

December 2021

Progress in reducing emissions in Scotland

2021 Report to Parliament

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Climate Change Committee
December 2021

Report to the Scottish Parliament pursuant to Section 9(1) of the Climate Change (Scotland) Act 2009.

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Acknowledgements

The Committee would like to thank:

The team that prepared this report and its analysis: This was led by Chris Stark, David Joffe, Emily Nurse, Bianca de Farias Letti and Marili Boufounou and included Tom Andrew, Owen Bellamy, Eoin Devane, Aaron Goater, Ruth Gregg, Jenny Hill, Jaya Jassi, Daisy Jameson, Miriam Kennedy, James Kershaw, Ewa Kmietowicz, Luke Maxfield, Bea Natzler, Chloe Nemo, Simon Rayner, Vivian Scott, Marcus Shepheard, Abi Thomas and Louis Worthington.

Other members of the Secretariat who contributed to this report: Jo Barrett, Tom Dooks, James Lees and Richard Millar.

A number of organisations and stakeholders for their support, including the Scottish Government.

A range of stakeholders who engaged with us or met with the Committee bilaterally.

The Committee



**The Rt. Hon John Gummer, Lord Deben,
Chairman**

Lord Deben was the UK's longest-serving Secretary of State for the Environment (1993 to 1997). He has held several other high-level ministerial posts, including Secretary of State for Agriculture, Fisheries and Food (1989 to 1993). Lord Deben also runs Sancroft, a corporate responsibility consultancy working with blue-chip companies around the world on environmental, social and ethical issues.



Professor Keith Bell

Keith Bell is a co-Director of the UK Energy Research Centre (UKERC), a Chartered Engineer and a Fellow of the Royal Society of Edinburgh. He has been at the University of Strathclyde since 2005, was appointed to the Scottish Power Chair in Smart Grids in 2013 and has been involved in energy system research in collaboration with many academic and industrial partners.



Professor Nick Chater

Nick Chater is Professor of Behavioural Science at Warwick Business School. He has particular interests in the cognitive and social foundations of rationality, and applying behavioural insights to public policy and business. Nick is Co-founder and Director of Decision Technology Ltd, a research consultancy.



Professor Piers Forster

Piers Forster is Director of the Priestley International Centre for Climate and Professor of Physical Climate Change at the University of Leeds. He has played a significant role authoring Intergovernmental Panel on Climate Change (IPCC) reports, and is a coordinating lead author role for the IPCC's sixth assessment report.



Paul Johnson CBE

Paul Johnson is Director of the Institute for Fiscal Studies and a visiting professor at University College London (UCL). He is widely published on the economics of public policy, and he co-wrote the 'Mirrlees review' of tax system design. He was previously Chief Economist at the Department for Education (2000 to 2004).



Professor Corinne Le Quéré FRS

Corinne Le Quéré is a Royal Society Research Professor at the University of East Anglia (UEA), specialising in the interactions between climate change and the carbon cycle. She was lead author of several assessment reports for the UN's Intergovernmental Panel on Climate Change (IPCC) and she currently Chairs the French Haut Conseil pour le Climat.



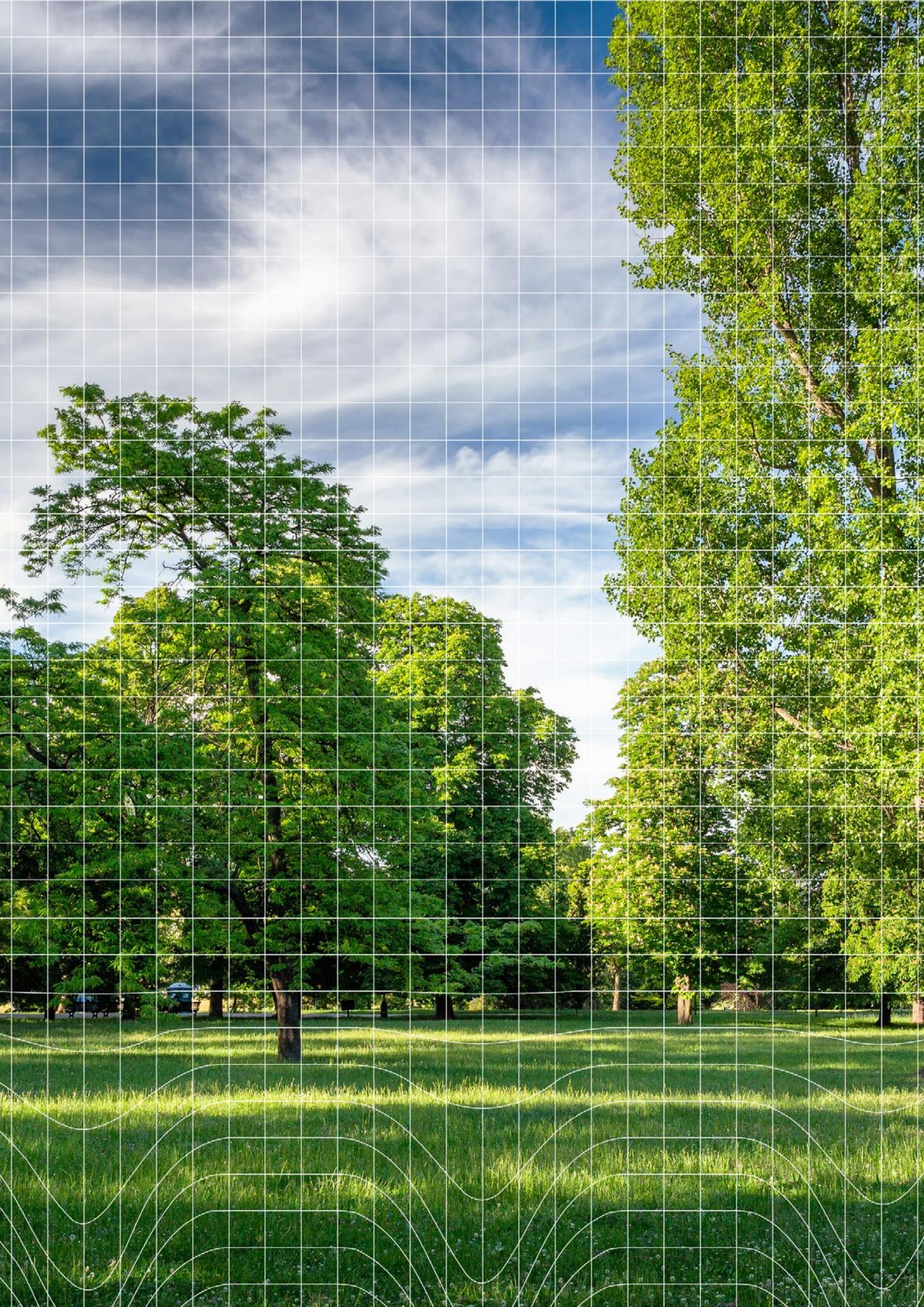
Pete Belts

Expert Adviser to the Committee

Pete was a career civil servant and until 2018 led UK policy on international climate change and energy. He was also Lead Negotiator for the European Union in the UNFCCC negotiations. His current portfolio includes roles at the European Climate Foundation; Willis Towers Watson; IRENA; Grantham School and Chatham House

Executive Summary

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Achievement of Scotland's legislated climate targets would be a strong contribution to global efforts, consistent with the Paris Agreement and a path to 1.5°C. COP26 in Glasgow marked a step forward in international commitments to address climate change. As globally, so in Scotland, the focus must now be to deliver against the commitments that have been made.

In this report we focus primarily on future delivery of emissions reductions. The 2020s is the critical decade in changing course for Net Zero.

Scottish emissions fell 2% in 2019, the latest year for which data are available, but Scotland missed its annual target by a significant margin. In 2020, emissions will have fallen substantially due to the lockdowns in response to the COVID-19 pandemic, but much of this effect is transient. The latest available data do not reflect these developments, so in this report we focus primarily on future delivery of emissions reductions. The 2020s is the critical decade in changing course for Net Zero.

In some key areas of climate policy, consultations and strategy statements have been published by the Scottish Government ahead of UK-wide equivalents. This is necessary, however, for Scotland to achieve the more rapid reductions in territorial emissions than the rest of the UK, needed to meet its legislated 2030 target of a 75% emissions reduction on 1990 levels.

Most of the key policy levers are now in the hands of the Scottish Government, but promises have not yet turned into action.

Most of the key policy levers are now in the hands of the Scottish Government, but promises have not yet turned into action. In this new Parliament, consultations and strategies must turn decisively to implementation.

Our key messages in this report are:

- **The Scottish Government has set out laudable ambitions.** The Climate Change Plan update (CCPu), published in December 2020, together with the more recent Programme for Government (PfG), describe a highly ambitious decade of decarbonisation. These contain a host of broad policy pledges, some large financial commitments and a welcome focus on a just transition.
- **Delivery of rapid emissions reductions cannot wait.** It has taken 30 years to halve Scottish territorial emissions; they must halve again in a decade to meet the legislated 2030 target. Although a broad set of policies and proposals have been announced, there is still relatively little detail on exactly how committed public funding will be spent and how emissions will be reduced in practice. A comprehensive, detailed policy framework must now be completed for decarbonisation in Scotland, so the focus can be on implementation and delivery of real-world progress in reducing emissions at the necessary rate. Progress must also be monitored closely, and policy corrected as appropriate, to ensure that delivery stays on track.
- **Greater transparency is needed.** The CCPu sets out pathways to 2032 for sectoral emissions. If delivered, they would meet the legislated targets. However, we have not been able to establish whether and how policies and proposals in the CCPu add up to the required emissions reductions. We recommend that the Scottish Government publishes, as soon as possible, a detailed and transparent quantitative breakdown of how the announced plans will achieve the sectoral pathways to which it has committed. Only with this detail will we be able to assess progress properly, and to give due credit to the Scottish Government where delivery is on track.

We recommend that the Scottish Government publishes, as soon as possible, a detailed and transparent quantitative breakdown of how the announced plans will achieve the CCPu sectoral pathways.

Action is needed now to avoid the gap to meeting the annual targets widening, which could undermine the credibility of Scottish climate policy and the targets framework.

