progress

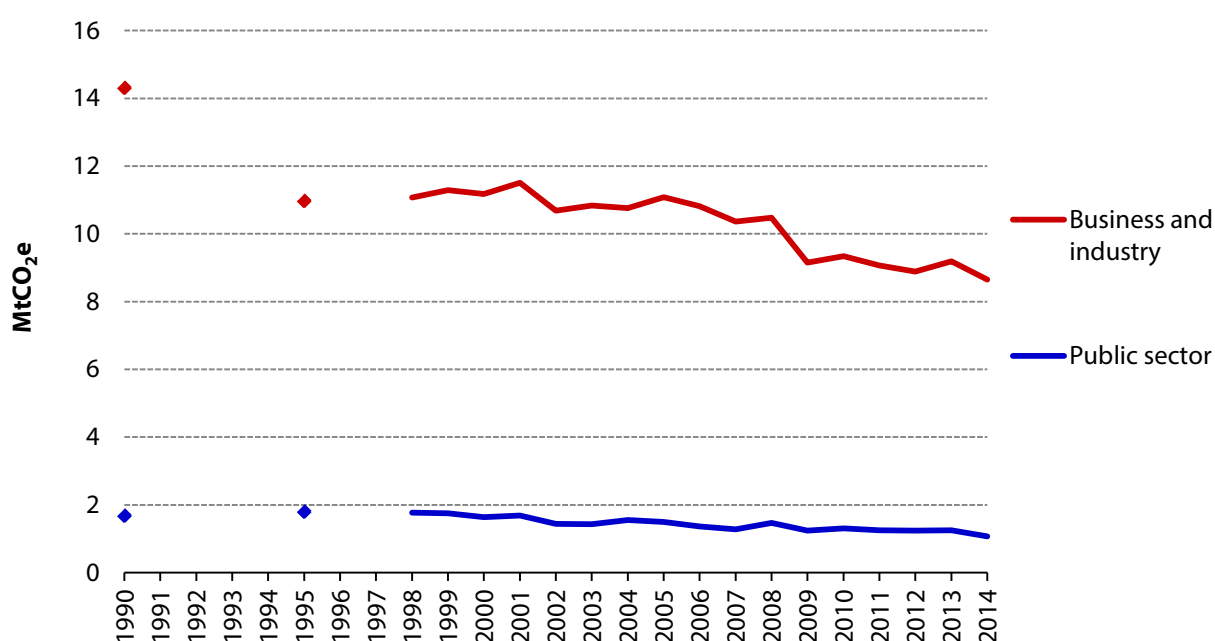
Table 4.1. Summary of progress	
Milestone	Progress
The public sector will have reduced its energy consumption by at least 12% by 2020 relative to 2005-2007 average.	Energy consumption data in Scotland are not broken down by sector so it is not possible to assess progress for this milestone. However, Scottish public sector organisations are now required to report on their compliance with climate change duties.
By 2027, there will be a complete transformation in the way Scottish public bodies work and in how their estates are managed. This will be achieved through implementing and outperforming existing carbon management plans, adopting sustainable procurement processes and through supporting governance arrangements.	In 2015, the Scottish Government introduced an Order requiring all 151 public bodies which appear on the Major Player list ⁴⁵ to submit an annual report to the Sustainable Scotland Network (SSN), detailing their compliance with the climate change duties. Annual reporting should include emissions, savings from emission reduction projects, as well as renewable energy generation and consumption.
By 2027, there will have been significant progress in transforming energy use in industry and business through resource efficiency measures and low carbon technologies such as CCS and fuel switching.	UK and EU policies to date have failed to drive progress towards a low-carbon industry sector. UK industry roadmaps are under development but remain to be turned into action.
By 2050, direct emissions from the sector will be almost zero.	Emissions from business and industrial processes (including some emissions within the EU ETS) were 8.7 MtCO ₂ e in 2014, accounting for 19% of total emissions in Scotland. Between 1990 and 2014 emissions fell by 40%.

⁴⁵ Sustainable Scotland Network (2015) *The Scottish Statutory Instrument 2015*, <http://www.keepsotlandbeautiful.org/media/846003/major-players-jan2016.pdf>

Emission trends and drivers

Business and industrial process emissions (including some emissions within the EU ETS) were 8.7 MtCO₂e in 2014, accounting for 19% of total emissions in Scotland. Between 1990 and 2014 emissions fell by 40%. In 2013 emissions rose by 3%, although they then fell 6% in 2014, with an average annual fall of 1% between 2009 and 2014 (Figure 4.1). The large fall in emissions in 2014 was partially due to a fall in building heat demand, mainly in the public and commercial sector, due to warmer temperatures than average.

Figure 4.1. Business, industrial processes and public sector emissions by mode (1990-2014)



Source: NAEI (2016) *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2014*, https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1606140853_DA_GHGI_1990-2014_Report_v1.pdf.

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

Around 15% of business and industrial process emissions come from F-gases. Since 1990 these have increased nearly 500%.⁴⁶

Public sector emissions were 1.3 MtCO₂e in 2013, having risen 1% from 2012. Emissions then fell to 1.1 MtCO₂e (14%) in 2014, representing 2% of Scotland's total. In 2014, the fall in emissions was due to decreased heating demand, with falls of 2% per year on average between 2009 and 2014. Emissions were 36% below 1990 levels (Figure 4.1).

⁴⁶ A small amount of F-gases are included in emissions from residential buildings (Chapter 3).

Opportunities to reduce emissions

Alongside low-carbon heat (Chapter 2) our High Ambition scenario for Scotland to 2030, consistent with meeting existing annual emissions targets, identifies a range of non-residential energy efficiency measures to reduce emissions. This includes energy and process management, improved equipment and insulation and material efficiency measures such as programmable thermostats, fabric measures and glazing.

Without policy it is likely that F-gas emissions would continue to increase due to increasing use of products and appliances using F-gases, such as refrigeration and air conditioning equipment or foams used for energy efficiency measures. However, we estimate F-gas emissions in Scotland will to be significantly reduced by 2030 due to EU regulations.

Progress in developing policy to reduce emissions

Emissions can be reduced through energy and resource efficiency measures and the decarbonisation of heat.

The Scottish Government has set the following milestones in RPP2 for business, industry and the public sector:

- The public sector will have reduced its energy consumption by at least 12% by 2020.
- By 2027, there will be a complete transformation in the way Scottish public bodies work and in how their estates are managed. This will be achieved through implementing and outperforming existing carbon management plans, adopting sustainable procurement processes and through supporting governance arrangements.
- By 2027, there will have been significant progress in transforming energy use in industry and business through resource efficiency measures and low-carbon technologies such as CCS and fuel switching.
- By 2050, direct emissions from the sector will be almost zero.

It is difficult to assess progress against these targets. For example, energy consumption data in Scotland are not broken down by sector so it is not possible to assess progress in the public sector towards its energy consumption target.

A number of EU, UK and GB policies cover emissions from business and the public sector, including the EU ETS, CRC Energy Efficiency Scheme, Climate Change Levy (CCL) and Climate Change Agreements (CCAs), the Energy Savings Obligations Scheme, and the RHI (Chapter 2). The CRC is to be replaced with higher CCL after 2018-19 with an alternative reporting mechanism.

Our UK progress report found that there is a gap in current policy. We identified three key areas in which the policy framework is weak or there is no policy: larger energy efficiency projects, low-carbon heat post-2020 and industrial CCS (Chapter 2). The UK Government's industrial roadmaps project was an important first step towards identifying barriers to unlocking cost-effective abatement, but these now need to be translated into a delivery plan for an industrial low-carbon policy framework strong enough to support the level of investment required.

The Scottish Government has additional policies and funding for these sectors, which go beyond what is available across the UK. These include:

- **The Resource Efficient Scotland** (a programme of Zero Waste Scotland) advice service was launched in April 2013, providing support to businesses, third sector and public sector organisations to reduce costs through implementing resource efficiencies in energy, raw materials, water and waste management. RES and Zero Waste Scotland have set up:
 - The Green Network for Businesses to give opportunities to visit a green business in local areas to help cut energy, water, waste and raw material costs.
 - Scottish Manufacturing Action Plan work stream (Box 4.1). The plan was published in February 2016 outlining actions in leadership, skills, circular economy, energy efficiency and decarbonisation, competitive infrastructure, investment in SMART manufacturing, supply chain capability, technology and innovation.
- **Low Carbon Infrastructure Transition Programme** is a £76m scheme to support the development of substantive private, public and community low-carbon projects, launched in March 2015. It is a working partnership between Scottish Government and public sector partners, supported and part-funded (£33m) by the new 2014-2020 European Regional Development Fund. The programme aims to support the acceleration of projects to develop investment-grade business cases allowing them to secure existing streams of public and private capital finance. In addition, it collates and shares with investment communities recurring barriers and challenges to projects. The programme is more open and encouraging to innovative projects than available in other areas of the UK.
- **Scotland's Energy Efficiency Programme** (Chapter 3) includes funding and programmes for public buildings and businesses to make them more energy efficient and will be implemented from 2018. The programme is currently asking for applications for pilot schemes.

Funding available includes:

- Interest-free loans of £1,000 to £100,000 are available to small and medium-sized enterprises (SMEs) for resource efficiency projects, although there are challenges with marketing and the conversion from advice to taking up the loan.
- Loans for renewable energy projects, with an interest rate of 5% for businesses signing up for FiTs, or the RHI.
- Convenience Store Resource Efficiency Grants are provided to convenience retailers to improve energy-efficiency of stores.

For the existing stock of non-residential buildings there are measures set out on how to implement regulations under section 63 of the Climate Change (Scotland) Act. Guidelines⁴⁷ have set new requirements for assessment and improvement of larger non-residential buildings starting from September 2016. There is a commitment from the Scottish Government to undertake further review,⁴⁸ although no timetable for this review is in place.

While these Scottish initiatives are useful, emissions in industry and the commercial sector will remain mainly under the influence of EU and UK policies.

⁴⁷ Scottish Government (2016) *Improving Energy Performance and Emissions in existing Non-Domestic Buildings*, <http://www.gov.scot/Resource/0050/00500639.pdf>

⁴⁸ In response to the 2013 Sullivan Report update. Scottish Government (2013) *A Low Carbon Building Standards Strategy for Scotland*, <http://www.gov.scot/Resource/0043/00437438.pdf>

Box 4.1. A Manufacturing future for Scotland - Scottish Manufacturing Action Plan

The plan includes energy efficiency and decarbonisation as a key aspect.

It includes a Decarbonisation of Industry Steering Group to promote and coordinate action to support energy intensive industries deliver emission reductions under the EU ETS, to meet legal obligations such as CCL and consider further support to reduce emissions in the future. The group has also commissioned a report to provide a Scottish summary of the UK Government's 2015 industrial decarbonisation roadmaps, including a recommendation to inform development of a national programme of activity to support industrial decarbonisation, energy efficiency and heat recovery. This will work alongside other programmes such as RES, Heat Network Partnership and LCITP.

A number of work streams include timescales for implementation:

- Advice and support from 2016
- Energy efficiency and heat recovery from 2017
- Benchmarking performance from 2017
- Low-carbon technology demonstration from 2018

Source: Scottish Enterprise (2016) *A Manufacturing Future for Scotland*, <http://www.scottish-enterprise.com/knowledge-hub/articles/insight/scotlands-manufacturing-action-plan>

Public sector

The Climate Change (Scotland) Act 2009 includes a duty on public bodies to contribute to the delivery of climate change targets. The Scottish Government introduced in 2015 an Order requiring all 151 public bodies which appear on the Major Player list⁴⁹ to submit an annual report to the Sustainable Scotland Network (SSN), detailing their compliance with the climate change duties. In the pilot year (2014/15) 112 bodies submitted 110 reports. Annual reporting should include emissions, savings from emission reduction projects, as well as renewable energy generation and consumption. This will provide information essential to understanding and curbing waste, and goes further than reporting in the rest of the UK. The bodies each set their own emission baselines and set their own targets based on carbon management plans.

Scottish Procurement has developed a framework⁵⁰ to facilitate the implementation of Non-Domestic Energy Efficiency (NDEE) to the Scottish public sector. The framework will cover retrofit of public sector buildings and grounds including a combination of building fabric and environmental service systems. The Scottish Government, through the Low Carbon Infrastructure Transition Programme, is establishing a NDEE Support Unit to accelerate the number of projects and the delivery timescales of public sector energy efficiency projects. The Support Unit is expected to launch in autumn 2016 and will be a four-year single contract with value of up to £2m. This is a positive step and both the Framework and support go further than available in England.

Salix Finance Ltd currently manages a £14.3m revolving fund, providing interest-free loans on behalf of the Scottish Government for public sector energy efficiency implementation projects.

⁴⁹ Sustainable Scotland Network (2015) *The Scottish Statutory Instrument 2015*, <http://www.keepsotlandbeautiful.org/media/846003/major-players-jan2016.pdf>

⁵⁰ Scottish Government (2016) Web Page Non domestic Energy Efficiency, <http://www.gov.scot/Topics/Government/Procurement/directory/Utilities/NonDomesticEnergyEfficiency>

These projects have produced more than £68m and 336 ktCO₂e lifetime savings since 2008. This fund is used to stimulate public sector investment for new innovative technologies or approaches to energy efficiency and to generate project pipelines. During 2016/17, Salix are specifically focusing on estate-wide energy efficiency retrofit.

Other areas in which the Scottish Government is working to improve the energy efficiency of public buildings are:

- Scottish Funding Council which offers funding and advice to universities for district heating and energy efficiency programmes.
- Policy engagement and partnership, including a knowledge hub and awareness and training events.

The Scottish Government are progressing with plans to retrofit existing public buildings, although they must ensure support is turned into action.

Recommendations

Progress in previous recommendations is shown in Table 4.2. Further work on heat and energy efficiency at a UK level is being completed by the Committee and a report will be published in October 2016. This will include recommendations for the UK and devolved governments.

Table 4.2. Recommendations from 2015 progress report	
Recommendation	Progress
Set ambitious CO ₂ reduction targets for government buildings and consider extending the public bodies duties under the Climate Change Act (Scotland) to require other public bodies to do the same.	The bodies each set their own emission baseline and boundaries in line with GHG reductions and set their own targets based on carbon management plans.



Chapter 5: Transport

Summary of progress

Table 5.1. Summary of progress

Milestone	Progress
A mature market for low-carbon cars resulting in achievement of an average efficiency for new cars of less than 95 gCO ₂ /km.	Improvement in new car efficiency continued in 2015, driven by the EU directive targeting 95 gCO ₂ /km in 2020. CO ₂ intensity of new cars fell from 124.4 gCO ₂ /km in 2014 to 121.5 gCO ₂ /km in 2015, a 2% reduction. This is in line with the UK but not as low as Wales and Northern Ireland.
An electric vehicle (EV) charging infrastructure in place in Scottish cities.	At the end of June 2016, there were around 1,800 public charging points across Scotland (109% increase from 2015), accounting for 15% of UK charge points. ⁵¹ The proportion of UK sales of electric vehicles (EVs) taking place in Scotland was unchanged in 2015, around 5%. This remains lower than Scotland's overall share of car sales in the UK (8%). However, overall sales of EVs have grown, with a 29% increase in 2015. Rapid-charge points have been installed at 50-mile intervals on Scotland's primary road network.
Personalised travel planning advice provided to all households.	The evaluation of Smarter Choices Smarter Places (SCSP) in 2015/16 will provide some summary information on the number of interventions of different types delivered as part of the programme.
Effective travel plans in workplaces with more than 30 employees.	Travel planning is often delivered as part of a project in the workplace. The review of SCSP to be published this year will provide some information on number of interventions. Sustrans Scotland launched a Scottish Workplace Journey Challenge for May 2015.
At least 10% of all journeys made by bicycle.	In 2014, 1% of journeys were by bike, well below the 2020 ambition of 10%. This figure has remained at around 1% since 2003.
By 2030 the Scottish Government aims to see significant progress in decarbonisation of road transport, through the wholesale adoption of electric cars and vans, and conversion to hybrid or alternatively-fuelled HGVs and buses, along with a significant modal shift and significant steps to decarbonise rail and maritime transport.	Progress is being made across Scotland to promote active travel, and increase the use of EVs with rapid-charge points at 50-mile intervals, and an increase in electric buses. The low-carbon transport loan made 87 loans in 2015/16 totalling just under £3m, and a total of £7.8m is available for 2016/17. Rail electrification programmes are also progressing. Overall, however, surface transport emissions are not reducing at a quick enough pace to meet future annual targets, especially those from cars which account for nearly half of all transport emissions.

⁵¹ Zap Map (2016), <https://www.zap-map.com/statistics/#charger-type>

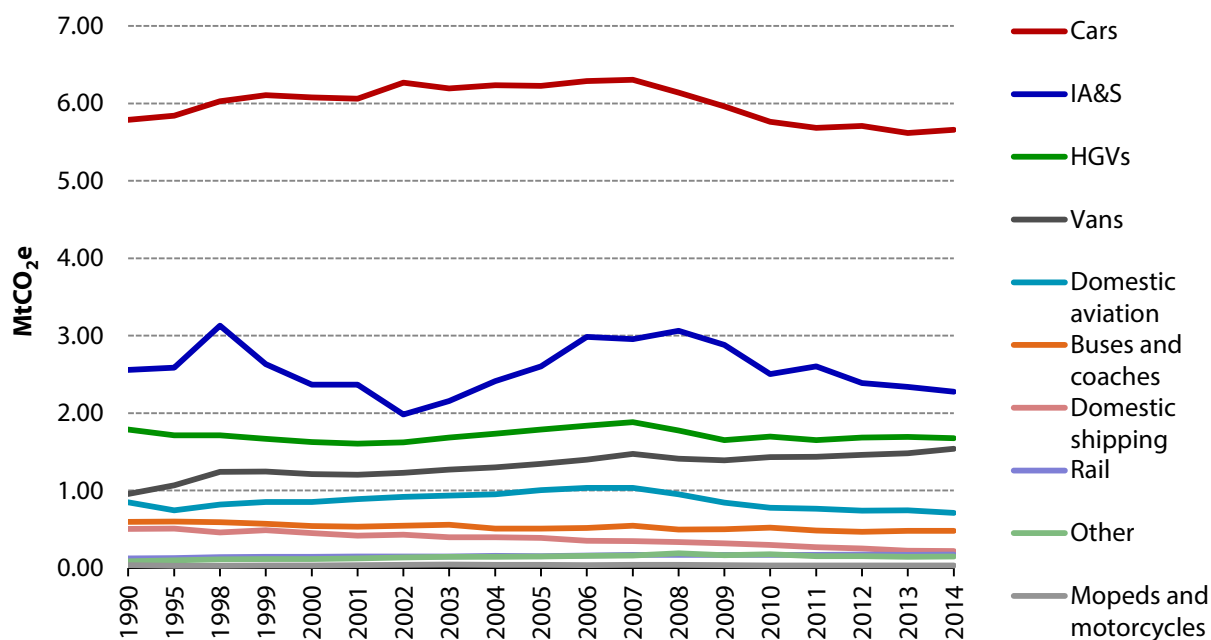
Emission trends and drivers

The Scottish Government's emission targets cover emissions from all transport in Scotland, including Scotland's share of international aviation & shipping (IA&S). In 2013 total transport emissions fell 3% from 2012, followed by a further 2% fall in 2014 to 13 MtCO₂e, with an average annual decrease of 1.2% per year between 2009 and 2014. Emissions are 3% lower than 1990 levels. Within total transport, emissions changes have varied by mode (Figure 5.1):

- Cars are the largest source of emissions, accounting for 44% of the total at 5.7 MtCO₂e. Emissions from cars rose by 1% in 2014, with an average annual fall of 1% between 2009 and 2014. Overall car emissions are just 2% lower than in 1990. This reflects improvements in new car efficiency, alongside an increase (1.7%) in vehicles-kilometres (Figure 5.2).
- International aviation and shipping emissions were 2.3 MtCO₂e in 2014, 18% of total transport emissions. This is a decrease of 3% from 2013; with an average annual fall of 4% between 2009 and 2014. Emissions are 11% lower than 1990 levels.
- Emissions from heavy goods vehicles (HGVs) account for 17% of Scotland's transports emissions at 2.2 MtCO₂e. Emissions fell 1% in 2014, but there was no overall change between 2009 and 2014. They are now 10% lower than in 1990.
- Emissions from vans were 1.5 MtCO₂e in 2014, 12% of total transport emissions. Emissions increased by 4% during 2014, with an average annual increase of 2% between 2009 and 2014. Emissions are 61% above 1990 levels.
- The remaining 9% of emissions comprise domestic aviation and shipping, buses, rail and motorcycles.

Overall transport emissions accounted for 28% (13 MtCO₂e) of total Scottish emissions. This makes up a large proportion of non-traded sector emissions (around a third of Scotland's non-traded sector target in 2014). Therefore, they are of particular importance for the achievement of existing Scottish emissions targets.

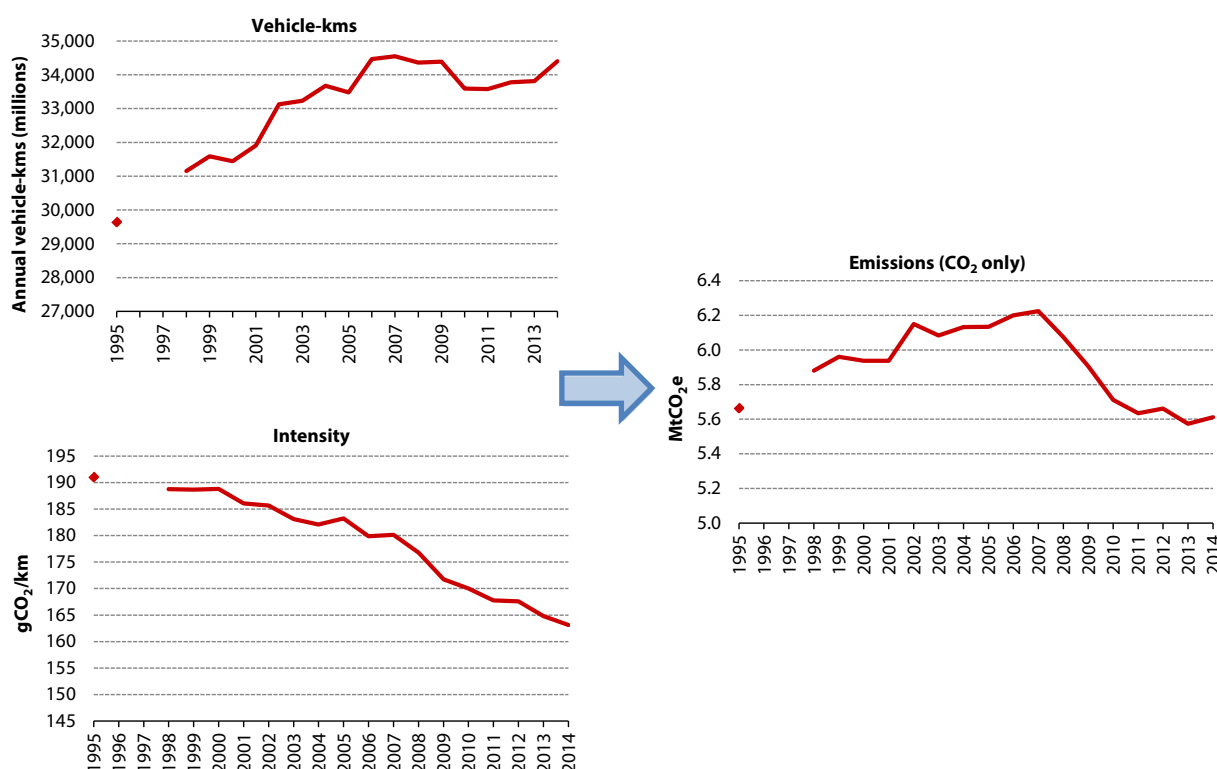
Figure 5.1. Transport emissions by mode (1990-2014)



Source: NAEI (2016) *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2014*, https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1606140853_DA_GHGI_1990-2014_Report_v1.pdf.

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

Figure 5.2. Historical trends in car vehicle-kms, gCO₂/km and emissions, Scotland (1995-2014)



Source: NAEI (2016) *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2014*, https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1606140853_DA_GHGI_1990-2014_Report_v1.pdf
 Transport Scotland (2016) *Scottish Transport Statistics No. 34 - 2015 edition, chapter 5: road traffic*, <http://www.transport.gov.scot/report/scottish-transport-statistics-no-34-datasets-8914> and CCC calculations
Notes: Inventory GHG data are not available for Scotland for 1996-1997.