- **The annual targets during the 2020s will be very difficult to meet.** even with the strongest climate policies. Emissions in 2019 were above the annual target. This represents a warning in respect of future annual targets, as there is unavoidable inertia in scaling-up policy to reduce emissions in those sectors that have made only slow progress to date. Electricity generation is already substantially decarbonised, providing very limited scope for further gains in that sector, in contrast to the rest of the UK. After the pandemic, efforts to lock in behavioural changes that reduce emissions (e.g. increases in working from home and in walking and cycling) can maximise the lasting impact on emissions, but only action now will limit the extent of the post-pandemic rebound in emissions. This is key to avoiding the gap to meeting the annual targets widening, which ultimately will undermine the credibility of Scottish climate policy and the targets framework.
- **Meeting the 2030 target.** Climate policy in Scotland must focus on the transition to Net Zero and the need for rapid progress by 2030. Major changes are required across the Scottish economy, requiring lasting, systemic changes in most sectors. These are best achieved by aiming for the outcomes required by 2030, 2040 and 2045. We view the balance of effort across sectors in the CCPu to meet the 2030 target to be broadly appropriate, albeit extremely stretching. The aim should be for a smooth path to 2030 and beyond, especially for the decarbonisation of buildings and transport, rather than the 'sharp reduction and then plateau' profile presented in the CCPu for those sectors. Given the risks to meeting the 2030 interim target across a range of sectors, ambition will have to be increased in those areas where rapid gains are still feasible, especially through peatland restoration, achieving healthier diets and reducing aviation demand.
- **Travel demand.** The CCPu's targets for a 20% reduction in car-miles by 2030 and the establishment of 20-minute neighbourhoods go well beyond the ambitions on travel demand elsewhere in the UK. If achieved, they would bring benefits for the climate and for the health and wellbeing of Scotland's citizens, through improved air quality, increased walking and cycling, and better access to services. The PfG recognises this will require major interventions and investments to make it easier to walk, cycle and travel by public transport, but at present those plans for delivery are not clear.
- **Heat in buildings.** The CCPu sets out a very stretching pathway to reduce emissions from Scottish buildings. To a large extent, this is supported by the Scottish Government's ambitious Heat in Buildings Strategy, with its target of decarbonising one million homes by 2030, over a third of the stock, backed by a strong set of energy efficiency and low-carbon heating milestones, and by the PfG's major financial commitment to invest £1.8 billion over this Parliament. However, more detail is needed to clarify how this budget relates to targets in the Strategy and the extent to which additional private investment is required. If delivered, this would put Scotland at the forefront of heat decarbonisation in the UK, with a notably stronger focus on supporting domestic energy efficiency than UK Government policy.
- **There is still an urgent need for post-CAP low-carbon agriculture policy.** The Scottish Government has consulted on options for future agriculture and land use support through a Bill to replace the current Common Agricultural Policy (CAP), with plans for an Agriculture Bill in 2023. This needs to clarify what funding will be available for land-based mitigation and sequestration. There should also be a clear plan to move to healthy and low-carbon diets.

If achieved, Scotland's ambitions on travel demand would have multiple benefits. However, at present, delivery plans are not clear.

There is still an urgent need for post-CAP low-carbon agriculture policy. There should also be a clear plan to move to healthy and low-carbon diets.

Reliance on greenhouse gas removals to contribute to the 2030 target comes with significant risks.

- **Engineered greenhouse gas removals (GGR).** The CCPu's ambition for 2030 relies on a substantial contribution from GGR, using carbon capture and storage (CCS). The UK Government recently announced that the proposed Scottish CCS cluster is only a reserve project, behind the two 'Track 1' clusters in the North of England. Although further clusters are expected to follow, failure of the Scottish CCS cluster to secure Track 1 support raises important questions about whether the CCS infrastructure and GGR facilities can now be developed in time to be operational by 2030. The Scottish Government must make a quick decision on whether to continue to plan for removals to contribute to the 2030 target or to change course. Clear contingency plans will have to be developed for meeting the 2030 target if it should turn out that GGR cannot be delivered at scale on the necessary timetable, accompanied by a clear date – no later than 2023 – to implement these contingency plans if developments on CCS do not provide confidence that they can deliver by 2030.
- **Cooperation with the UK Government.** The Scottish Government has made ambitious commitments in some areas that require going ahead of the UK-wide path, often in areas where policy is not clearly devolved to Scotland. Following on from the recent publication of the UK Net Zero Strategy, an agreement is needed as a matter of priority for the Scottish and UK Governments to work together to deliver specific decarbonisation solutions in Scotland ahead of other parts of the UK, to meet the faster deployment required in Scotland this decade. In effect, the roll-out of many solutions will have to begin in Scotland before moving south. This may require the Scottish Government to complement UK-wide funding schemes with its own funding.

The Scottish and UK Governments must find a way to work together to deliver specific decarbonisation solutions in Scotland ahead of other parts of the UK.

The rest of this executive summary is set out in four sections:

1. Emissions pre- and post-pandemic
2. The CCPu's ambitions to meet the 2030 target
3. The path for emissions reduction in the 2020s
4. Policies to drive down emissions in the 2020s

1. Emissions pre- and post-pandemic

Scottish emissions fell 2% in 2019, the latest year for which data are available, but Scotland missed its annual target by a significant margin.

The impact of the COVID-19 pandemic may have been sufficient for Scotland to meet its 2020 interim target.

However, the rebound in emissions expected for 2021 and beyond makes it very challenging to meet subsequent annual targets.

The emissions data presented in this progress report largely relate to 2019, the most recent year for which data have been published. On the basis of the greenhouse gas (GHG) emissions inventory published in June 2021, total annual Scottish emissions fell by 2% in 2019 to 47.8 MtCO₂e and by 44% compared to 1990 levels.

On the ‘GHG Account’ basis, against which performance against the legislated targets is assessed, emissions were 51.5% below 1990 levels, meaning that Scotland missed its 2019 annual target for a 55% reduction.*

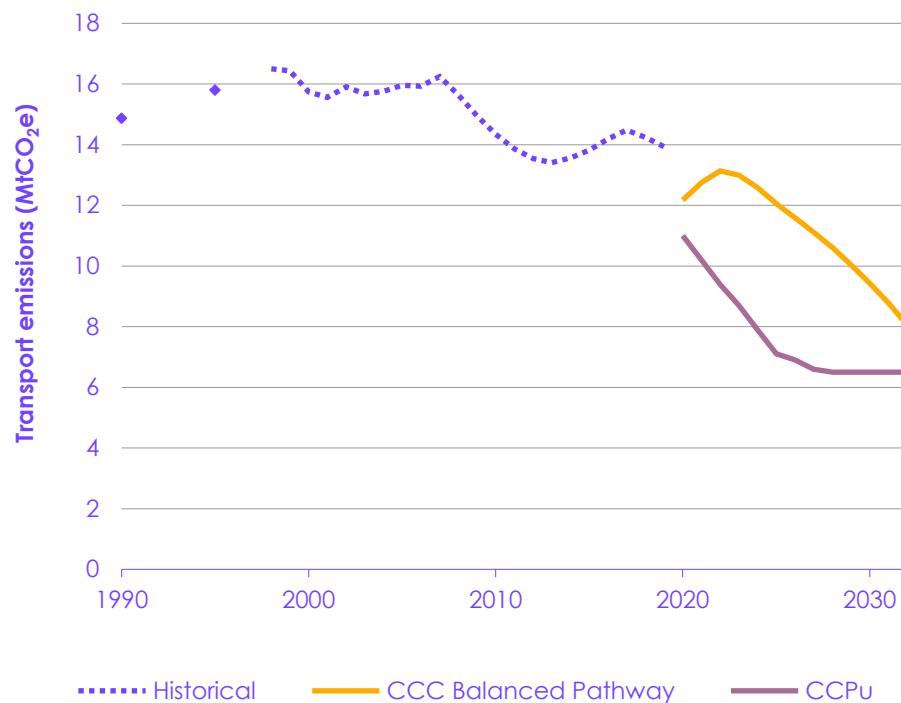
Emissions in 2020 will have been considerably lower than those in 2019, due to the impacts of the lockdowns in response to the COVID-19 pandemic. The impact on emissions is likely to be similar to the 13% fall for the UK as a whole, and may therefore be sufficient for Scotland to meet its 2020 interim target. It will only become clear whether the target was met when Scottish emissions data for 2020 are published, in June 2022.

However, for 2021 and subsequent years, there is likely to be a significant rebound in travel demand relative to 2020, when travel was strongly limited by lockdowns. Given that transport accounted for around 30% of total Scottish emissions in 2019, and the ongoing need for further reductions in economy-wide emissions each year, meeting the annual emissions targets will be highly challenging. There are now only limited further reductions from electricity generation, so meeting the targets now requires significant progress on decarbonisation in a range of sectors where it has so far been weak.

We note that the CCPu relies on very rapid reductions in transport emissions, relative to 2019 levels, to meet annual targets over the period to 2025 (Figure 1). Concerted early action to limit the post-pandemic rebound in travel demand, and encourage modal shift to walking, cycling and public transport, will be crucial in achieving anything close to the required rate of reductions, given expected limits on how quickly electric vehicles will enter the vehicle fleet.

* The GHG Account is a measure of Scottish emissions that is designed to be consistent with the methodology for estimating emissions that was in place when the Scottish targets were set, excluding any subsequent changes in the estimation methodology or scope of emissions in the published inventory.

Figure 1 The CCPu pathway implies a halving of transport emissions from 2019 to 2025



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019; CCC Sixth Carbon Budget; Scottish Government (2021) Update to the Climate Change Plan 2018-2032: Securing a Green Recovery on a Path to Net Zero; CCC analysis.

Note: The CCPu's transport sector includes emissions from aviation and shipping, and therefore corresponds to a combination of the CCC surface transport, aviation and shipping sectors.

2. The CCPu's ambitions to meet the 2030 target

The CCPu's ambition for 2030 in many areas is necessarily at or above the levels in the CCC's Balanced Pathway.

Under Scotland's climate legislation, the Scottish Government must choose its own path to the legislated emissions targets. Nevertheless, it is instructive to compare the sectoral emissions trajectories and planned deployment of measures against the Committee's own assessment, in order to identify areas of particularly high or low ambition, and where delivery risks or opportunities might lie (Table 1). The CCPu's ambition for 2030 in many areas is necessarily at or above the levels in the CCC's Balanced Pathway, which would deliver a balanced transition to Net Zero in Scotland by 2045, but would not achieve the 2030 interim emissions target set by the Scottish Parliament. The areas of greater ambition include surface transport, buildings, tree-planting and engineered greenhouse gas removals.

Table 1

Headline actions in the update to the Climate Change Plan compared to the CCC pathway

Headline actions	Scottish Government commitment	CCC pathway
Electric vehicles	Phase-out of the need for new petrol and diesel cars and vans by 2030	Phase-out of all new fossil-fuelled car and van sales by 2032
Car travel	Reduction in total car-kilometres travelled of 20% by 2030, relative to 2019 levels	Reduction in total car-kilometres travelled of 6% by 2030, relative to UK DfT baseline growth, implying broadly flat demand in absolute terms
Heat pumps in homes	80,000-100,000 heat pumps installed cumulatively over 2021-2026	136,000 heat pumps installed cumulatively over 2021-26
	170,000 heat pump installations in 2030	83,000 heat pump installations in 2030
Low-carbon heat networks (all buildings)	Around 5 TWh of low-carbon heat networks by 2030	2.6 TWh of low-carbon heat networks by 2030
Industry	38% emissions reduction from 2018 to 2030	47% emissions reduction from 2018 to 2030
Aviation demand	No specific commitment made	Reduction of aviation demand of 16% relative to baseline demand, implying a 4% reduction in absolute terms
Diet change	No specific commitment made	20% shift away from consumption of meat and dairy products by 2030
Tree-planting	18,000 hectares/year by 2024/25	15,000 hectares/year by 2024/25
Peatland restoration	20,000 hectares/year from 2021 onwards	50,000 hectares/year from 2022 to 2045
Greenhouse gas removals	3.8 MtCO ₂ /year by 2030. First delivery-scale installations begin operation in 2029	UK removals deployment by 2030 is CCS retrofit to existing large-scale biomass plants, which are not located in Scotland

Note: The CCPu's Industry sector comprises manufacturing, mining and quarrying, construction and downstream oil and gas, making it broadly the equivalent of the combination of the CCC's manufacturing & construction and fuel supply sectors.

Note 2: Heat pump targets were calculated by assuming some households in the Scottish Government's announced targets for 'zero-emissions heat installations' are met by low-carbon heat networks.

Note 3: The number for low-carbon heat networks considers scenarios where 0 to half of 1.2 TWh of existing heat networks convert to low-carbon by 2030.

New plans should be developed to go beyond the CCPu sectoral pathways where feasible, given the range of risks to delivery against the legislated targets over the coming decade.

Despite the tougher 2030 interim goal, the Scottish Government still has lower ambition in some areas than that in the Committee's pathways. New plans should be developed to go beyond the CCPu sectoral pathways where this is feasible, given the range of risks to delivery against the legislated targets over the coming decade, including from lesser delivery in areas reserved to the UK Government. Areas where policy is devolved to Scotland in which our pathways go further than those set out by the Scottish Government include:

- **Peatland restoration.** Our assessment is that peatland restoration could occur at a significantly higher rate than that committed to by the Scottish Government, which is less than half that in the Committee's Balanced Pathway.
- **Healthier diets.** Reduction in consumption of meat and dairy can both improve the health of Scottish citizens and contribute to the emissions targets, through reduced agricultural emissions and the release of surplus land that can be used to remove CO₂ from the atmosphere. Demand-side options are not sufficiently considered in the CCPu.
- **Aviation demand.** None of the recent policy documents or consultations set out an explicit intent to limit aviation demand growth – indeed the Aviation Strategy Consultation sets out the objective of working with the aviation industry to help restore and increase international connectivity. However, a commitment has been made to review Air Passenger Duty ahead of its devolution to Scottish Government to ensure alignment with climate change goals.

3. The path for emissions reductions in the 2020s

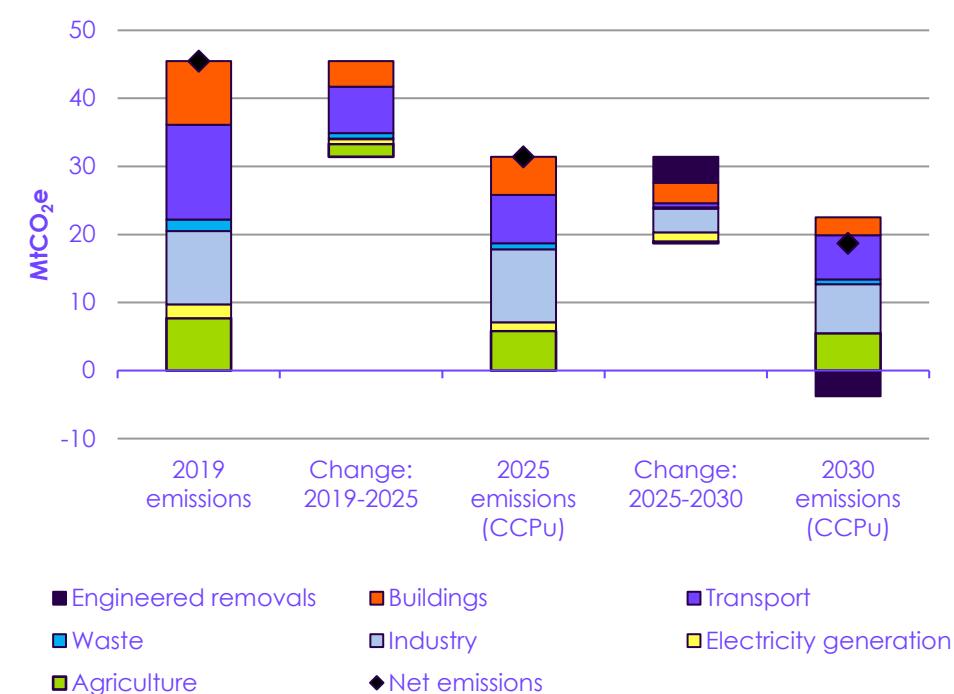
The CCPu targets a broadly coherent balance of sectoral emissions reductions by 2030, but the path through the 2020s looks less appropriate. Achieving ambitious annual rates of emissions reduction in the earlier years of 2020s will be more difficult than in later years, since mass-market take-up of EVs and heat pumps, and the deployment of CCS must come later in the decade (Figure 2).

The Scottish Government should not plan for the CCPu's plateaus in emissions in the transport and buildings sectors in the second half of the 2020s.

Given the importance of a smooth transition to Net Zero, particularly those aspects involving action by individual citizens, the Scottish Government should plan on continuing strong emissions reductions in transport and agriculture emissions post-2025, and buildings emissions post-2029, rather than the plateaus seen in the CCPu. This will also help to mitigate risks to meeting the targets from under-delivery in other sectors, and to avoid a cliff-edge of a sudden drop in demand for buildings services.

The extent of the emissions reductions relied upon in the transport and buildings sectors over the first half of the 2020s, and the well-established risks in achieving these, suggest that it will be very difficult to meet the annual targets during this period unless significant progress can be achieved more broadly across sectors.

Figure 2 The CCPu trajectory for Scottish emissions across the 2020s



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019; Scottish Government (2021) Update to the Climate Change Plan 2018-2032: Securing a Green Recovery on a Path to Net Zero; CCC analysis.

4. Policies to drive down emissions in the 2020s

The 2021/22 Programme for Government (PfG) was published in September 2021 and is a strong signal that the Scottish Government is moving towards integrating Net Zero in all areas of policy across the economy. The PfG announced £1.8 billion of funding towards decarbonising buildings, which was later reiterated in the Scottish Heat in Buildings strategy. Other priorities include transport, with investment into active travel and the decarbonisation of passenger rail services and buses. There is also an increase in funding for peatland restoration (Box 1).

A comprehensive, detailed policy framework must now be completed for decarbonisation in Scotland.

The Committee's assessment is that most of the key policy levers over decarbonisation are now in the hands of the Scottish Government. A comprehensive, detailed policy framework must now be completed for decarbonisation in Scotland.

- **The past year has seen significant advancements in Scottish climate policy ambition.** The CCPu, published in December 2020, sets out an ambitious pathway to Net Zero by 2045, with a focus on meeting the 2030 interim target of a 75% reduction on emissions compared to 1990 levels.
- **The Scottish Government is moving towards integrating Net Zero in all areas of policy.** The PfG is a strong signal of this, as is the creation of a new Cabinet Secretary position for Net Zero, Energy and Transport. New supporting ministerial roles working across the relevant sectors to support the transition to Net Zero have also been created, with policy portfolios covering issues such as employment, green skills, just transition, active travel and biodiversity.
- **The focus within the Scottish Government's plans on a 'just transition' and on public engagement are commendable.** The Scottish Government has accepted all the Just Transition Commission's recommendations, and has set out several positive commitments towards ensuring that the transition is fair. A new Public Engagement Strategy has been published, focusing on communicating climate change actions and their impact on people's lives, and encouraging participation of the public in shaping policy.
- **Progress has been made in many areas highlighted by the Committee, but important gaps remain.** Most of the recommendations made by the Committee last year have been achieved, at least in part, or are underway. However, important gaps remain, particularly in the agriculture sector. Of the 30 recommendations with an expected timeframe of 2021 (or earlier), 9 were scored as achieved, 5 as partly achieved, 13 as underway, 2 as not achieved and 1 as not yet assessed.
- **There is still an urgent need for post-CAP low-carbon agriculture policy.** The Scottish Government has consulted on options for future agriculture and land use support through a Bill to replace the current Common Agricultural Policy (CAP), with plans for an Agriculture Bill in 2023. This should clarify what funding will be available for land-based mitigation and sequestration. There should also be a clear plan to move towards healthy, low-carbon diets.
- **Scotland is ahead of the rest of the UK in setting out buildings decarbonisation policy.** Key milestones for energy performance certificates (EPCs) and boiler phase-out are generally five years earlier than UK

milestones. The Scottish Heat in Buildings Strategy outlines more developed plans for delivering commitments on the ground than the UK Heat and Buildings Strategy, such as through local heat and energy efficiency strategies, and has set out proposals, ahead of the UK, to include an efficiency metric in EPCs.

- **Scotland's commitments on travel demand are very ambitious, but there is not yet a clear plan.** The Scottish Government is more ambitious than the rest of the UK on reducing car use and has introduced a new commitment to reduce total car mileage by 20% by 2030. However, detailed plans on how to achieve this commitment have not yet been laid out – this is required urgently. The commitment to a 2030 phase-out for sale of new petrol and diesel cars is in line with UK commitments.
- **Positive steps have been made towards funding decarbonisation,** including in some of the most challenging sectors, and to develop sectoral policies to deliver action. Key sectoral commitments made by the Scottish Government in the past year include £1.8 billion of funding towards decarbonising buildings, increased expenditure on active travel, rising to £320 million (or 10% of the total transport budget) in the year 2024-25 and £500 million of investment in the natural economy over the course of this Parliament. However, there is relatively little detail on exactly how the committed money will be spent.
- **Ambition and policy development must be increased where feasible to mitigate delivery risks.** There are major delivery risks across the areas in which the Scottish Government has adopted high ambition, especially where delivery is not entirely in its control. Ambitions, and associated policy planning, must be stepped up in other areas to mitigate these risks.
- **Oil and gas production.** There remain questions over the compatibility of new fields for fossil fuel production in the North Sea with UK and Scottish climate ambitions. We are preparing advice in this area for publication in the new year.

Positive steps have been made towards funding decarbonisation, but there is relatively little detail on exactly how the committed money will be spent.

Ambition and policy development must be increased where feasible to mitigate delivery risks.

Box 1**The 2021/22 Programme for Government**

In September 2021, the Scottish Government published its annual Programme for Government (PfG), which sets out planned public sector spending over the next year. This was the first PfG following the publication of the Update to the Climate Change Plan.

Building a Net Zero Nation was a key theme and underpinned some of the most important funding announcements in the PfG, including:

- The pledge of £1.8 billion over this Parliament for green buildings. This sum includes £400 million for large-scale heat decarbonisation infrastructure and £465 million to support those least able to pay.
- Increased expenditure on active travel, rising to £320 million (or 10% of the total transport budget) in the year 2024-25.
- £287 million in total by 2025-26 for low- or zero-carbon initiatives in transport.
- £500 million dedicated to green jobs of the future, a £100 million Green Jobs Fund and a £500 million Just Transition Fund for the North East and Moray, to be used over a period of 10 years.
- Investing £33 billion over the course of this Parliament in the National Infrastructure Mission, including £1 billion in the Scottish National Investment Bank.
- £240 million spent in the next year, on industry and low-carbon technologies, along with hydrogen and Carbon Capture and Storage, through the Energy Transition Programme.
- £500 million invested in the natural economy over the course of this Parliament, including in the expansion of the Nature Restoration Fund, forestry and the restoration of peatlands.