Reducing emissions from transport in Scotland

Scotland's climate change targets require emissions to be reduced more rapidly than in the rest of the UK. Our High Ambition scenario, which is consistent with meeting existing emissions targets, identified 5.6 MtCO₂ of abatement in 2030 from measures to reduce surface transport emissions. The majority of the abatement is due to conventional vehicle efficiency improvements and increased uptake of electric vehicles and other ultra-low-emission vehicles, with smaller reductions from biofuels, behaviour change in passenger transport, improvements to freight operations and rail electrification.

To achieve these targets, additional policies will have to be put in place to accelerate uptake of low-carbon technologies and a greater reduction in demand for carbon intensive activities. Effort to-date has not been sufficient, with the RPP2 not including any policies on transport. The Climate Change Plan needs to go further, to put Scotland on clearly track to near-zero emissions from transport by 2050.

This section sets out current progress and the policy levers that Scotland could use to reduce its transport emissions more rapidly and highlights areas where a lack of devolved powers might make it more difficult to accelerate emissions reduction.

Milestones and progress

The Scottish Government is aiming for almost total decarbonisation of the transport sector by 2050 and has set a number of milestones for new car efficiency, electric vehicles, cycling and travel behaviour change. Achievement of targets depends on a mix of EU, UK and Scottish Government measures, namely EU car and van efficiency standards and Scottish measures to promote modal shifts and a switch to electric vehicles. Local authorities play a key role in implementing transport measures as they have control over a number of provisions including cycling plans, buses and concessionary travel.

As part of the devolution settlement, the Scottish Government has additional powers to set speed limits, which could reduce fuel consumption. They are also to get control over air passenger duty and have suggested that the duty might be cut by 50%. This could lead to increased carbon emissions if it were to result in an increase in flight and passenger numbers. There are no separate targets to reduce emissions from international aviation and shipping as these are largely set internationally, but they are included within Scotland's overall emission reduction targets.

In 2016, the Scottish Government published a refreshed National Transport Strategy which sets out the future of Scotland's transport infrastructure and services. The strategy includes three key strategic outcomes one of which is reducing emissions to tackle climate change, air quality and health improvement. The Carbon Account for Transport⁵² (CAT) meets a commitment contained in the strategy to help make decisions and develop actions to meet emission reduction targets by providing a structure for monitoring and reviewing progress. The latest update in 2015 estimates that by 2027 emissions from transport infrastructure and fiscal/regulatory projects would increase total transport emissions by 50 ktCO₂e. The CAT report should be used to promote those measures which reduce emissions, as well as minimising the impact of policies and projects that increase emissions.

New car efficiency

There has been good progress in improving new car efficiency in 2014 and 2015 (Figure 5.3), driven by the EU directive targeting 95 gCO₂/km by 2020.

CO₂ intensity of new cars fell from 128.3 gCO₂/km in 2013 to 124.4 gCO₂/km in 2014, a 3% reduction. The CO₂ intensity of new cars in Scotland fell by a further 2% in 2015, to 121.5 gCO₂/km. This is in line with the UK but higher than Wales and Northern Ireland. This outperforms the EU 2015 target of 130 gCO₂/km.

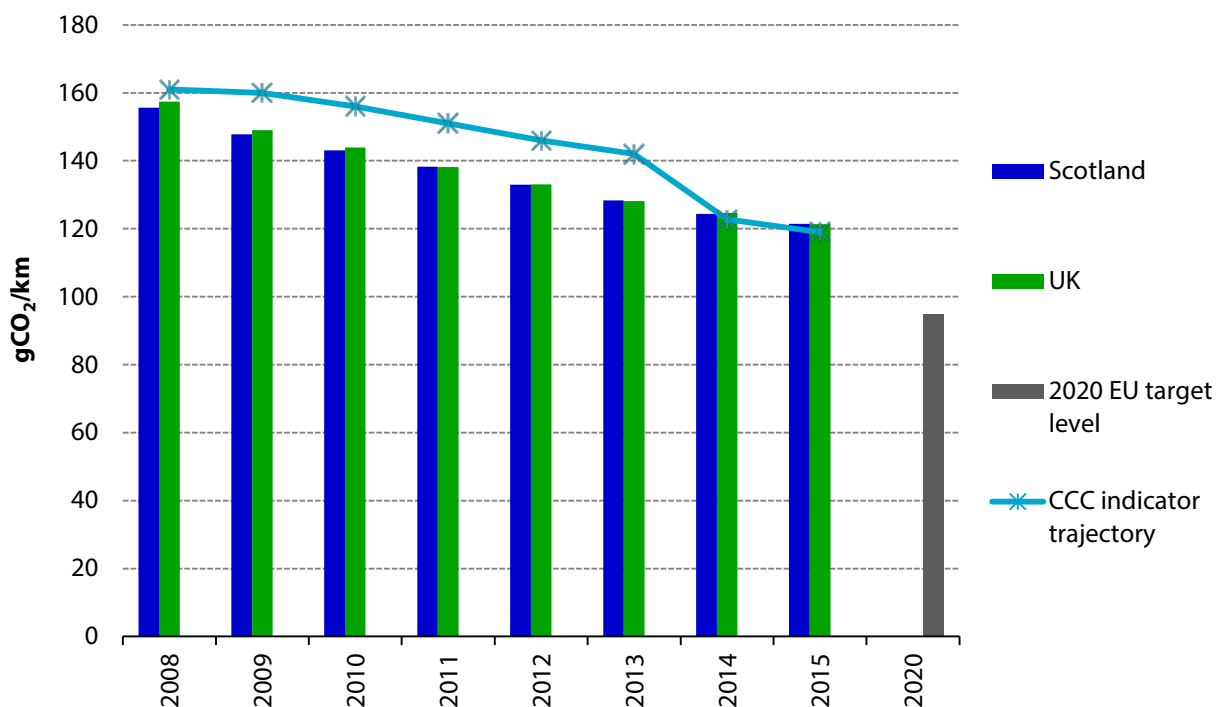
Although there is progress, there is evidence of a growing gap between test-cycle emissions and those achieved in real-world driving conditions, implying smaller reductions in gCO₂/km on the road. The latest evidence suggests that real-world emissions from new cars, in the EU in 2014, were around 40% higher than emissions as measured on the official New European Driving Cycle (NEDC) test-cycle, up from 24% in 2011.⁵³ Renault and Citroen published CO₂ intensity figures for a sample of their vehicles using a new protocol similar to the Real Driving Emissions (RDE) test procedure, in which a Portable Emissions Measurement system is attached to the vehicles

⁵² Transport Scotland (2015) *Carbon Account for Scotland No.7: 2015 Edition*, http://www.transport.gov.scot/sites/default/files/documents/rrd_reports/uploaded_reports/j408446/j408446.pdf

⁵³ ICCT (2015) *Laboratory to road: A 2015 update*, http://www.theicct.org/sites/default/files/publications/ICCT_LaboratoryToRoad_2015_Report_English.pdf

exhaust while it is driven on real roads. The results were emissions between 36% and 56% higher than the official NEDC values. The NEDC is due to be replaced with the Worldwide harmonised Light vehicle Testing Procedure (WLTP) from September 2017. There is evidence that the WLTP alone will not fully close the gap, but there are options to further reform the testing procedure. In September 2015 we commissioned work⁵⁴ to understand in more detail the specific contributions to the emissions gap for the UK car and van fleet. This found that the introduction of the WLTP would narrow the gap to around 23% in 2020. The study also found that the gap could be reduced to around 5% if CO₂ was tested using the RDE procedure and enforced by an independent testing authority.

Figure 5.3. New car gCO₂/km: Scottish and UK average and CCC indicator level (2008-2015)



Source: NAEI (2016), Scottish Government (2016) *Scottish Transport Statistics No. 34 - 2015 edition, chapter 5: road traffic*, <http://www.transport.gov.scot/report/scottish-transport-statistics-no-34-datasets-8914> and CCC calculations.

Electric vehicles

While it is important for Scotland to develop a market for EVs as part of the cost-effective path to meeting annual targets, the cost reductions needed to accelerate uptake will be driven by growth in the global market for EVs. The global outlook for EVs is looking increasingly positive, with battery costs falling more rapidly than previously anticipated and several governments and automotive manufacturers making public commitments to accelerate uptake.

⁵⁴ Element Energy (2015) *Quantifying the impact of real-world driving on total CO₂ emissions from UK cars and vans*, <https://documents.theccc.org.uk/wp-content/uploads/2015/09/Impact-of-real-world-driving-emissions-for-UK-cars-and-vans.pdf>

In 2016 the Scottish Government announced that £7.8m would be available in 2016/17 through the expanded Low Carbon Transport Loan Fund, to help businesses, taxi operators and consumers to reduce their transport emissions. The Scottish Government have said this will equate to 11,000 tonnes CO₂; the equivalent of removing over 4,000 cars from Scottish roads for a year.⁵⁵ There were 87 loans made in 2015/16 totalling just under £3m. It is a positive step to see funding more than double.

Rapid-charge points have been installed on Scotland's primary road network at 50-mile intervals, with Transport Scotland awarded £600,000 funding for 2014/2015. This will help to meet Scotland's target to have an electric vehicle (EV) charging infrastructure in place in Scottish cities, as well as significant progress in decarbonising road transport:

- At the end of June 2016, there were around 1,800 public charging points across Scotland.⁵⁶ On primary roads rapid-charge points are installed at 50-mile intervals.
- EV sales in Scotland increased 29% in 2015.
- The proportion of UK sales of EVs taking place in Scotland was 5% in 2015. This remains lower than Scotland's overall share of car sales in the UK (8%).

Scotland has a number of other schemes to encourage electric vehicle use in the home and workplace, along with public transport including the Scottish Green Bus Fund, ChargePlace Scotland, which enables EV drivers to charge their vehicles for free at the vast majority of publically available CPS points, and Switched on Fleets offering free analysis of public sector fleets. The Green Bus Fund met its target to have 269 new low-carbon buses by March 2016. Five rounds of awards were made by spring 2015 amounting to £13m. Round 6 is now closed but has application from 3 operators for around 60 buses. Funding for round 6 is available in financial year 2016/17 and totals £3m.

Despite progress in sales and charge points, central and local government should also continue to roll out softer measures to promote EVs to bring sales in line with share of overall car sales in Scotland. The government should also consider extending existing incentives to support the emerging market for ultra-low-emission HGV technologies.

Walking and Cycling

Scottish transport statistics shows that in 2015, 1% of journeys were by bike, well below the 2020 ambition of 10%. This figure has remained around 1% since 2003. The Minister for Transport has confirmed that the Scottish Government are still committed to this vision. A budget of £5.9m is available for walking and cycling infrastructure in 2016/17, and a review and update of the Cycling Action Plan 2013,⁵⁷ which highlights a number of actions, under broad themes of leadership and partnership, infrastructure integration and road safety, as well as promotion and behavioural change, will be published by the end of 2016. We will assess this in our next progress report in 2017.

⁵⁵ Scottish Government (2016), <http://news.scotland.gov.uk/News/Low-Carbon-Transport-Loan-Fund-doubles-2557.aspx>

⁵⁶ Zap Map, <https://www.zap-map.com/statistics/#charger-type>

⁵⁷ Transport Scotland (2013) *Cycling Action Plan for Scotland 2013*, http://www.transport.gov.scot/sites/default/files/documents/rrd_reports/uploaded_reports/j0002/CAPS_2013_-_final_draft_-_19_June_2013.pdf

Behaviour change

The following behaviour change milestones have been set:

- Personalised travel planning advice provided to all households.
- Effective travel plans in workplaces with more than 30 employees.

Progress in these areas is difficult to assess, although the Smarter Choices Smarter Places (SCSP) pilot programme has been seen as a success by Transport Scotland in terms of the outcome.⁵⁸ In 2015/16, a wider roll-out of behaviour change initiatives was undertaken, supporting 160 projects, in partnership with local authorities and with "Paths for All" administering the programme. These included a fleet of electric bicycles and promotion for residents and visitors to the Orkney Islands, as well as across Scotland a number of online planning tools, pilots of 20mph speed zones, cycle trainings, and advertising of travel planning tools. Personalised and workplace travel plans are being delivered by some local authorities as part of projects under SCSP. Other partners such as Sustrans Scotland also delivered local projects that incorporate travel planning.