Funding decisions were planned around supporting policy decisions aimed at delivering Net Zero in Scotland by 2045.

- Through the Heat in Buildings Strategy, the funding for green buildings will be channelled towards decarbonising 1 million homes and the equivalent of 50,000 non-domestic buildings by 2030 by switching them to low- or zero-emissions heating.
- The importance of a just transition is recognised by the Scottish Government through the decision to publish Just Transition Plans for every sector of the Scottish economy, starting with the energy sector next spring.
- Funding for green jobs will be supporting setting up a Green Jobs Workforce Academy to upskill and reskill the workforce to match the future demands of the job market.
- The Scottish Government is undertaking steps to decarbonise its rail network and bus fleet by investing in priority bus infrastructure and a Zero Emission Bus Challenge Fund, as well as committing to decarbonise passenger rail services by 2035.
- The PfG announced further ScotWind leasing rounds in this Parliament.

Source: Scottish Government (2020) *A Fairer, Greener Scotland: Programme for Government 2021-22*.

The rest of this report is set out in three chapters:

1. Progress in reducing Scotland's emissions
2. The Updated Climate Change Plan
3. Policy progress and recommendations

We provide our full recommendations, sector by sector, in each section of Chapter 3, as well as in a separate annex.

Chapter 1

Progress in reducing Scotland's emissions

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Introduction

This chapter describes sectoral and whole-economy trends in emissions and sets out whether Scotland's 2019 target has been met.

Scotland missed its 2019 target by a significant margin. 2020 emissions data are not yet available, but COVID-19 is likely to have resulted in significant reductions in emissions. Positive behaviours need to be locked in if COVID-related emissions reductions are to have a lasting impact.

This chapter outlines Scotland's progress towards its climate targets based on the latest available emissions data for Scotland, which cover the period to 2019. Trends in territorial emissions are described both for Scotland as a whole, and for the various sectors of the economy. We also assess whether Scotland's 2019 emissions reduction target has been met.

In addition, this chapter presents the most recent data on Scotland's carbon footprint, which includes emissions embedded in goods and services consumed in Scotland, regardless of their origin. Finally, we discuss the potential impacts of COVID-19 on Scotland's emissions, both temporary and permanent.

Our key messages are:

- Scotland's territorial greenhouse gas (GHG) emissions were 47.8 MtCO₂e in 2019, 2% below 2018 levels and 44% below 1990 levels.
- Scotland's carbon footprint was 70.7 MtCO₂e in 2017. Consumption emissions in 2017 (the latest year for which data are available) were 49% greater than territorial emissions in the same year. Consumption emissions are now falling at a similar rate to territorial emissions, but have fallen less since 1990, only 21%, due to a lack of progress before 2008.
- Using the 'base inventory', against which emissions targets in Scotland are measured, Scotland's emissions have fallen by 51.5% from 1990-2019. This means that Scotland missed its annual target for 2019 of reducing emissions by 55% on the base inventory by a significant margin.*
- While 2020 emissions data for Scotland are not yet available, emissions are expected to have fallen significantly due to COVID-19. Changes in behaviour, such as reductions in business travel and increased walking and cycling, need to be locked in if emissions reductions resulting from COVID-19 are to have any lasting impact. Much faster progress is needed outside of the power sector to meet long-term targets.

Our analysis is set out in the following sections:

1. Context for this report
2. Progress in reducing Scotland's territorial emissions
3. Progress against Scotland's targets in the base inventory
4. Progress in reducing sectoral emissions
5. Progress in reducing Scotland's carbon footprint
6. Effects of past and future methodological changes
7. Impacts of COVID-19 on emissions in 2020 and beyond

* GHG emissions inventories are updated frequently to improve their accuracy. The 'base inventory' methodology ensures that year-to-year changes in the inventory methodology do not make the targets significantly easier or more difficult than intended. This methodology is only used to compare Scotland's progress against its targets, and emissions figures cited in this chapter represent the 2021 GHG emissions inventory, rather than the base inventory, unless otherwise stated.

1. Context for this report

This report assesses Scotland's progress towards its climate targets based on the latest available emissions data for Scotland, which cover the period 1990 to 2019.

This year's report follows swiftly on from the 26th United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP26), which was hosted in Glasgow in November.

This year's report follows on from COP26, which marked a step forward in global efforts to address climate change. Follow-up actions will determine whether it's considered a success.

The UK's presidency of COP26 was aided by the UK's and Scotland's record as climate leaders.

COP26 marked a step forward in global efforts to address climate change, including a material increase in ambitions to reduce emissions across the world, finalisation of rules on reporting emissions and international carbon trading, and the launch of a range of new initiatives and sector deals. How far this can be considered a success will depend on follow-up actions over the coming year and beyond.

The UK's presidency of COP26 was aided by its record as a climate leader, a record to which Scotland continues to be a major contributor:

- Scotland has achieved substantial emissions reductions in recent years, with 2019 emissions down 44% compared to 1990 levels.
- More recently, and since our Progress Report to Scottish Parliament in 2020, the Scottish Government has published an update to its Climate Change Plan and several other key documents, outlined in Chapter 3.
- As part of their commitment to raising global climate ambition, Scotland also submitted an indicative Nationally Determined Contribution before COP26.

The Scottish Climate Change Act was passed into law in October 2019, and legislates significant emissions reductions in the coming years:

- An interim target of a 75% reduction in emissions by 2030, compared to 1990 levels.
- Net Zero emissions by 2045.

Scotland's 2030 emissions target is more ambitious than that recommended by the Committee. The 2020s must mark a new era for climate action in Scotland if these targets are to be met.

The interim target – now due in just 8 years – is more ambitious than that recommended by the Committee and will be difficult to achieve. In our 2020 Progress Report to Scottish Parliament, the Committee suggested that the beginning of the 2020s marks a “new era” for climate action in Scotland. If these targets are to be realised, 2022 must see significant steps toward delivering that action.

Scotland has made welcome progress in planning for decarbonisation and integrating Net Zero in all areas of policy across the economy. Climate consultations and statements in many areas of climate have generally been published in Scotland before UK Government equivalents. This faster pace is necessary, however, to ensure that Scotland achieves a more rapid reduction in territorial emissions than the rest of the UK to meet the legislated 2030 interim target for a 75% emissions reduction on 1990 levels.

More broadly, Net Zero has become an integral part of Scottish government policy, with Net Zero considerations at the heart of the most recent **2021/22 Programme for Government**. Many of the programmes announced are directed toward a '**green recovery**' from the effects of COVID-19, on which the Scottish Government formally sought the Committee's advice in 2020.

We do not know the extent of the full impact of the pandemic on Scottish emissions yet, as provisional 2020 emissions data for Scotland are not available. However, we attempt to provide an initial indication of the effect of the pandemic in section 7, using provisional data available for the UK as a whole.

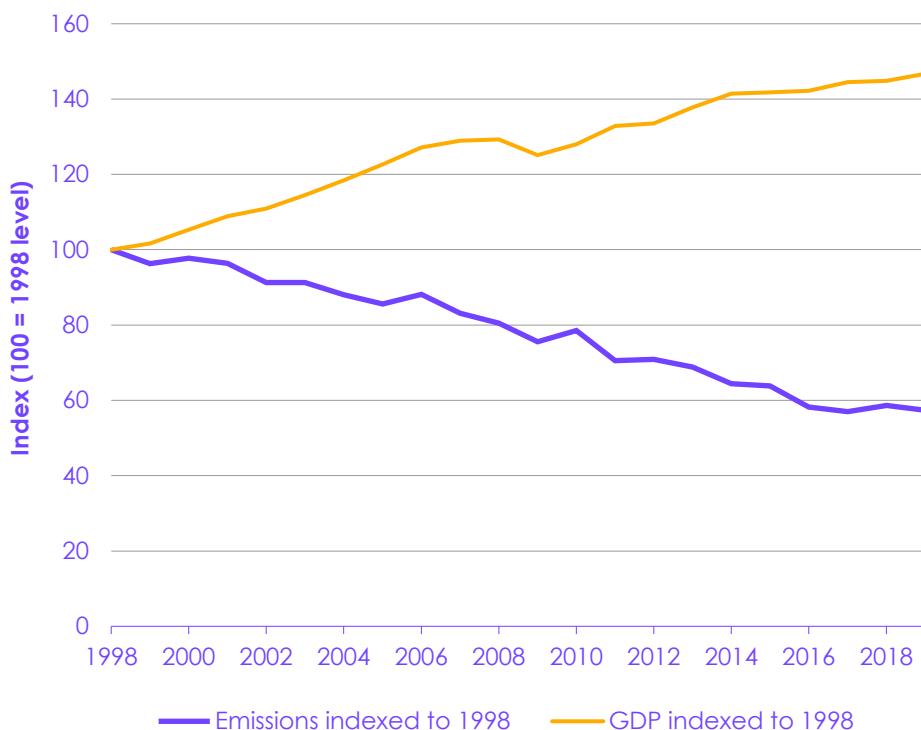
2. Progress in reducing Scotland's territorial emissions

Scottish emissions fell by 2% in 2019 and were 44% below 1990 levels, while the economy has continued to grow.

On the basis of the GHG emissions inventory published in June 2021, total Scottish emissions fell by 2% in 2019 to 47.8 MtCO₂e and by 44% compared to 1990 levels. Since 1998, GHG emissions in Scotland have fallen by 43% while the economy has grown by 47% (Figure 1.1).

This emissions reduction follows on from a 3% increase in 2018, the first annual increase in emissions since 2012. Based on what has been seen for the UK as a whole, it likely precedes a significant drop in 2020 due to the response to the COVID-19 pandemic – this will become apparent in the emissions inventory published in June 2022.

Figure 1.1 Greenhouse gas emissions have fallen in Scotland as the economy has grown

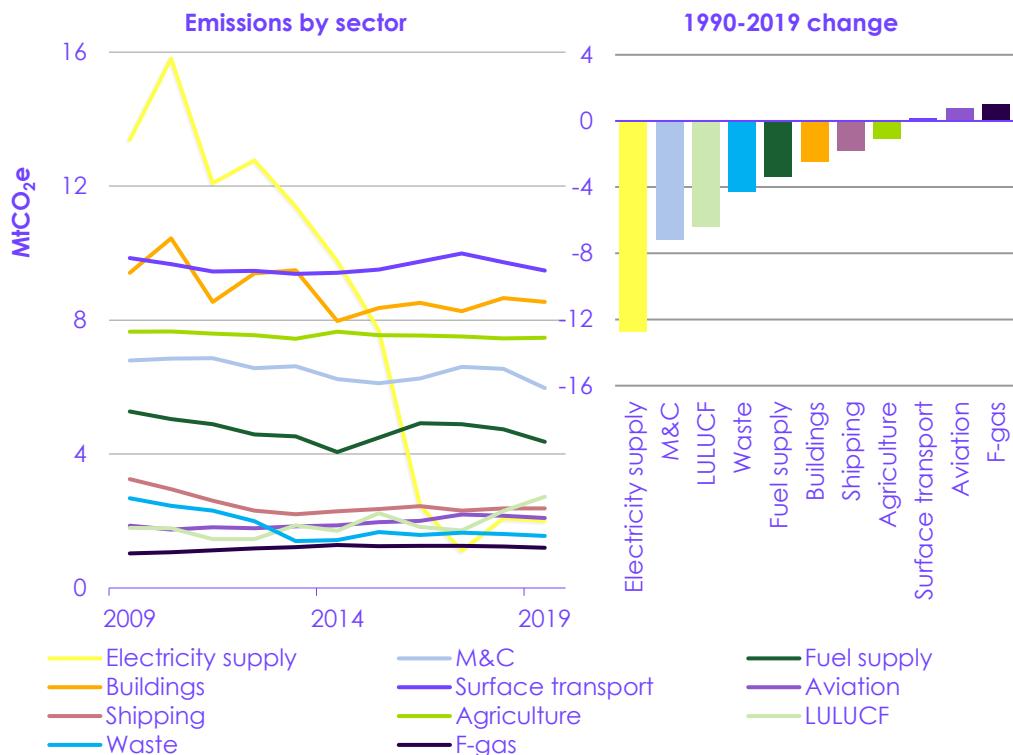


Source: ONS (2021) Regional gross domestic product: all International Territorial Level (ITL) regions; NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019; CCC analysis.
Notes: GDP in real terms, chained volume measure. GDP estimates are not available for Scotland prior to 1998.

Emissions reductions in the past decade have been driven by progress in the power sector, with small reductions in some sectors and increases in others.

The fall in total emissions in the past decade has not been evenly distributed across all sectors. Strong progress in the power sector has dominated, with smaller reductions in some sectors and increases in others (Figure 1.2).

Figure 1.2 Greenhouse gas emissions by sector in Scotland (1990-2019)



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019; CCC analysis.

Emissions from electricity generation in Scotland are now so low that a 4% reduction between 2018 and 2019 was not enough to make it the biggest contributor to emissions reductions over the period. Unlike in previous years, the largest reduction in emissions in 2019 came from industry – manufacturing, construction and fuel supply – which was partly offset by increases in land use emissions:

The biggest sectoral emissions reduction in 2019 came from industry, and was partly offset by increases in land use emissions.

- Emissions fell by close to 1.0 MtCO₂e across industry between 2018 and 2019, reaching 10.3 MtCO₂e in 2019.
- Despite the more modest contribution from the power sector to emissions reductions in 2019, the sector is still the biggest contributor to long-term emissions reductions in Scotland – 75% of the total fall in emissions in Scotland from 2009 to 2019 came from the power sector. Emissions across all other sectors outside have fallen by just 8% over the same period* (Figure 1.3). Emissions savings from the power sector have largely run out.
- Changes in the inventory to account for peatland emissions mean that the land use, land use change and forestry (LULUCF) sector is now estimated to be a net emitter, having previously been estimated to be a net sink using the old methodology. On the new inventory basis, land use emissions in 2019 were 70% below their 1990 levels, largely driven by agriculture-related land use (i.e. emissions and sequestration of greenhouse gases directly from and as a result of land use changes to cropland and grassland, rather than

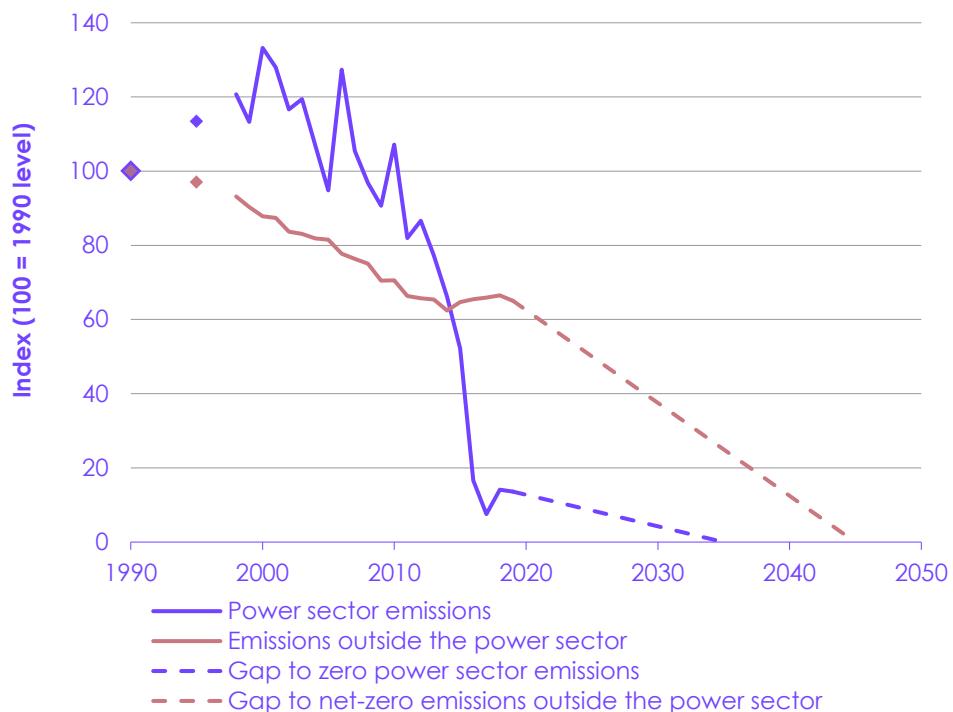
* This number differs significantly from the equivalent estimate in our 2020 Progress Report due to the expanded scope of the emissions inventory to include peatlands, which has increased estimates of emissions for every year.

direct emissions from agricultural activities), which have fallen significantly due to the reduction of agriculture in Scotland over the period.

Progress must be extended beyond the power sector, and the rate of annual emissions reduction must steepen to nearly 2 MtCO₂e, if Scotland is to meet its 2045 Net Zero target.

To meet the Net Zero target, the overall rate of emissions reduction must be increased, while progress must be extended beyond the power sector: emissions fell an average of 1.5 MtCO₂e each year from 2009 to 2019, and must fall by nearly 2 MtCO₂e in each year from 2020 to 2045 (once future methodology changes to the inventory are implemented, see section 6).

Figure 1.3 There is limited room to reduce direct emissions from the power sector further



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019; CCC analysis.

Note: Emissions pathways from 2019 to 2045 are indicative, representing the average required rate of emissions reduction from 2019 to net-zero emissions in the power sector by 2035 and 2045 for all other sectors.

3. Progress against Scotland's targets in the base inventory

Compliance against Scotland's targets is measured against a 'base inventory' methodology to ensure year-to-year changes in the inventory methodology do not make the targets easier or harder to meet.

Compliance with Scotland's recently legislated climate targets is measured against a 'base inventory' methodology for estimating emissions, as recommended by the Committee in December 2017 (see Figure 1.5).¹

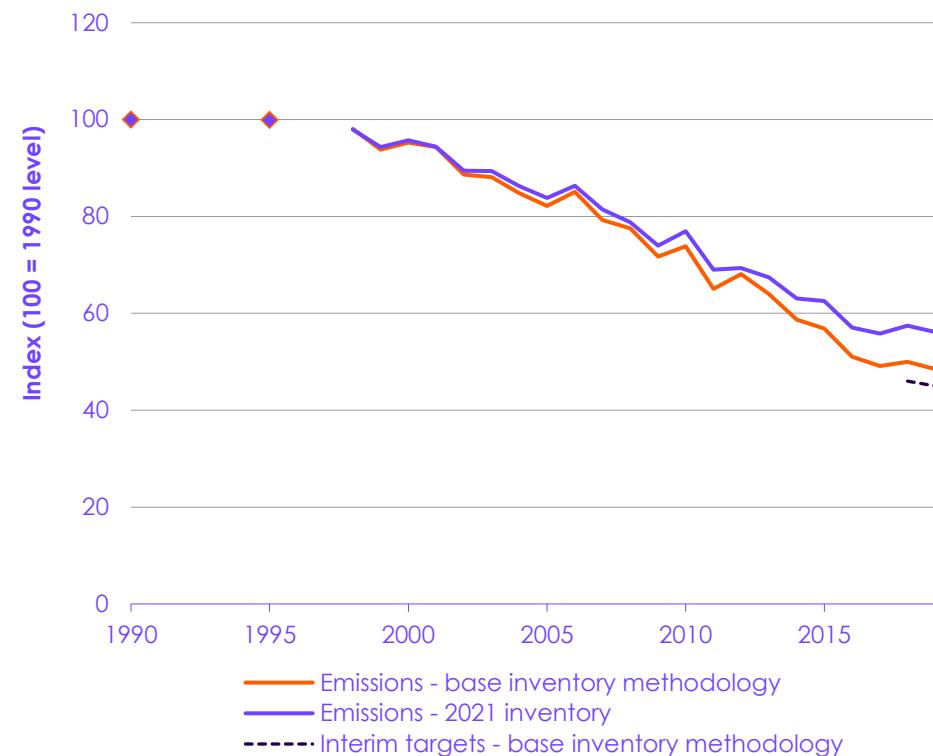
Calculation of a reference 'GHG account' for emissions, consistent with the methodology that was current at the time targets were set, ensures that year-to-year changes in the inventory methodology do not make the targets significantly easier or more difficult than intended. The 'base inventory' must be updated at least every five years to ensure that the basis of targets does not diverge too far from the latest scientific evidence.

The 2019 Act defined the reference 'base inventory' as the most recent inventory published by 30 June 2018. This sets the base inventory as the one published on 12 June 2018 covering emissions in Scotland from 1990 to 2016. On this basis:

- In the 'base inventory', the 1990 baseline against which emissions reductions are measured was 75.7 MtCO₂e.
- For the year 2019, the 'base inventory' GHG account was 36.7 MtCO₂e.
- Against the 'base inventory', emissions have fallen by 51.5% from 1990 to 2019 (Figure 1.4). This means that Scotland missed its annual target for 2019 of reducing emissions by 55% on the base inventory basis.

Emissions against the 'base inventory' have fallen by 51.5% between 1990 and 2019. Scotland has missed its annual 2019 target of a 55% reduction in emissions.