Transport Scotland has agreed a further £5m funding in 2016/17 for Smarter Choices, Smarter Places and Paths for All will continue to administer the programme and provide support for the projects, including planning, implementation and evaluation. For funding, proposals are required from each local authority on the programme of work they intend to take forward in 2016/17 with this resource. It is recognised that behaviour change is a long-term process and so in principle there is a desire to secure further funding to continue this programme beyond March 2017. This will form part of Transport Scotland's budget planning process.

There was an evaluation report for Smarter Choices Smarter Places (Going Smarter) in 2013. A follow-up evaluation for the 2015/16 programme has been commissioned and is expected to be published later in 2016.

Sustrans also deliver active travel plans to workplaces which include cycle to work schemes and workplace training.

Rail electrification

The Scottish Government has a rolling programme of electrification which forms part of a wider £5bn investment package for Scotland's railway infrastructure. Of the 2,776 km of rail track in Scotland, 25.3% (711 km) is electrified. The programme has to-date delivered the Airdrie to Bathgate Railway and the £12m Paisley Canal electrification project. The Edinburgh to Glasgow via Falkirk line is to be completed by December 2016.

⁵⁸ Scottish Government (2013) *Monitoring and Evaluation of the Smarter Choices, Smarter Places Programme Going Smarter*, [http://www.transport.gov.scot/system/files/documents/tsc-basic-pages/SCSP - Goingsmarter - Final version - Do not edit.pdf](http://www.transport.gov.scot/system/files/documents/tsc-basic-pages/SCSP_-_Goingsmarter_-_Final_version_-_Do_not_edit.pdf)

Scottish opportunities to reduce emissions

There are several areas in which Scotland could implement more ambitious policies than the rest of the UK in order to reduce transport emissions more rapidly, including local authority schemes to promote Ultra-Low-Emission Vehicles (ULEVs), local freight strategies and air passenger duty.

Local measures to promote ULEVs: Measures that make electric vehicles and other ULEVs⁵⁹ more convenient or attractive than higher emitting alternatives could be implemented by Scottish local authorities (LAs), supported by the Scottish Government, as an important complement to national policies. In 2015, the Low Carbon Vehicle Partnership published a guide⁶⁰ for LAs on how to implement specific measures. Key examples include:

- Provision of recharging infrastructure is key to encouraging uptake of ULEVs, enabling the convenient recharging of both private cars and heavily utilised taxis and commercial vehicles. There are several policy tools that can be used to increase infrastructure provision:
 - Planning policy can be used to require new buildings, renovations or developments to provide recharging infrastructure.
 - Provision of public recharging infrastructure by LAs, such as fast and rapid recharging points in town and city centres.
 - Grants or loans from LAs to help businesses provide recharging infrastructure for their employees and customers.
 - Discounted electricity for recharging.
- Preferential access can provide additional time saving or financial incentives:
 - Road access: Giving ULEVs access to dedicated road space, such as high-occupancy vehicle lanes or bus lanes.
 - Parking access: Discounted or free access to parking spaces.
 - Low-emission zones: Low-emission zones can be introduced in congested urban centres to reduce the impacts of air pollution. Higher emitting vehicles entering these zones face a charge and ULEVs are usually exempt. Scottish Government has a Low Emission Zone framework already in place which could be expanded.⁶¹

These access-based incentives are only likely to be viable whilst ULEVs make up a relatively small fraction of the fleet. As ULEV uptake grows, dedicated road space could become congested reducing the value of the incentive to users and impacting more heavily on revenues from parking and low-emission zones. Other options include:

- Use of ULEVs in the public sector, such as LA, NHS, police or fire service fleets, can help to provide public exposure to ULEVs and demonstrate that they are suitable for a range of practical and demanding applications.

ULEV car clubs and taxi services can provide more direct exposure to ULEVs, helping to raise awareness by allowing members of the public to drive or be the passenger in a ULEV. The number of private car trips could also be reduced by integrating car clubs and taxi services into the wider public transport network.

⁵⁹ Such as hydrogen fuel cell vehicles.

⁶⁰ Urban Foresight for Low CVP (2015) *Local measures to encourage the uptake of low-emission vehicles*.

⁶¹ Scottish Government National Low Emission Zone Framework,
<http://www.gov.scot/Publications/2015/01/3287/10>

Local measures to promote active travel and low-emission public transport: Measures that promote switching from car travel to active and lower-emission public transport modes can make an important contribution to cutting emissions. Many of these measures can be implemented by Scottish local authorities, with support from the Scottish Government:

- Improved and expanded infrastructure for walking, cycling, bus and rail can make these modes safer and more attractive relative to travelling by car.
- Land-use planning which seeks to prioritise developments with convenient access to active and public transport infrastructure could help to minimise car use.
- Smart ticketing and integration of different modes can enable seamless and convenient car-free journeys.
- Travel planning and information can help the public to identify opportunities to use non-car modes and highlight the financial and health benefits of walking and cycling.

Improved freight operations: Emissions from HGVs can be reduced by promoting more efficient logistics practices that increase average vehicle fill and reduce the number of HGVs on the road⁶². Scottish local authorities and the Scottish Government can play a role in promoting these practices:

- Urban Consolidation Centres (UCCs) are logistics hubs that can be used by multiple, often collaborating, freight operators to consolidate freight into a smaller number of HGVs for onward delivery. Land-use planning policy can be used to encourage the construction of UCCs on the edge of urban areas. Low-emission or congestion zones can also be used to incentivise operators to reduce the number of HGVs that enter urban areas.
- Modal shift of freight to rail can be promoted through land-use planning policy to encourage the construction of intermodal freight exchanges at strategic locations on the transport network.

Measures to promote efficient driving: As car emissions vary with factors such as speed and acceleration, improving driving style can play an important role in reducing emissions:

- Driving at higher speeds can reduce fuel efficiency due to factors such as additional air resistance. Our analysis suggests that reducing driving speed from 70mph to 60mph can reduce car emissions by around 8% on average. The Scottish Government has powers over enforcement and setting of speed limits.
- Intelligent Transport Systems can be implemented on motorways and dual carriageways to help reduce congestion and promote smooth driving over stop-start driving, which typically uses more fuel and has higher emissions. The Scottish Government is already implementing Intelligent Transport Systems on some parts of the motorway network.

⁶² CfSRF (2015) *An assessment of the potential for demand-side fuel savings in the HGV sector*, <https://documents.theccc.org.uk/wp-content/uploads/2015/11/CfSRF-An-assessment-of-the-potential-for-demand-side-fuel-savings-in-the-HGV-sector.pdf>.

Road pricing: The Scottish Government has the power to introduce a system of tolls on the road network. These could be used to help reduce emissions by differentiating the charges according to vehicle emissions, exempting the lowest emitting vehicles. Such measures are considered controversial and are not included in Committee's emission reduction scenarios for Scotland, but they should be considered if deeper emissions reductions from road transport are required.

Whilst there is much more that could be done to accelerate emissions reductions, Scotland is already achieving progress in some areas, such as use of ULEVs in public sector and public transport fleets (Box 5.1).

Box 5.1. Case studies of progress in reducing emissions from transport in Scotland

Measures to promote electric vehicles in Dundee

Dundee has been ahead of many UK cities in rolling out measures to promote electric vehicles (EVs). Dundee has the largest council EV fleet in the UK, with 60 vehicles in total. It also has the UK's "most extensive" urban rapid-charge network. EV uptake is also increasing beyond the council fleet, with city taxi companies and the University of Dundee adding EVs to their fleets.

Aberdeen Hydrogen Bus Project

Aberdeen has set up a collaborative partnership of industry and public sector organisations to fund the world's largest demonstration of hydrogen fuel cell buses. This comprises a fleet of 10 hydrogen buses, fuelled by hydrogen produced by onsite electrolyzers. A small fleet of hydrogen/diesel hybrid vans and fuel cell range extended electric vans has also been launched as part of the project. Aberdeen has also developed a hydrogen strategy for the city, with ambition for wider use of hydrogen as a fuel in future.

Source: Scottish Government (2015) *Cleaner Air for Scotland – The Road to a Healthier Future*, <http://www.gov.scot/Publications/2015/11/5671/9>

Barriers to going further

Whilst there is scope to go further in transport decarbonisation, there are several barriers that could limit the extent to which Scotland is able to reduce its transport emissions. The measures identified for Scotland may be challenging to implement with powers currently devolved to the Scottish Government:

- **Limited fiscal levers:** As relatively few taxes are devolved, the Scottish Government has a limited ability to provide fiscal incentives for ULEVs or to fund new ULEV grant schemes through general taxation:
 - The Scottish Government does not have the power to set fuel duty or vehicle taxes, such as Vehicle Excise Duty or Company Car Tax, which could be adjusted to provide a greater incentive to purchase lower emitting vehicles.
 - Extension of the grant funding for ULEVs could be a way of accelerating their uptake especially as costs of EVs fall, but this is likely to require significant additional revenue funding as uptake increases.
- **Limited influence on the regulatory regime:** Stretching vehicle emissions standards beyond 2020, tested using more representative procedures, will be a crucial policy measure

to reduce emissions from vehicles. These regulations are currently implemented at an EU level and Scotland's influence over the level of ambition in the targets is likely to be limited.

- **Geographical issues:** Scotland has a slightly higher proportion of population living in very remote areas than the UK as a whole, which could make the adoption of electric vehicles with limited range more challenging in these areas. Within these locations infrastructure is

not ready, and a switch should not take place until it is. However, the overall distribution of trip distances for Scotland as a whole is broadly similar to the rest of the UK⁶³, with around 80% of the population living in urban areas, so the scope to reduce emissions should not be significantly affected by this, or prevent the widespread roll-out to large groups of the population where infrastructure and driving habits make EVs a real option. Nonetheless, care should be taken to choose appropriate measures for different locations. For example, plug-in hybrid vehicles might be well suited to remote villages where there is an occasional need to make very long journeys, whereas significant improvements in electric range and expansion of the rapid recharging network may be needed before battery electric vehicles can be used in such locations.

Air Passenger Duty

The Scottish Government have proposed to reduce Air Passenger Duty (APD) by 50% by the end of the next Scottish Parliament, and to abolish it completely when resources allow. All else being equal this will tend to increase demand for aviation. Total aviation emissions in Scotland are 1.6 MtCO₂e and the Government's APD consultation paper estimated that a 50% cut would lead to a maximum increase in emissions of around 0.06 MtCO₂e (i.e. around a 4% increase; 0.1% of total Scottish emissions).⁶⁴ This is therefore likely to be manageable, but will require additional emission reductions to be made elsewhere in the economy in order to stay within legislated targets. Within the Climate Change Plan there needs to be a credible overall strategy for aviation that is in line with its climate obligations and what comes out of the ICAO agreements.

Recommendations

Progress in previous recommendations is shown in Table 5.2. We also recommend that the Climate Change Plan includes strong policies for emission reduction in the transport sector. These should focus on:

- Promote local policies to reduce demand through shifts to public transport, cycling and walking.
- Develop policies to meet 65% uptake of EVs in new car sales by 2030. Include support for upfront cost and roll-out of incentives such as preferential road access and free parking.
- Set out a policy to promote efficient driving.
- Roll-out new policies to reduce emissions from HGVs under devolved powers, i.e. driver training, use of Urban Consolidation Centres, and a modal shift to rail.
- Produce an aviation strategy which is in line with climate obligations and International Civil Aviation Organisation agreements.

⁶³ CCC (2016) *Scottish emissions targets 2028-2032: Transport Technical Annex*, <https://documents.theccc.org.uk/wp-content/uploads/2016/03/Scotland-Advice-Transport-Annex.pdf>.

⁶⁴ <http://www.transportscotland.gov.uk/report/j340458-01.html>

Table 5.2. Recommendations from 2015 progress report

Recommendation	Progress
The Scottish Government and Scottish local authorities should consider introducing measures to break non-financial barriers to electric vehicles (EVs), e.g. through free or preferential access to parking and bus lanes and through raising awareness about EVs through public procurement.	Ongoing. There has been progress made to promote uptake of EVs with increasing sales, although the proportion of sales is still below overall share of car sales.
'Smarter Choices Smarter Places' programme should be extended beyond 2016 to allow funding of longer-term behaviour change programmes.	Complete.
The Scottish Government should consider other options to drive down emissions such as congestion charging.	Ongoing.
Speed limits are likely to be fully devolved to Scotland in the future. The Scottish Government should evaluate how speed limits (in particular greater enforcement) could help with meeting carbon targets.	Complete. Average speed reductions have taken place on the A9 and the A77. A model has been designed to estimate carbon savings from speed limit changes on trunk roads and motorways. It has not been developed into a full appraisal but it is a tool that has been tested.
Air passenger duty is also likely to be devolved in the future. The Scottish Government should assess the carbon impact of any proposed changes to the duty.	Complete. Transport Scotland ⁶⁵ estimated that a 50% reduction in APD could lead to an increase in Scotland's annual CO ₂ emissions by the equivalent of between 0.05 and 0.06 MtCO ₂ .