Figure 1.4 Emissions under the Scottish GHG Account 'base inventory' and the 2021 inventory

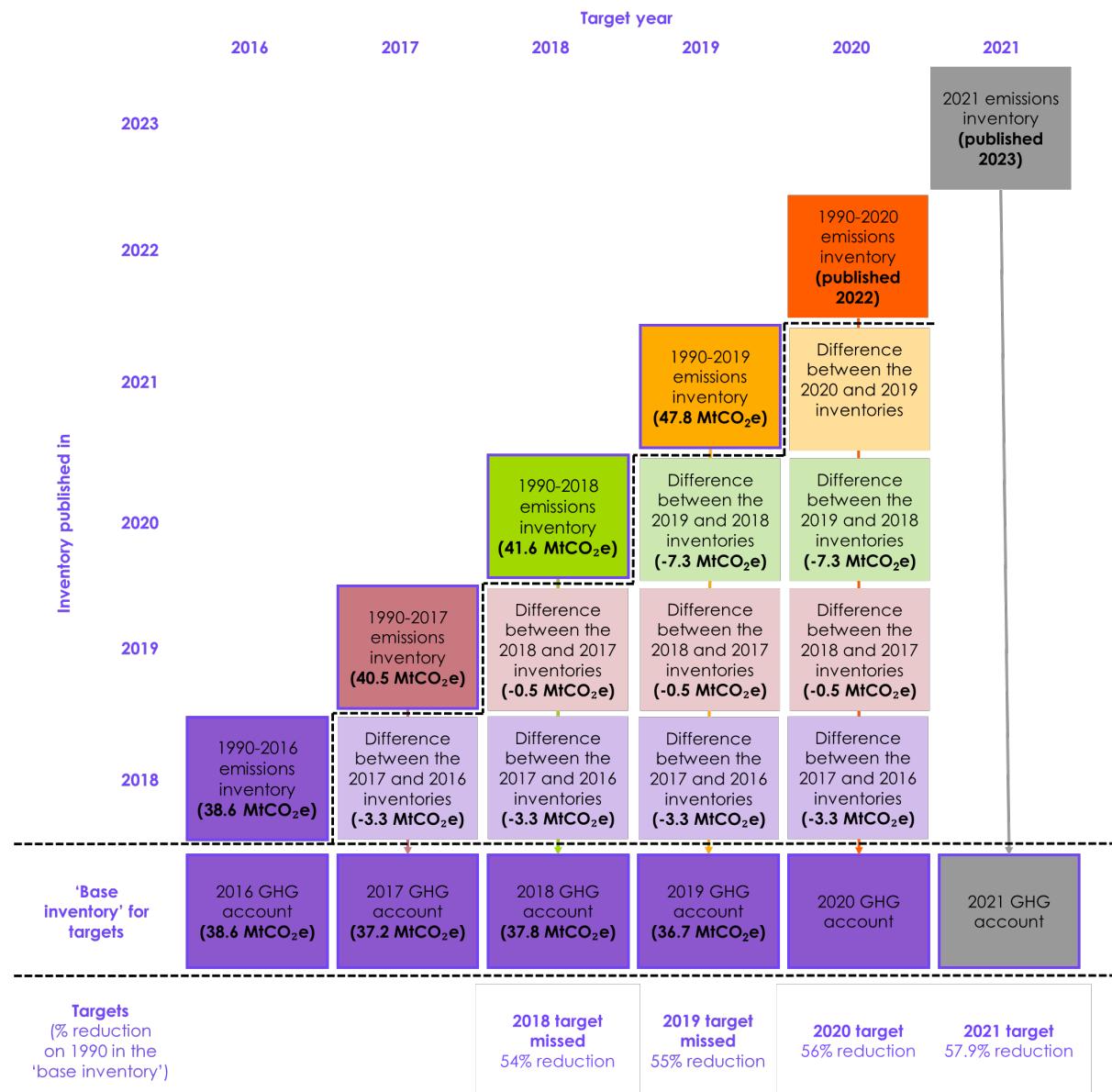


Source: Scottish Government (2021) Scottish Greenhouse Gas statistics: 1990-2019; CCC analysis.

The Committee has set out in recent progress reports that Scotland is at risk of missing its next 'interim' legislated target of a 56% reduction in emissions by 2020, unless emissions fall in sectors other than electricity generation. While emissions data are not yet available for 2020, the impact of the COVID-19 pandemic means that the 2020 target could potentially have been met (see section 7). However, this will not mean that the underlying structural changes to drive emissions reductions in key sectors have been achieved. We go into the changes that are needed in more detail in Chapter 3.

The Committee is due to advise the Scottish Government on its emissions targets in 2022, as a new base inventory will be set for use from 2023.

Figure 1.5 Calculations of the Scottish GHG Account 'base inventory'



Source: Scottish Government (2021) Scottish Greenhouse Gas statistics: 1990-2019; CCC analysis.

Notes: This illustrates the process of adjusting the GHG inventory to create the GHG Account, focusing on the years 2018-2023. The inventory published in June 2018 is the base inventory. Emission estimates in subsequent years are adjusted to meet the scientific methodology used in 2018, using a set of adjustments derived from the differences in emissions estimates for a given year in consecutive inventories. After a maximum of five years from the 2019 Climate Change (Emissions Reduction Targets) Act – in this example by 2023 – the base inventory is updated to re-align with the latest available scientific methodology (potentially together with changes to the legislated targets). In this case, the estimate for 2021 emissions made in 2023 would not be adjusted, and the inventory published in 2022 would become the new base inventory.

4. Progress in reducing sectoral emissions

- In this section, we review progress in reducing emissions in each sector of the economy, and identify the underlying factors which have driven those changes. A summary of sectors and progress in reducing emissions is shown in Table 1.1.

Table 1.1

Summary of sectoral emissions changes (2021 GHG inventory basis)

Sector	1990 emissions (MtCO ₂ e)	2018 emissions (MtCO ₂ e)	2019 emissions (MtCO ₂ e)	Emissions change 1990-2019	Emissions change 2018-19
Surface transport	9.4	9.7	9.5	+1%	-2%
Aviation	1.4	2.2	2.1	+54%	-3%
Shipping	4.2	2.4	2.4	-43%	0%
Manufacturing & construction	13.1	6.5	6.0	-55%	-9%
Fuel Supply	7.7	4.7	4.4	-43%	-8%
Buildings	11.0	8.7	8.5	-22%	-1%
Agriculture	8.6	7.5	7.5	-13%	0%
Land use	9.1	2.3	2.7	-70%	+18%
Power	14.7	2.1	2.0	-86%	-4%
Waste	5.8	1.6	1.6	-73%	-4%
F-gases	0.2	1.2	1.2	+414%	-3%
Total	85.1	48.9	47.8	-44%	-2%

Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019; CCC analysis.

a) Surface Transport

Surface transport is Scotland's highest-emitting sector. Emissions from the sector fell by 2% in 2019 and only 4% since 2009. The longer-term trend is not on track to meet Net Zero.

Surface transport emissions in Scotland were 9.5 MtCO₂e in 2019, representing 20% of total emissions. As for the UK as a whole, surface transport has been Scotland's highest emitting sector since 2015.

The sector's emissions were relatively flat up until 2019, falling by 2% from the previous year and by only 4% over the past decade (Figure 1.6). While this represents the second consecutive annual fall in sectoral emissions, the longer-term trend is still not on track to meet Net Zero.

2020 transport emissions are likely to have dropped significantly as a result of travel restrictions imposed in light of the COVID-19 pandemic.

2020 will have seen considerable reductions in surface transport emissions due to reductions in travel as a result of the COVID-19 pandemic. However, we do not yet have data on these impacts, and the degree to which they will represent sustained emissions reductions is uncertain (see section 7).

Emissions from car travel continue to comprise the majority (56%) of surface transport emissions, followed by HGVs (18%) and vans (18%). While the efficiency of new cars has improved over the past decade, this has been largely offset by increases in total miles driven and increasing sales of larger vehicles.

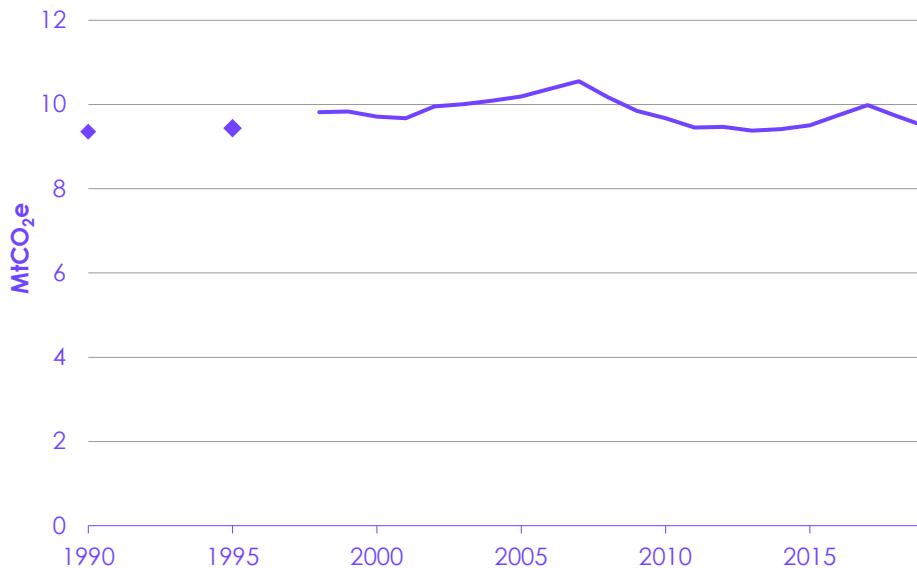
- 2019 saw the average test-cycle emissions from newly registered cars in Scotland increase by 3% for the second successive year.² This concerning trend is driven by the increasing popularity of larger vehicles such as SUVs and risks locking in higher levels of emissions.
- Total vehicle traffic in Scotland rose by around 1% in 2019, consistent with average annual trends across the past decade. The pandemic led to a 23% fall in UK traffic in 2020.³
- On average, Scottish car drivers each drove around 80 more miles annually in 2019 than they did a decade ago.

The market for electric vehicles is growing rapidly, and Scottish Government's investment in charging infrastructure puts roll-out in Scotland ahead of England, Wales and Northern Ireland on a per-capita basis.

The market for electric vehicles is now growing rapidly, with plug-in models making up 2.6% of all new car sales in 2019.⁴ Sales of ultra-low emission vehicles in Scotland more than doubled in 2020, despite the pandemic.

There are now more than 2,500 public charging devices across Scotland, of which over 650 are rapid chargers. The Scottish Government's investment in the ChargePlace Scotland network has helped drive infrastructure deployment, and on a per-capita basis Scotland is ahead of England, Wales and Northern Ireland in both total public charge points and rapid devices.

Figure 1.6 Surface transport emissions in Scotland (1990-2019)



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019; CCC analysis.

b) Aviation

Aviation emissions fell by 3% in 2019, but have risen significantly since 1990.

Aviation emissions in 2019 were 2.1 MtCO₂e, representing 4% of Scotland's total emissions. Despite a 3% reduction in aviation emissions between 2018 and 2019, aviation emissions have grown significantly in Scotland since 1990, and in 2019 were 54% higher than 1990 levels and 13% higher than 2009 levels (Figure 1.7):

- The fall in emissions over the 2018-2019 period was accompanied by a 2% reduction in the number of terminal passengers. As this reduction follows several years of passenger demand growth, and was followed by the unusual and drastic decreases in passenger numbers brought about by the pandemic, it is too soon to tell whether the reduction is a one-off or part of wider trend.
- Emissions from domestic flights decreased by more than 5% between 2018 and 2019, continuing the steady decline which started in 2007. Emissions in 2019 were 0.5 MtCO₂e, 33% below 1990 levels.
- The increase in aviation emissions since 1990 has been driven by the increase in demand for international flights. Although emissions from international flights fell by 2% between 2018 and 2019, this follows on from several years of steady increases. International aviation emissions in 2019 were 183% higher than in 1990, at 1.5 MtCO₂e.