⁶⁵ Transport Scotland (2016) *Estimate of the Impact on Emissions of a Reduction in Air Passenger Duty in Scotland*, <http://www.transport.gov.scot/report/j340458-01.htm>



Chapter 6:

Agriculture, rural land use and forestry

Summary of progress

Table 6.1. Summary of progress	
Milestone	Progress
Reduction target for agriculture of 1.3 MtCO ₂ e from 2006 levels by 2020 to help towards a 42% reduction by 2020 in all emissions.	Since 2006 emissions in agriculture have decreased 1.5 MtCO ₂ e (13%). However, this target is difficult to assess due to uncertainties in the methodology used to measure agricultural emissions since it was set.
Increase afforestation rate to plant 10,000 hectares per year, with 100,000 hectares planted by 2022.	<p>Tree planting rates are markedly below the rates seen in the 1970s. The 10,000 hectare target has yet to be achieved:</p> <p>Around 8,300 hectares of new forest were planted in 2014; this fell to 7,600 hectares in 2015.</p> <p>Rates will have to rise substantially if 100,000 hectares are to be planted by 2022.</p>

Overview

Agriculture and land use are devolved to the Scottish Government. The key scheme for Scotland is the Scottish Rural Development Programme (SRDP) which funds economic, environmental and social measures for the benefit of rural Scotland. The key purpose for the SRDP 2014 -2020 is to help achieve sustainable economic growth in Scotland's rural areas such as woodland creation, agro-forestry, and beef efficiency. Given the role that SRDP funding can play with regards to emissions savings, the Scottish Government should look to agree new arrangements or adapt existing arrangements as appropriate.

However, there are EU policies in place that also influence emissions savings, such as the Common Agriculture Policy (CAP). The impact of the UK's vote to leave the EU on emissions savings in agriculture is highly uncertain at present. The main impact on emissions savings from possible CAP withdrawal would most likely result from the changes in funding from the agri-environmental schemes under what is now CAP Pillar Two.

Rural land use emissions and sequestration are addressed through a combination of improved agricultural practice, woodland creation and management, and peatland restoration:

- The Climate Change Delivery Plan (June 2009) proposed a reduction target for agriculture of 1.3 MtCO₂e by 2020. This is the equivalent of a 10 % reduction in emissions in the agricultural sector.
- Increase afforestation rate to plant 100,000 hectares over a 10-year period.

Emission trends and drivers

Emissions from the agriculture sector are largely non-CO₂ gases, with over half (57%) due to methane and almost one third (31%) due to nitrous oxide (N₂O). Enteric emissions make up 30%, followed by agricultural soil emissions (27%). The biggest sources of emissions in land use are related to agriculture and developments (the conversion of land to settlements). However, these are more than offset by carbon sequestered from forestry and grassland which were a net emissions sink in 2014, absorbing around 10 MtCO₂e.

Emissions from lowland peat and the horticultural use of peat are included in emissions accounting, but emissions from upland peatlands are not captured. This is an issue for Scotland, where most of the UK's upland peat is located. Similarly, carbon sequestration from the restoration of peat (e.g. re-wetting of peatland) is not currently captured in the emissions inventory.

There is ongoing uncertainty in the emissions inventory for the agriculture, land use and forestry sector, in particular agriculture, for Scotland and for the UK as a whole. This is the subject of a current research programme, which has started to feed through into improvements in the accuracy of the inventory. The Smart Inventory is to be delivered by 2017. Scotland is taking a lead within the UK on research on measuring agriculture emissions. Changes to the inventory this year have resulted in downward revisions across the whole time series, largely relating to N₂O emissions from agricultural soils.

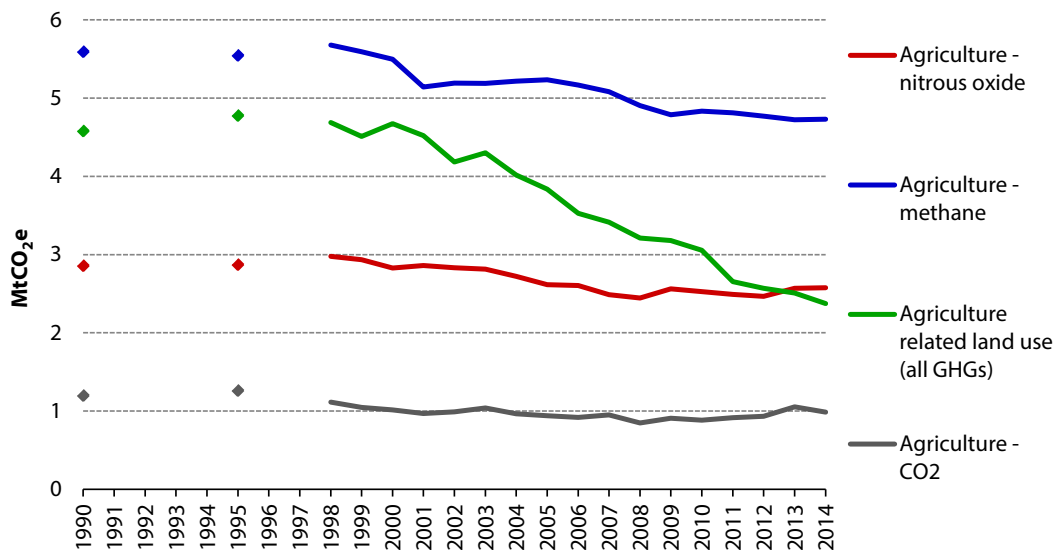
Current estimates show that emissions from agriculture and related land use were about 11 MtCO₂e in 2014, 23% of Scotland's total (compared to around 9% at the UK level). Emissions rose 1% in 2013 before falling by nearly 2% in 2014. Average annual falls of around 1% occurred between 2009 and 2014. Emissions were 25% lower than 1990 levels in 2014 (Figure 6.1). The figures (subject to the uncertainty noted above) in the inventory break down as follows:

- Methane emissions fell by 15% between 1990 and 2014, from 5.6 MtCO₂e to 4.7 MtCO₂e, as a result of falling numbers of livestock and improving livestock productivity. Emissions have stayed largely the same since 2009.
- Nitrous oxide emissions declined by 10% between 1990 and 2014 to 2.6 MtCO₂e, reflecting a reduction in the use of fertiliser, although emissions have remained largely the same since 2009.
- Emissions from agriculture-related land use fell by 48% between 1990 and 2014, dropping from 4.6 MtCO₂e to 2.4 MtCO₂e. This was driven by a reduction in emissions from land converted to cropland. Emissions declined by 5% in 2014, with average falls of 5% per year since 2009.
- CO₂ emissions from on-farm stationary (e.g. heating farm buildings) and mobile (e.g. tractors and harvesters) combustion were 0.8 MtCO₂e in 2014, having declined 19% since 1990.
- Land use related to development accounted for 3% of overall Scottish emissions in 2014, at 1.6 MtCO₂e. This was 0.5% lower than 2013, but 14% below 1990 levels, and reflected a small decrease in the conversion of grassland to settlements in 2014.

The forestry sector in Scotland is a net emissions sink. The size of the sink decreased slightly in 2013 and again in 2014 (1% per year) to around 10.2 MtCO₂e per year, with an average annual decrease of 0.6% between 2009 and 2014. However, the sink is 16% larger than in 1990 (Figure 6.2). The rate of increase has been slowing since 2004, reflecting low tree planting rates

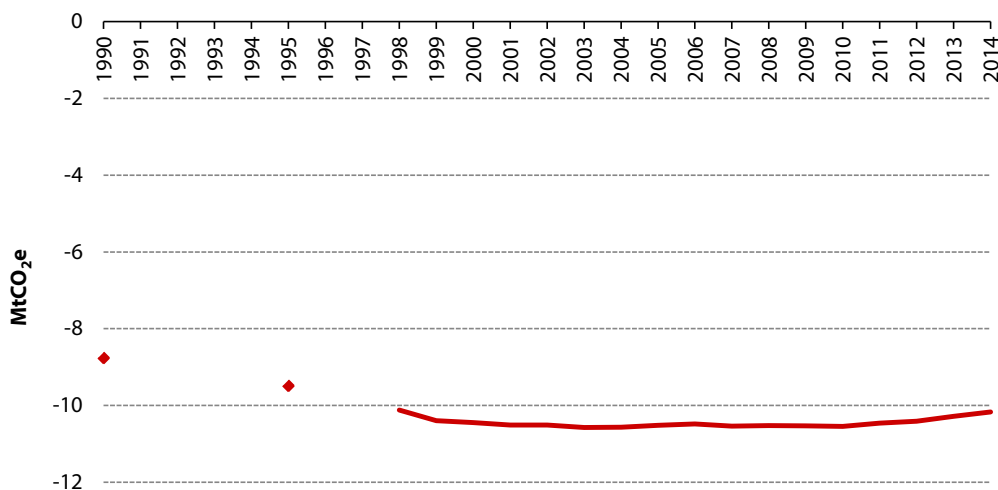
historically – current net carbon sequestration rates are currently reducing year-on-year due to the lower proportion of young trees in Scottish forests.

Figure 6.1. Agriculture and related land use emissions (1990-2014)



Source: NAEI (2016) *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2014*, https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1606140853_DA_GHGI_1990-2014_Report_v1.pdf
Notes: Inventory GHG data are not available for Scotland for 1991-1994 or 1996-1997.

Figure 6.2. Forestry emissions (1990-2014)



Source: NAEI (2016) *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2014*, https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1606140853_DA_GHGI_1990-2014_Report_v1.pdf
Notes: Inventory GHG data are not available for Scotland for 1991-1994 or 1996-1997.

Opportunities for emission reductions

Emissions from agriculture and related land use make up the third largest emission sector (after energy supply and transport) with 23% of emissions. Within this, agriculture accounts for a 19% share and land use (including forestry) accounts for 4%. Reductions in the sector have not occurred at the rate required to meet targets. The Climate Change Plan needs to include a detailed plan with clear objectives based on emission reductions identified in our High Ambition Scenario for Scotland.⁶⁶ We believe that the Scottish Government aims to do more, but if it continues with voluntary measures it will need to be clear how these will be judged and what would trigger wider measures. Agriculture is an area that may benefit from greater international collaboration, and that should be given serious momentum.

The main measures that could be implemented to reduce emissions from farming practices and agriculture related land use include livestock health, livestock diets and breeding, waste manure and management, on farm fuel efficiency, and crops and soil management. Our annual targets advice High Ambition scenario identifies 1.5 MtCO₂e of savings by 2030 from these measures.

Forestry acts as a carbon sink in Scotland, removing 10 MtCO₂e. The main measures that would be deployed to increase the carbon sink and slow the release of emissions are planting trees and minimising carbon losses from degraded peatland and other soil types. In addition to the carbon benefits, there are synergies with efforts to adapt to climate change. For example, the restoration of peatland can improve water quality, while the creation of agro-forestry systems can enhance biodiversity and improve soil structure and fertility. In our annual targets advice our High Ambition scenario identified the planting of trees from both the creation of new woodland and the integration of trees and shrubs into existing arable and grassland systems (e.g. agro-forestry) as measures that could deliver 1.6 MtCO₂e of savings by 2030.

Progress in developing policy to reduce emissions and meet targets

Scotland has a number of initiatives to help meet targets and reduce emissions which we consider in the following sections. Alongside these the Scottish Government is considering a number of policies and proposals for inclusion within the Climate Change Plan. The government has assessed our measures identified in marginal abatement cost curve (MACC) developed by Scotland's Rural College (SRUC) and are aiming to align action to these. Where existing literature does not specify suitability for Scotland they are commissioning work to test applicability to Scottish circumstances.⁶⁷ This is a positive step towards improved targeting of policy and action in areas where emissions can be reduced in a cost-effective way.