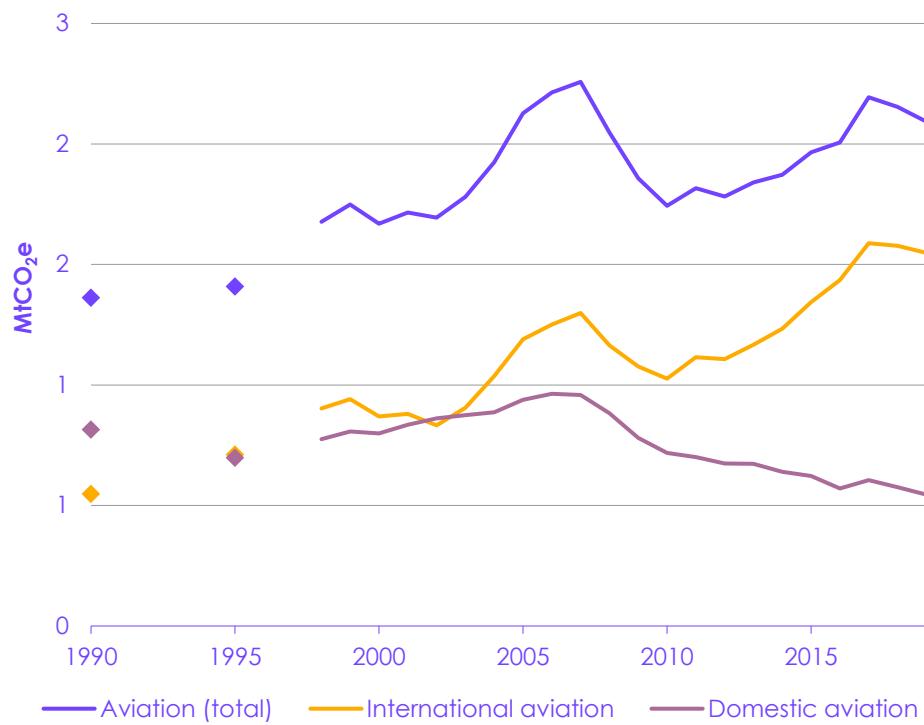
Since 2009 the total number of terminal passengers in Scotland rose by 28% to reach 28.9 million in 2019.⁵ The increase in emissions over that period has been more modest than growth in passengers due to increased plane loadings, decreases in average flight distance (due to faster growth in flights to the EU than other international destinations) and some improvements in fleet efficiency.

The COVID-19 pandemic resulted in a sharp drop in passenger numbers and will be accompanied by a drop in 2020 aviation emissions. A return to demand growth seen in the last decade would not be sustainable.

The COVID-19 pandemic will result in Scottish aviation emissions in 2020 being significantly lower than 2019 levels, following a sharp drop in passenger numbers. Although these data are not yet available for Scotland, aviation emissions for the UK as a whole fell by 60% during this period. To what extent these emissions reductions will be sustained in future years is uncertain, and depends on the future evolution of the pandemic as well as the potential for longer-term behavioural changes which may result (see discussion in section 7).

As Scotland's recovery from the pandemic continues, a return to the increases in passenger numbers seen in the last decade would not be sustainable if Scotland is to stay on track to meet its climate targets.

Figure 1.7 Aviation emissions in Scotland (1990-2019)



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.

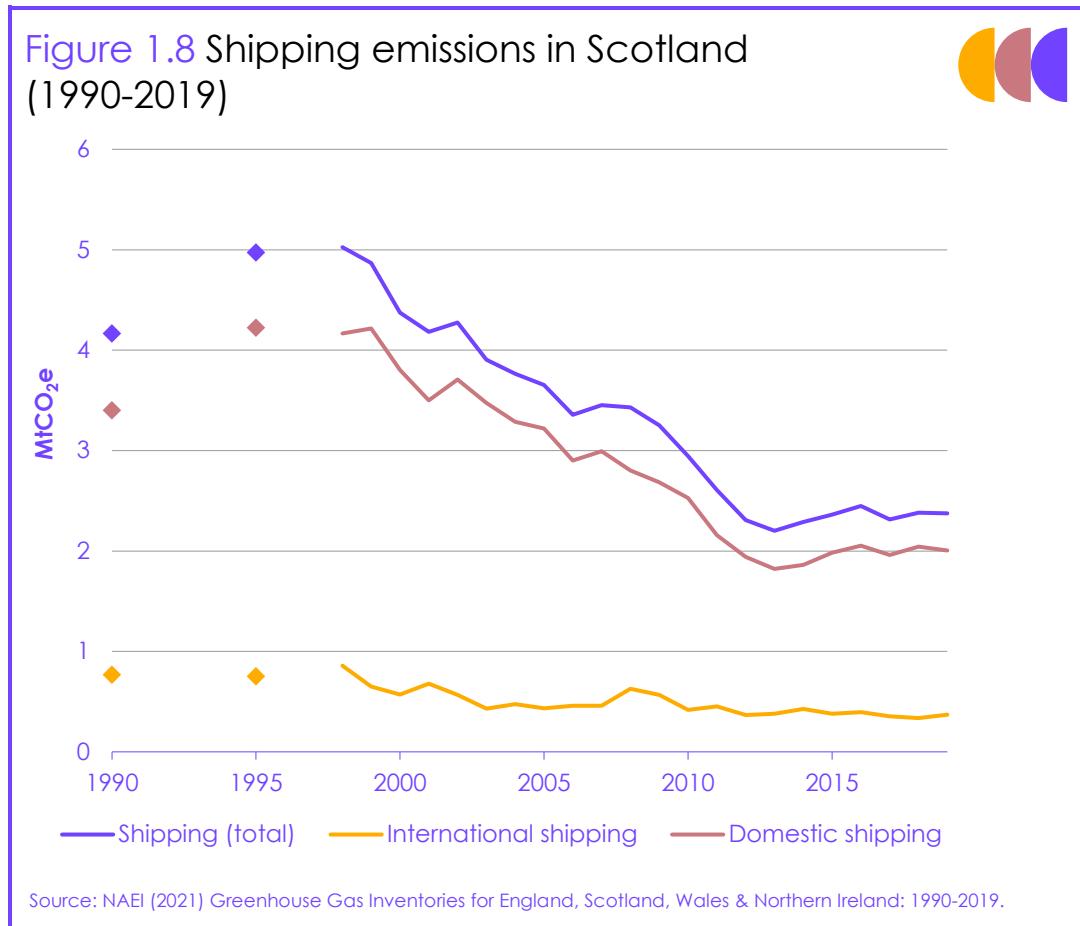
c) Shipping

Shipping emissions have remained largely unchanged since 2012, and fell by just 0.3% in 2019.

Shipping emissions were 2.4 MtCO₂e in 2019, accounting for 5% of Scotland's total emissions. Emissions from shipping have fallen by 43% since 1990, and by 27% over the past decade. However, emissions have remained largely unchanged since 2012, and in 2019 fell by just 0.3% on the preceding year (Figure 1.8).

- Scottish shipping emissions are largely driven by domestic shipping, which accounts for 83% of the total. These emissions fell slightly (by 2%) in 2019, despite a 4% increase in domestic freight movements and a 1% rise in ferry traffic.

International shipping emissions, as measured by bunker fuel sales in Scotland, rose by 10% in 2019.



d) Manufacturing and construction

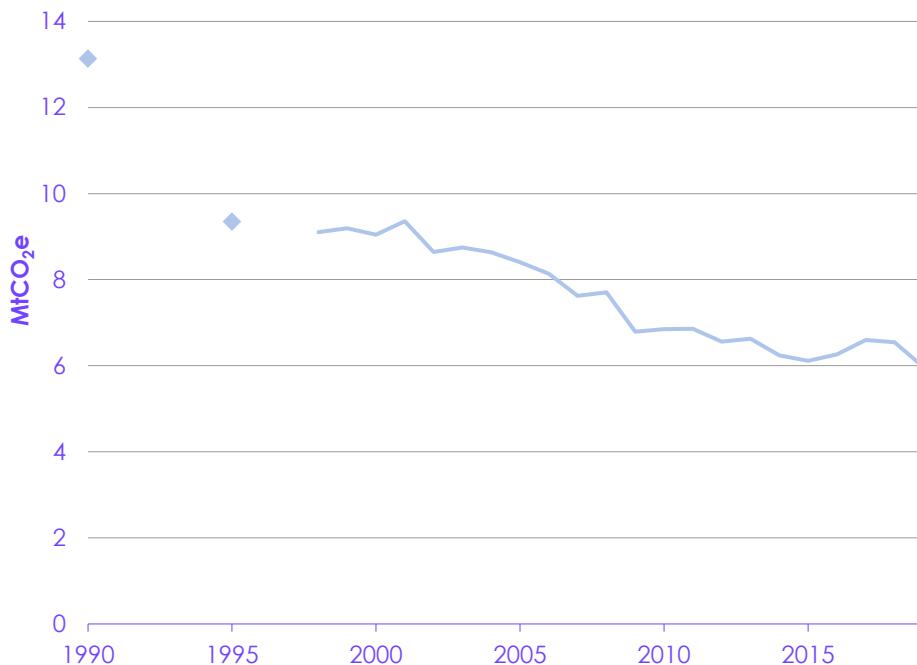
Manufacturing and construction emissions fell by 9% in 2019. This was the largest annual decrease in any sector, and caused in part by a temporary plant closure.

Manufacturing and construction emissions in Scotland fell by 9% in 2019 to 6 MtCO₂e, and represented 12% of Scotland's total emissions. The annual decrease in emissions was the largest observed in any sector. However, it was likely caused by a temporary plant closure, discussed below.

More generally, emissions from this sector have fallen by 55% since 1990, although they rose by 7% between 2015 and 2018 (Figure 1.9). Although 2019 emissions in this sector apparently represent the resumption of emissions reductions in this sector, the extent to which this reduction represents underlying progress is uncertain:

- The decrease from 2018 to 2019 was driven mostly by a decrease in emissions from chemicals production (62% of the decrease) and decreased electricity generation on industrial sites (26% of the decrease). Around half of the decrease in emissions from chemicals production may be attributed to the temporary closure of the Mossmorran plant for several months in the second half of 2019 due to a series of flaring issues.⁶
- An increase in emissions from food and drink production (of 14%) slightly offset these decreases.
- Taking into account this temporary plant closure, it is unclear whether the remainder of the annual fall in emissions since 2018 reflects underlying progress (such as improvements in energy efficiency) or simply year-to-year fluctuations. Excluding 2019, emissions trends since 2015 suggest that reductions in sectoral emissions have slowed. In order to achieve emissions targets, sustained progress in decarbonising this sector must resume.

Figure 1.9 Manufacturing and construction emissions in Scotland (1990-2019)



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.

e) Fuel Supply

The fuel supply sector covers the production and supply of fossil fuels, low-carbon hydrogen, and bioenergy. Current emissions from high-carbon hydrogen and ammonia production and bioenergy conversion are accounted for in manufacturing and construction (section d). As a result, this section focuses specifically on emissions from fossil fuel supply.