It is important to note that many of the actions set out below have wider benefits. In September 2016, the Adaptation Sub Committee will also provide an assessment of progress towards implementing the objectives, proposal and policies in the Scotland Climate Change Adaptation Programme (SCCAP). The Adaptation Sub-Committee have also set out the risks from climate change to Scotland in the 2017 UK Climate Change Risk Assessment (CCRA) Scotland National Summary.⁶⁸ Those two reports considered the natural environment (including soils and

⁶⁶ Developed from the Scotland's Rural College (SRUC) Marginal Abatement Cost Curve (MACC) (2015), <http://documents.theccc.org.uk/wp-content/uploads/2016/03/Scottish-Emissions-Targets-2028-2032.pdf>

⁶⁷ Research includes a comparative analysis of slurry management in Scottish Farming Systems and evidence assessment of probiotics and other additives in livestock feed.

⁶⁸ CCC (2016) *UK Climate Change Risk Assessment 2017 Evidence Report Summary for Scotland*, <https://documents.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Scotland-National-Summary.pdf>

peatland) in detail. Many of the actions that help reduce emissions will also help to preserve the natural environment.

Agriculture

Culture and behaviour change

The main programme for encouraging behaviour change across farms in Scotland is the Farming for a Better Climate initiative (FFBC) launched by the Scottish Government and Scotland's Rural College in 2009 with £375,000 funding per year. It is designed to encourage voluntary uptake of win-win actions in five key action areas:

- Using energy and fuels efficiently
- Developing renewable energy
- Locking carbon into soil and vegetation
- Optimising application of fertilisers and manures
- Optimising livestock management and storage of waste

As part of the initiative, Scotland's Rural College now work with nine volunteer farmers, other local farmers and industry specialists to identify and demonstrate mitigation measures that could be applicable to various different types of farms. An evaluation of the first phase of the programme demonstrated savings in greenhouse gas emissions from the focus farms of around 10-12%, despite challenging weather conditions. A series of workshops to showcase successful measures and practices have been well attended by farmers, although there is no follow-up as to how many farms implement measures. We have recommended previously that monitoring how many farmers have adopted or aim to adopt particular measures would be useful to understand the impact of FFBC fully.

Scotland's Farming Innovation Network is a £200,000 three-year initiative that started in 2013, which aims to inform and inspire farmers and growers to implement best management practices for sustainable and profitable agriculture based on organic, low input and low-carbon principles. It is delivered by the Soil Association Scotland and is funded by the Scottish Government's Scotland Rural Development Programme with co-funding from industry.

Soils

In 2015 the Scottish Government announced plans for compulsory soil testing every five to six years for arable and temporary grass. They will maintain a database of results which will inform farmers of the costs of over applying fertiliser. If compulsory testing does not work, we recommend considering introducing a fertiliser ration or quota system.

Nitrogen use

The Scottish Government announced in 2014 a requirement for nutrient management planning by some farmers as part of the CAP Greening element. At present the requirement has not been fully confirmed and only applies to grassland farmers, but it could be a model for fertiliser reduction and efficiency on other farms. Alongside this, the RPP2 has a proposal to achieve a 90% uptake of cost-effective nitrogen efficiency measures, which could be regulated. Further

work is being undertaken by the Scottish Government on reducing demand and use, for example using clover and legumes.

Livestock efficiency

Under CAP Pillar Two the five-year beef efficiency scheme⁶⁹ aims to reduce emissions from beef production and also improve overall herd profitability. It has £45m of funding for the first three years to incentivise farmers to take part.

In 2016 the Scottish Government commissioned ClimateXChange to produce a report on livestock health and GHG emissions.⁷⁰ Dealing effectively with endemic livestock diseases represents an opportunity to reduce emissions by reducing the impact of diseases on the efficiency and sustainability of livestock. The report found that GHG emission savings were identified for twelve livestock diseases, but some proved more tractable than others. Overall, the evidence suggests that emissions intensity could be reduced through a number of control measures, in particular for three diseases⁷¹ which were considered more cost-effective and feasible to control. The Scottish Government should consider a focus on managing these diseases.

The Scottish Government is also considering policy action in the Climate Change Plan to reduce emissions from enteric fermentation in livestock production. They have commissioned ClimateXChange to assess the existing evidence base for the effectiveness of probiotics, nitrates, high fat diets and essential oils from sources such as clover, eucalyptus, garlic and oregano as well any other feed additives or supplements aimed at the reduction of methane from enteric fermentation. It will address health and welfare, practical feasibility (including opportunities and challenges), logistics, broader environmental impact and cost-benefit analysis.

Slurry and manure

Scotland's anaerobic digestion (AD) industry grew by more than two thirds between 2014 and 2015. The Anaerobic Digestion and Bio resources Association show that there are 27 AD projects operational, with a further 43 in planning approval. Issues that have occurred from AD on farms in recent years have been due to lack of knowledge and expertise in maintaining the systems. To overcome this the Scottish Government could look at the potential of co-operative schemes where one farmer is fully trained and manages a number of other farmer's plants.

The Scottish Government have commissioned work from ClimateXChange to produce a comparative analysis of the existing evidence base as it applies to Scottish farming systems to inform their understanding of the policy options available to them for the delivery of effective reduction in GHG emissions from the management and use of slurry and manure.

Energy efficiency and renewables

The UK Government has made changes to the Feed-in Tariff (Chapter 2) which supports small-scale generation technologies including AD. Tariffs have changed and pre-accreditation has

⁶⁹ Scottish Government, <https://www.ruralpayments.org/publicsite/futures/topics/all-schemes/beef-efficiency-scheme/>

⁷⁰ ClimatexChange (2016) *Livestock Health and Greenhouse Gas Emissions*, http://www.climatexchange.org.uk/files/7414/6054/5380/Livestock_Health_and_GHG.pdf

⁷¹ The three diseases are: neosporosis (beef cattle); infectious bovine rhinotracheitis, IBR (dairy cattle); and parasitic gastroenteritis, PGE (sheep).

been removed such that installers under FiTs now risk receiving lower than expected tariffs in the event of a delay. However, for AD there is now a one-year pre-accreditation.

The Scottish Government also has a number of funding options for community and locally-owned projects, such as The Community and Renewable Energy Scheme (CARES) (Chapter 2). The fund provides loans towards the high-risk, pre-planning consent stages of renewable energy projects which have significant community engagement and benefit.

Land use

Scotland's second land-use strategy⁷² was published in March 2016. It retains the long-term vision of the first strategy; three objectives relating to the economy, environment and communities; and the Principles for Sustainable Land Use to guide policy and decision making by Government and across the public sector. It builds on the experience of the two Regional Land Use pilot projects (Box 6.1) and contains activities for the next five years including themes such as agriculture, Scottish Rural Development Programme, forestry and the uplands as well as land-use decision making at a local level. Opportunities exist within to adapt land-use to future climate environments. The Government will develop and publish a more detailed reporting framework for the strategy by December 2016.

Box 6.1. Aberdeenshire Land Use Strategy Pilot

Aberdeenshire Council carried out one of two regional pilots for the Scottish Land Use Strategy on behalf of Scottish Government. The two Pilots, the other led by Scottish Borders Council, were asked to pilot a mechanism which:

- Considered existing and future land uses in an integrated way
- Established a means to prioritise and guide decisions to optimise the use of land, and
- Helped resolve competition or conflicts relating to future land-use change.

The Aberdeenshire Pilot was primarily focused on issues of rural land-use change. The key aim of the Pilot was to create a framework which summarised policy and environmental information for users and indicated where particular types of land-use change might be beneficial or detrimental in line with policy goals and climate change mitigation/adaption. The Pilot operated at two geographic scales, the first being the full Aberdeenshire local authority area and the second being two local focus areas (the Upper Dee within Cairngorms National Park boundary and the Huntly area). In these local focus areas, the James Hutton Institute carried out extensive community and landowner engagement on land-use change issues.

A number of potential beneficial aids to land-use change decision making have been created, including an Overview Report of land-use change in the region and a web-based interactive tool. The results found that consultation at both the local and regional level greatly benefitted the process, and there is strong support for more integrated, holistic rural land-use planning.

Source: Aberdeenshire Council Land Use Strategy Pilot, <https://www.aberdeenshire.gov.uk/environment/energy-conservation/aberdeenshire-land-use-strategy-pilot/>

⁷² Scottish Government (2016) *Getting the best from our Land*, <http://www.gov.scot/Resource/0049/00497086.pdf>

Peatlands

Our High Ambition scenario for Scotland does not include actions aimed at reducing carbon losses from peatland because of the need to better understand the impact of different emissions reduction measures, and the omission of some peat sources from the current inventory.

However, Scottish peatlands are a large carbon store and degraded peatlands risk significant carbon emissions whether or not they are currently accounted for in the inventory.

Peatlands cover 1.7m hectares, approximately 23% of Scotland's land area, and contain up to 1.7 gigatonnes of carbon. Scottish peatlands account for 60% of the UK's peatlands and 4% of Europe's total peat carbon store. Historically, these peatlands have been damaged or drained, but there has been little drainage over the past two decades.

Peatlands supporting bog habitats can, in favourable states, deliver annual greenhouse gas savings through sequestration of up to 0.5-0.7 tonnes carbon per hectare per year. Peatlands in Scotland covering 1.7m hectares could therefore potentially deliver around a million tonnes of carbon sequestration per annum.

It is therefore important that action is taken to improve the condition of degraded soils, and to limit damaging practices such as horticultural use and intensive rotational burning on upland moors. In our CCRA Scotland National Summary we advise that more action is needed to restore degraded carbon stores particularly peatlands, as climate change may have direct impacts on the ability of soils and vegetation to sequester and store carbon. The Scottish Government should also encourage good practice in heather and grass burning to avoid damage to peatlands and ensure that detailed management plans are produced for restorations. However, steps are being taken by Scottish Government to restore peatland habitat by incentivising the private sector.

Scotland's 2014 National Peatland Plan: Working for our Future⁷³ sets out proposals for research and awareness-raising. The main aim set out in the plan is to manage, protect and restore peatlands to maintain their natural functions, biodiversity and benefits. By 2020, the plan aims to see:

- No more loss of peatlands with their condition improving rather than deteriorating.
- A Peatland Code will be in place governing private funding of peatland conservation and restoration, and peatland management included in national carbon accounting.
- The Flow Country (a large area of peatland and wetland in Caithness and Sutherland) will have moved from the UK Tentative List towards being a fully inscribed World Heritage Site.

The plan contains a sensible objective but does not define a mechanism for action in these areas.

The Peatland Action project began in 2012 to deliver restoration. In June 2015 a further £3m was announced that has enabled the project to undertake restoration of another 3,000 hectares, building on the nearly 6,000 hectares that saw physical restoration work between 2013 and 14.⁷⁴ From April 2016 the project will offer advice on applications for the SRDP which has £10m

⁷³ Scottish National Heritage (2015) *Scotland's National Peatland Plan*, <http://www.snh.gov.uk/docs/A1697542.pdf>

⁷⁴ Scottish National Heritage, <http://www.snh.gov.uk/climate-change/taking-action/carbon-management/peatland-action/information-for-applicants/>

funding stream devoted to peatland restoration, whose management options include upland, peatland, moorland and heath options, and wetland and bog options.

Forestry

Tree planting rates have been declining since the 1970s, reaching a low of just 2,700 hectares in 2010 (Figure 6.3). They have increased since then, largely as a result of the Scottish Rural Development Plan (SRDP), and the RPP2 contained a policy to increase the afforestation rate to 10,000 hectares per year, creating 100,000 hectares by 2022. The 10,000 hectare target has yet to be achieved:

- Around 8,300 hectares of new forest were planted in 2014; this fell to 7,600 hectares in 2015.
- Rates will have to rise substantially if 100,000 hectares are to be planted by 2022.

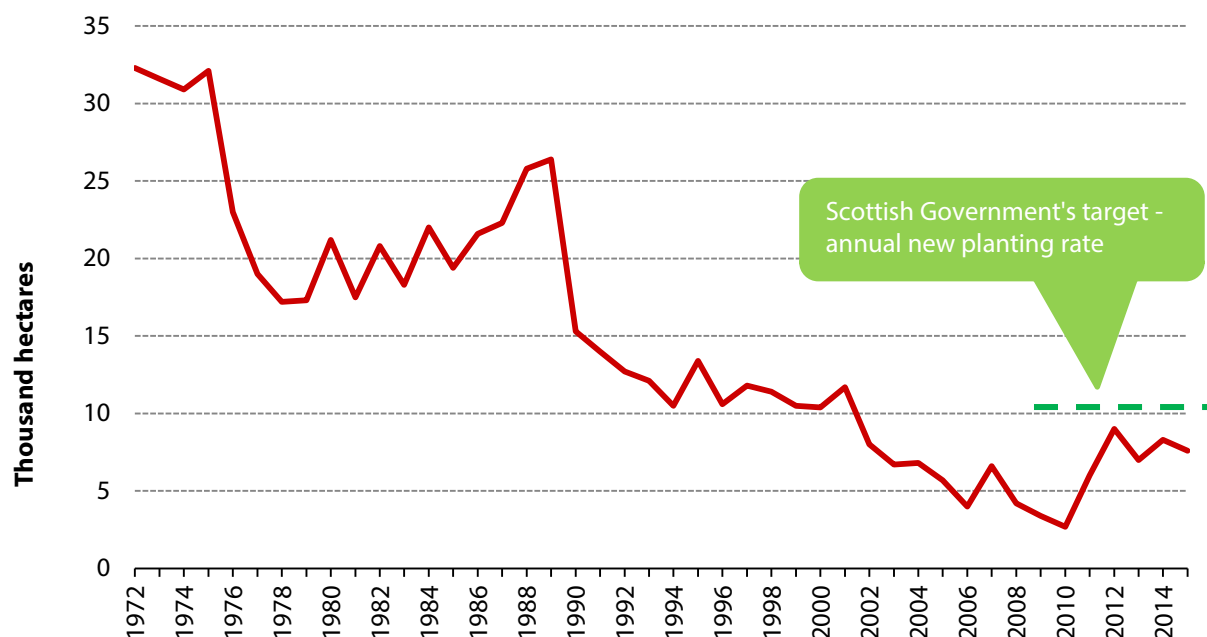
The 8% reduction in planting rates in 2014 was largely due to a delay in the launch of the Forestry Grant Scheme, itself reflecting a delay to the SRDP part of the CAP (from 2013 to 2014). The Scottish Government should ensure that this does not represent more than a temporary slow start associated with running a new scheme, and that uptake in future years meets the intended target. As identified in our CCRA Scotland National Summary more action is needed to create suitable woodland (i.e. diverse range of species) in appropriate locations for future climates.

The SRDP is the main source of woodland creation in Scotland with the Forestry Grant Scheme (FGS) having £36m funding per year. The scheme includes advice on types of trees to be planted which six different models landowners can choose from.

The 2016 updated Land Use Strategy has committed the Scottish Government to revise the Scottish Forestry Strategy⁷⁵ which was first published in 2006.

⁷⁵ Scottish Government (2006) Scottish Forestry Strategy: 2016, [http://www.forestry.gov.uk/pdf/wapr2016.pdf/\\$FILE/wapr2016.pdf](http://www.forestry.gov.uk/pdf/wapr2016.pdf/$FILE/wapr2016.pdf)

Figure 6.3. New tree planting in Scotland (1972-2015)



Source: Forestry Commission (2015) *Woodland area, planting and restocking data*, <http://www.forestry.gov.uk/forestry/inf-d-7aqknx>

Our High Ambition scenario also includes some agro-forestry. Our scenario assumes a high level of government support, including finance to support farmers, with Pillar Two payments from the CAP being one possible mechanism, as is currently the case in Scotland. However, barriers due to lack of knowledge and awareness that currently exist among farmers about the potential benefits of agro-forestry systems are considerable and would also have to be addressed.

Recommendations

Progress in previous recommendations is shown in Table 6.2. We also recommend that the Scottish Government:

- Include in the Climate Change Plan a stronger policy framework for agriculture emission reduction, which aims to achieve the measures set out in the Scottish Rural College's marginal abatement cost curve. This should include clear objectives, ways to monitor progress and how reductions will be achieved using the results from Scottish specific research where possible. If the government continues with voluntary measures they must be clear how they will be judged and what would trigger wider measures.
- Implement plans for compulsory soil testing to see if this works to reduce fertiliser use voluntarily; otherwise consider compulsory system.
- Address barriers to and awareness of agro-forestry.
- Consider private-sector investment for woodland creation, given uncertainty in CAP funding.

Table 6.2. Recommendations from 2015 progress report	
Recommendation	Progress
Carry out a survey to establish whether there has been Farming for a Better Climate (FFBC) uptake beyond the Climate Change Focus Farms and what measures have worked.	No progress. The Scottish Government should follow up from roadshows and events to establish how many and which measures are implemented.
Look at lessons from the Scottish Environment Protection Agency's diffuse pollution priority catchment work of working in partnership with the agricultural community to inform future action.	No progress.
Develop the RPP2 proposal to achieve a 90% uptake of cost-effective nitrogen efficiency to further encourage commitment.	Scottish Government is working on a number of options for reducing demand in the Climate Change Plan.
Adopt the RPP2 proposal for 21,000 ha peatland restoration per year as a policy to drive commitment.	Currently this remains a proposal. In the three years to 2015/16 there has been at least 8,500 ha of restoration.
Consider introducing additional measures and/or funding to ensure the woodland creation target is met.	Ongoing. Further funding is now available through the latest CAP funding.



Chapter 7:

Waste

Summary of progress

Table 7.1. Summary of progress	
Milestone	Progress
<p>Proportion of household waste recycled/composted/reused:</p> <ul style="list-style-type: none"> • 40% by 2010 • 50% by 2013 • 60% by 2020 • 70% by 2025 	<p>Nearly 43% of household waste was being composted, recycled or reused in 2014, an increase of 1 percentage point from 2013. This shows that Scotland has missed the second Zero Waste Plan target for 2013 (50%) and is therefore not on track for 60% in 2020; however, 12 out of 32 of Scotland's councils have met the 50% target.</p>
<p>Recycling 70% of all waste (including commercial and industrial waste) by 2025.</p>	<p>In 2014, total generated waste from household, construction and demolition and commercial and industrial sources was 10m tonnes. Out of this, 5.5m tonnes (55%) was recycled.</p>
<p>Reducing the proportion of total waste sent to landfill to a maximum of 5% of all waste by 2025.</p>	<p>The proportion of total waste arisings sent to landfill rose from 38% in 2013 to 39% in 2014.</p>
<p>Zero Waste (Scotland) Regulations (2012)</p>	<p>Many of the requirements have been met such as recycling services to households, separate collections, food-waste collections.</p> <p>Others, such as a ban on biodegradable municipal waste going to landfill from 2021, have long lead-times to enable businesses, local authorities and the waste management sector appropriate time to prepare.</p>
<p>Safeguarding Scotland's Resources – Blueprint For A More Resource Efficient and Circular Economy report contains the following targets:</p> <ul style="list-style-type: none"> • Reduce waste arisings in Scotland by 7% by 2017 against 2011 baseline • Reduce waste arisings in Scotland by 15% by 2025 	<p>In 2014 total waste arisings fell by 15%, to 10m tonnes. This is already outperforming the 2017 target and met the 2025 target.</p>

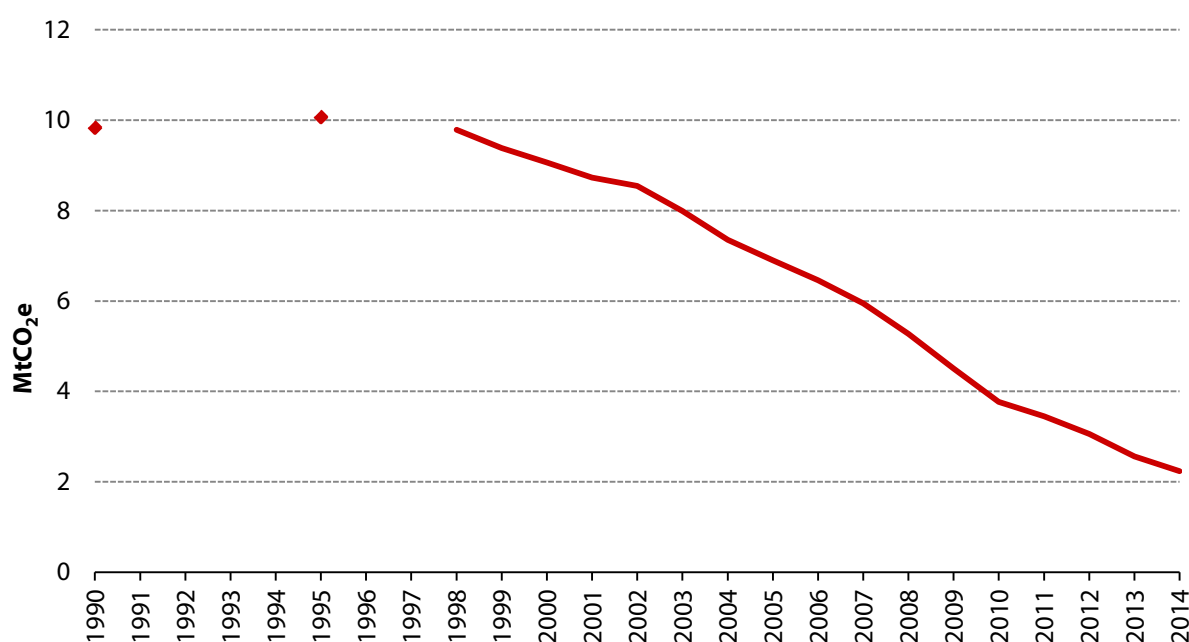
Latest emission trends and drivers⁷⁶

In 2013 emissions from the waste sector in Scotland were 2.6 MtCO₂e, 16% lower than in 2012. In 2014, emissions fell a further 14% to 2.2 MtCO₂e. Waste emissions have fallen 11% per year on average between 2009 and 2014. Emissions were 77% below 1990 levels in 2014 (Figure 7.1).

Total waste arisings in Scotland fell by nearly 10% in 2014.⁷⁷ Nearly 43% of household waste was being composted, recycled or reused in 2014, an increase of one percentage point from 2013. This shows that Scotland has missed the second municipal recycling target for 2013 (50%) and is therefore not on track for 60% in 2020; however 12 out of 32 of Scotland's councils have met the 50% target.

Methane released from waste in landfill is the main source of emissions in the waste sector. Landfill emissions have fallen steadily over time, reflecting a reduction in the amount of waste sent to landfill through a reduction in waste arising and waste diversion. Action to capture or flare landfill methane has also contributed to a reduction in emissions from waste management. However, in 2014 the proportion of total waste sent to landfill increased 1 percentage point to 39%.

Figure 7.1. Waste sector emissions (1990-2014)



Source: NAEI (2016) *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2014*, https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1606140853_DA_GHGI_1990-2014_Report_v1.pdf

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

⁷⁶ Includes SEPA data, Scottish Environment Protection Agency and database rights 2016.

⁷⁷ Scotland's Environment Waste Discover Data Tool (2016), <http://www.environment.scotland.gov.uk/get-interactive/data/waste-from-all-sources/>

Opportunities for emissions reductions

We identified the cost-effective opportunities to reduce waste emission in our annual targets advice. Our High Ambition scenario⁷⁸ assumed waste emissions could continue to fall as Scotland moves towards a circular economy through reducing waste arising, diversion from landfill and greater capture of methane at landfill sites.

Progress developing policy to reduce emissions and meet targets

The Scottish Government's Zero Waste Plan⁷⁹ (2010) and Safeguarding Scotland's resources in (2013)⁸⁰ were superseded in February 2016 with a Circular Economy Strategy.⁸¹ The Strategy carries forward existing waste reduction and recycling targets, which Scotland is currently on track to meet (Table 7.1, Figure 7.2 and Figure 7.3), and has £20m of funding in 2016/17. The strategy prioritises four sectors where they can make the biggest environmental and economic impact:

- Food and drink: inclusion of a Scottish Food Waste Reduction Target to achieve a 33% reduction in food waste by 2025, which is estimated to save £500m per year.
- Energy infrastructure: opportunities of equipment reuse from wind turbines and decommissioned oil and gas platforms.
- Construction and buildings: construction accounts for about 50% of all waste in Scotland, and is a major influence on efficient use of resources.
- Remanufacturing: already worth £1.1bn to the economy, and has potential to create an additional £620m turnover with 5,700 new jobs by 2020.

⁷⁸ CCC (2016) *Scottish Emissions Targets 2028 - 2032*, <https://documents.theccc.org.uk/wp-content/uploads/2016/03/Scottish-Emissions-Targets-2028-2032.pdf>, page 67

⁷⁹ Scottish Government (2010) *Scotland's Zero Waste Plan*, <http://www.gov.scot/Resource/0045/00458945.pdf>

⁸⁰ Scottish Government (2013) *Zero Waste Safeguarding Scotland's Resources*, <http://www.gov.scot/Resource/0043/00435308.pdf>

⁸¹ Scottish Government (2016) *Making Things Last*, <http://www.gov.scot/Resource/0049/00494471.pdf>

Table 7.1. Scotland's waste targets and progress		
Targets	2014 progress	On track
Proportion of household waste recycled/composted/reused - 50% by 2013, 60% by 2020	43%	No
Reduce the amount of waste produced by 7% by 2017 and 15% by 2025 against a 2011 baseline	15%	Yes
Recycling/composting and preparation for re-use 70% of waste from all sources by 2025	55%	Yes
Reducing the proportion of total waste sent to landfill to a maximum of 5% of all waste by 2025	39%	Uncertain - proportion rose 1% in 2014
Reduce biodegradable municipal waste to be sent to landfill to less than 1.8 Mt by 2013 and 1.26 Mt by 2020	1.06 Mt	Yes
Source: Scottish Government (2016) <i>Scotland's Environment Waste Discover Data Tool</i> (2016), http://www.environment.scotland.gov.uk/get-interactive/data/waste-from-all-sources/		

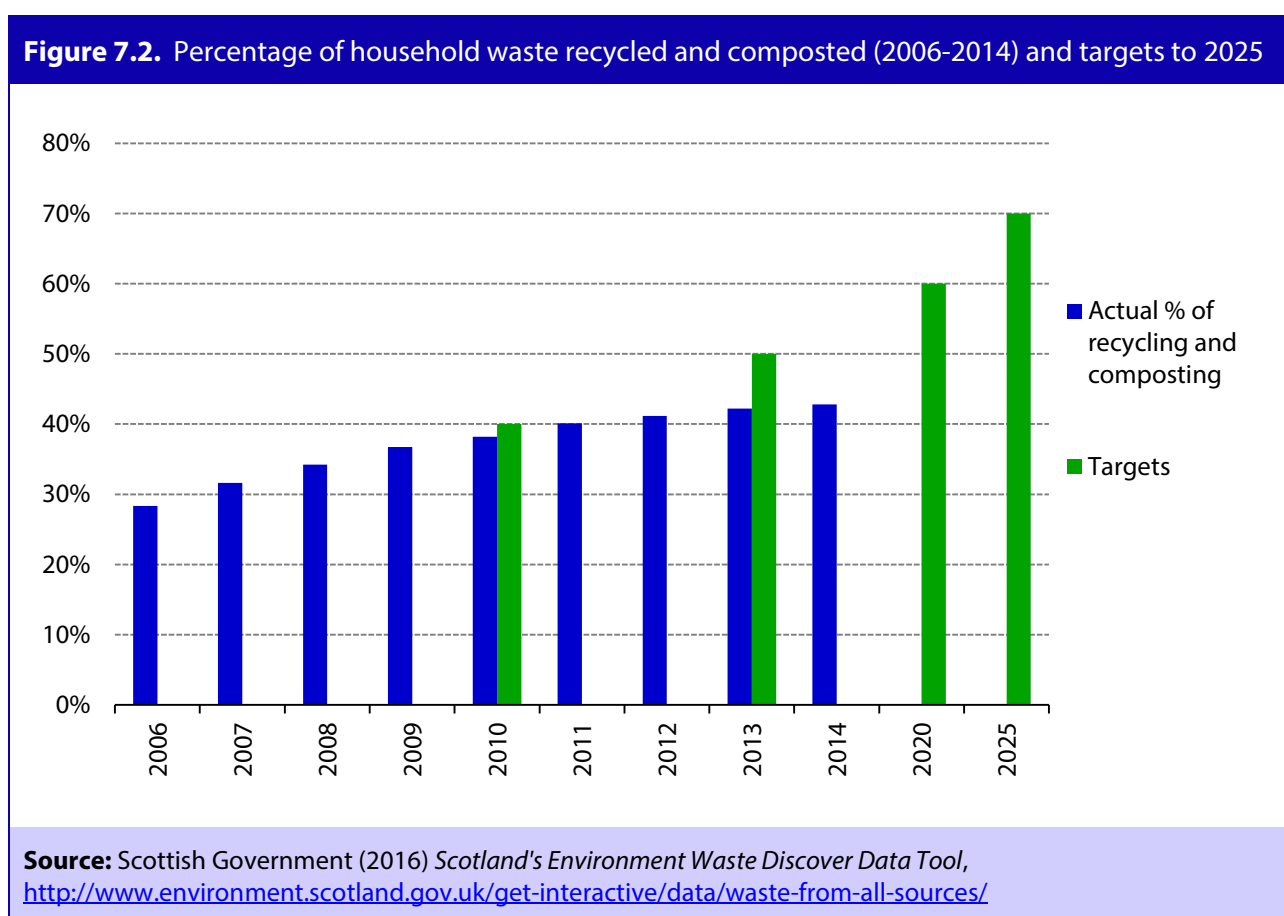
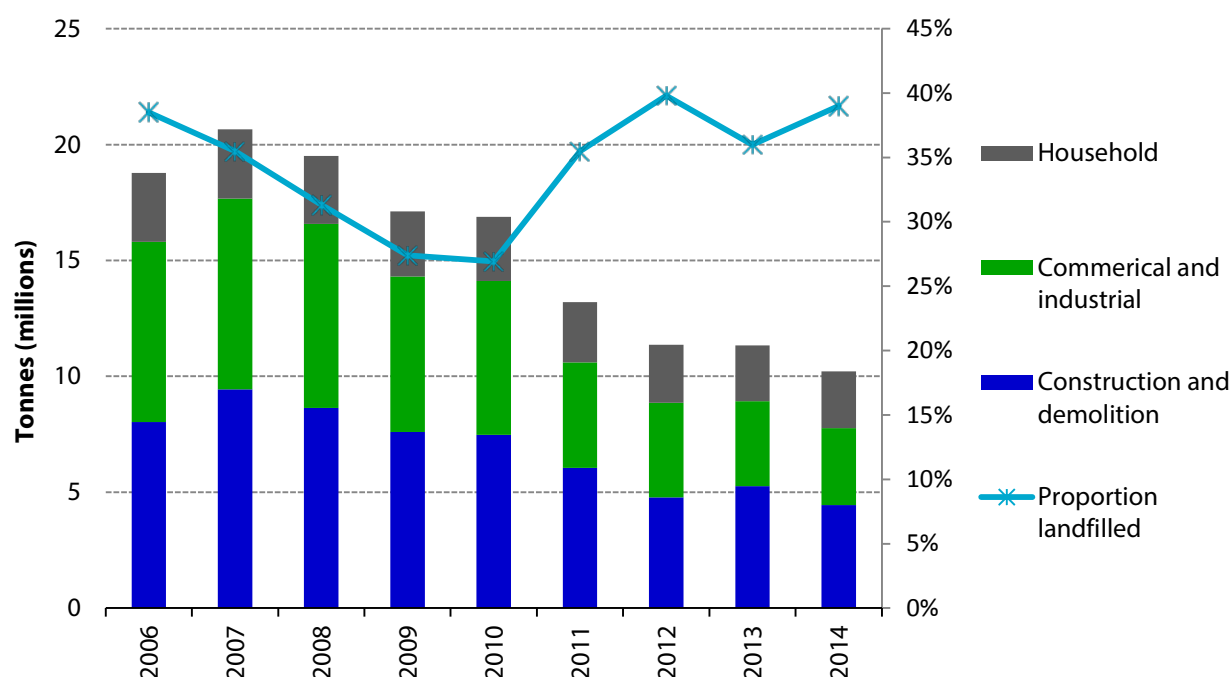


Figure 7.3. Waste arisings in Scotland by source and proportion of waste landfilled (2004-2014)



Source: Scottish Government (2016) *Scotland's Environment Waste Discover Data Tool*, <http://www.environment.scotland.gov.uk/get-interactive/data/waste-from-all-sources/>

In 2014 1.8m households (75% of total) have access to a separate food-waste collection service, up from 30,000 in 2010.⁸² In 2015 this accounted for 81% of local authorities, higher than in England (52%) and the UK as a whole (60%). However, in Wales every local authority provides separate food-waste collection. Not all Scottish local authorities provide this service due to regulations specifying a number of rural areas where separate collections of food waste do not apply. The Scottish Government have committed to reviewing the exemption from food-waste collection in rural areas.

Alongside the introduction of a Circular Economy Strategy and the food-waste target, the Scottish Government has introduced:

- **Zero waste (Scotland) Regulations 2012⁸³** proposes a series of regulations in waste collection and disposal:
 - All businesses, public sector and non-for-profit organisations are required to present metal, plastic, glass, paper and card for separate collection from 1 January 2014.
 - Food businesses (except rural areas) which produce over 5kg of food waste per week are to present that food waste for separate collection from 1 January 2016.
 - Local authorities to provide a minimum recycling service to householders.

⁸² Figures direct from Scottish Government.

⁸³ Scottish Parliament (2012) *Waste (Scotland) Regulations 2012*, <http://www.legislation.gov.uk/ssi/2012/148/contents/made>

- A ban on any metal, plastic, glass, paper, card, and food collected separately for recycling from going to incineration or landfill from 1 January 2014.
- A ban on biodegradable municipal waste going to landfill from 1 January 2021. Local authorities and the waste management sector are preparing for this through waste prevention and alternative recycling infrastructure.
- **Carrier Bag Charge (Scotland) Regulations⁸⁴** were introduced in October 2014 and requires all retailers to charge a minimum of 5p for every single-use carrier bag.
- **Scottish Recycling Fund⁸⁵** is a £3.8m fund (over 3 years) to develop or expand material re-processing capacity and remanufacturing facilities in Scotland.
- **Household Recycling Charter⁸⁶** was agreed by the Scottish Government in October 2015 and aims to bring in consistent practices across Scotland's local authorities. This should make it easier and less confusing for people to recycle potentially valuable materials including paper, card, glass and plastics and food waste. Half of Scotland's 32 local authorities have signed the Charter as of August 2016.
- **Scottish Materials Brokerage Service (2015)⁸⁷**: combining public sector waste and recyclables contracts of sufficient scale to nurture Scotland's reprocessing industry and get a much better deal for Councils and public bodies.
- **Landfill Tax (Scotland) Act 2014⁸⁸** means that the Scottish Parliament has new financial powers on disposals to landfill from 2015. At present it is set in line with the UK, although a tax credit scheme, the Scottish Landfill Communities Fund (SLCF), has been set up in Scotland to encourage landfill site operators to provide contributions which can then be passed onto community and environmental projects.
- **Methane capture**: through innovative flaring technology to remove emissions has been applied to two sites in the Scottish Borders and is now being implemented in two further sites in Glasgow and East Lothian. Scottish Environment Protection Agency (SEPA) is identifying further sites across Scotland where the same technological approach could be applied.

Scotland has put in place detailed targets, an annual report detailing progress and programmes to help meet these, specifically with the ban on municipal biodegradable waste going to landfill. However, more could be done to utilise new devolved powers on landfill tax, and municipal recycling targets are not being met especially in remote regions (e.g. Shetland's recycling rates were only 9% in 2014).

⁸⁴ Carrier bag charge Scotland (2016), <http://carrierbagchargescotland.org.uk/>

⁸⁵ Zero Waste Scotland (2016) *Scottish Recycling Fund*, <http://www.zerowastescotland.org.uk/content/scottish-recycling-fund>

⁸⁶ Scottish Government (2016) *Charter for Household Recycling in Scotland*, <http://www.gov.scot/Resource/0049/00490674.pdf>

⁸⁷ The Scottish Materials Brokerage Service (2014), <http://www.zerowastescotland.org.uk/brokerage>

⁸⁸ Scottish Parliament (2014) *Landfill Tax (Scotland) Act 2014*, <http://www.legislation.gov.uk/asp/2014/2/contents>

Recommendations

We recommend:

- Focus on encouraging recycling and introducing separate food-waste collections in rural and island communities.
- Ensure that structures are in place to handle the municipal biodegradable waste ban and to reduce emissions from non-municipal waste sent to landfill.



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