The fossil fuel supply sector emitted 4.4 MtCO₂e in 2019, representing 9% of total greenhouse gas emissions in Scotland:

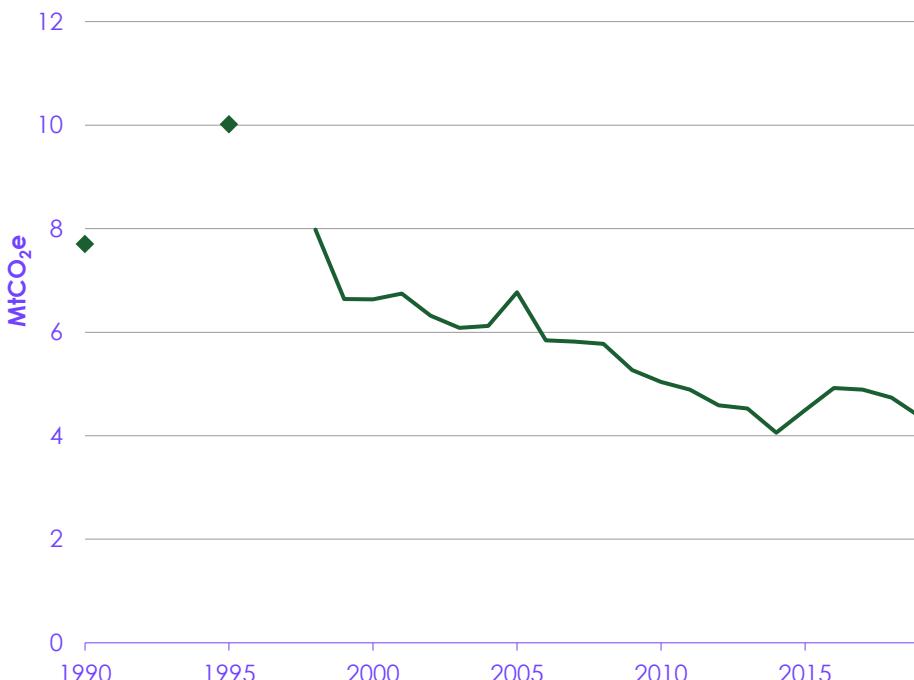
- The largest source of emissions came from oil and gas production, which accounted for 48% (2 MtCO₂e) and 11% (18 MtCO₂e) of Scottish and UK fossil fuel supply emissions, respectively.
- Refining comprised 41% of emissions (1.8 MtCO₂e).
- The remainder of emissions predominantly result from fugitive methane emissions from the gas grid, and from mining.

Fossil fuel supply emissions fell by 8% in 2019, and have fallen by 43% since 1990. Reductions in 2019 were driven by a decline in refinery output.

Fossil fuel emissions in Scotland fell by 0.4 MtCO₂e (8%) in 2019. Emissions in the sector have fallen by 43% since 1990 (Figure 1.10).

- The emissions reduction in 2019 was driven by a decline in refinery output, as well as falling energy use for oil and gas production.
- However, this was partially offset by an increase of 0.1 MtCO₂e from flaring and venting.

Figure 1.10 Fuel supply emissions in Scotland (1990-2019)



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.

f) Buildings

Direct emissions from buildings decreased by 1% in 2019. This small decrease is likely accounted for by the extreme cold weather event in 2018, which resulted in colder weather in 2018 than 2019.

Direct emissions from buildings decreased by 1% from 2018 to 8.5 MtCO₂e in 2019, comprising 18% of total Scottish emissions in 2019. This is similar to the UK, where buildings also comprised 18% of 2019 emissions.

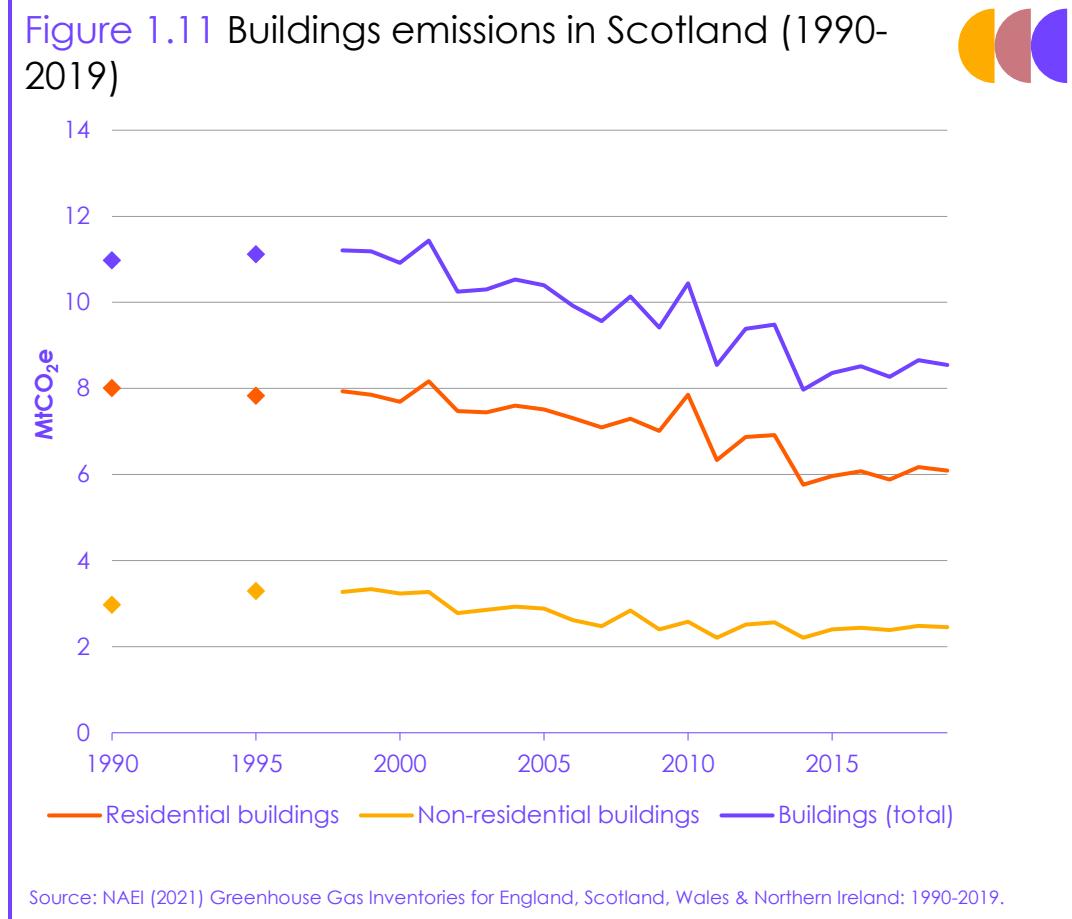
- Scottish emissions from non-residential buildings accounted for 29% (2.5 MtCO₂e) of total emissions from buildings, while residential buildings accounted for the other 71% (6.1 MtCO₂e).
- The extreme cold weather event the 'Beast from the East' in March 2018 resulted in colder weather for 2018 compared to 2019. This is likely to account for the small decrease in emissions seen in 2019.*

Direct emissions have decreased by 22% (2.4 MtCO₂e) since 1990, with more progress in the residential sector (decrease of 1.9 MtCO₂e) than the non-residential sector (decrease of 0.5 MtCO₂e). Scottish emissions have hovered within the range of 8 and 8.7 MtCO₂e since 2014 (Figure 1.11).

The share of homes with an EPC C rating or higher increased from 24% in 2010 to 41% in 2014, suggesting that emissions reductions over this period have been driven at least in part by genuine underlying progress.

Improvements to the energy efficiency ratings of homes suggest that a proportion of the emissions reductions made in the last decade reflect genuine underlying progress, with an increase in the share of homes having EPC C rating or higher from 24% in 2010 to 41% in 2014. EPC improvements have been slower since 2014 (as of 2018, 49% were EPC C or higher) which may in part account for the slower decrease in emissions since 2014.⁷

Figure 1.11 Buildings emissions in Scotland (1990-2019)



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.

* Temperature-adjusted emissions estimates, which are generally used to remove the effect of external temperatures on emissions, are not available for Scotland.

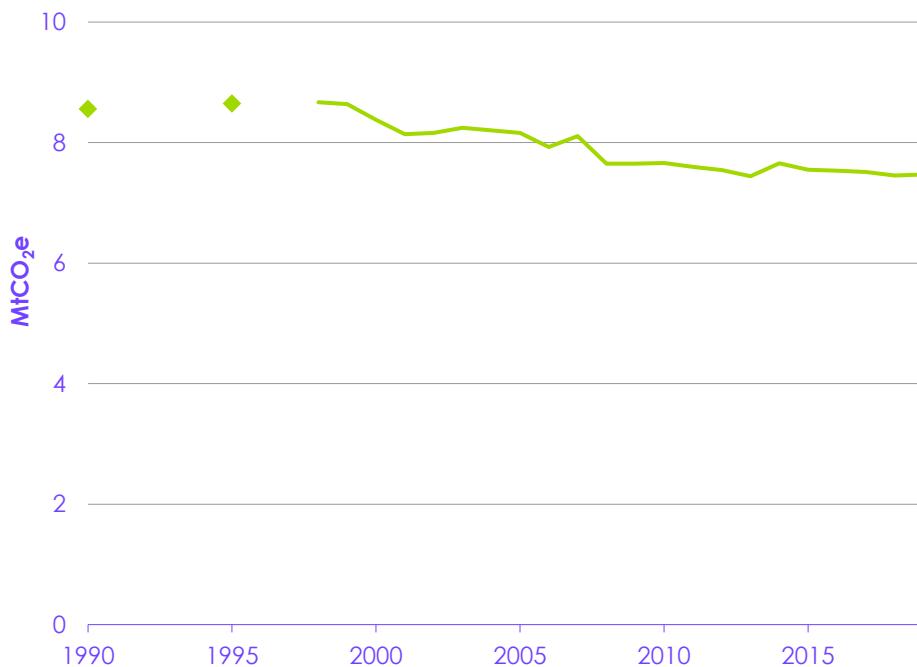
g) Agriculture

Agriculture emissions have been broadly flat since 2008 and increased slightly in 2019. Changes in sources within the sector have been more significant.

Emissions from agriculture were 7.5 MtCO₂e in 2019. They represented 16% of all Scottish emissions, a higher proportion than in the UK as a whole. Emissions have been broadly flat since 2008, falling by just 2%, and rose by less than 0.1 MtCO₂e in 2019. However, there have been more significant changes among sources:

- Emissions from enteric fermentation, the digestive process of livestock, account for 48% of all agriculture GHGs, and have fallen by 16% since 1990 as livestock numbers declined.
- Although emissions from manure management remained unchanged in the year to 2019, they have been on a steady downward trajectory over the last decade, decreasing by 8% since 2008.
- Both direct and indirect emissions from soils, which account for 29% of agriculture emissions, were broadly unchanged from last year but have risen by 4% since 2008.
- Energy use emissions from stationary and mobile machinery (11% of agriculture emissions) increased by 1% in 2019 and by 14% since 2008.

Figure 1.12 Agriculture emissions in Scotland (1990-2019)



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.

h) Land use, land-use change and forestry

Emissions inventory changes, including a better representation of emissions from peatlands and updated estimates of grassland emissions, increased estimated emissions in the LULUCF sector significantly. This turned the sector from a sink to a source.

Excluding inventory changes, land use emissions in Scotland rose by 0.4 MtCO₂e in 2019.

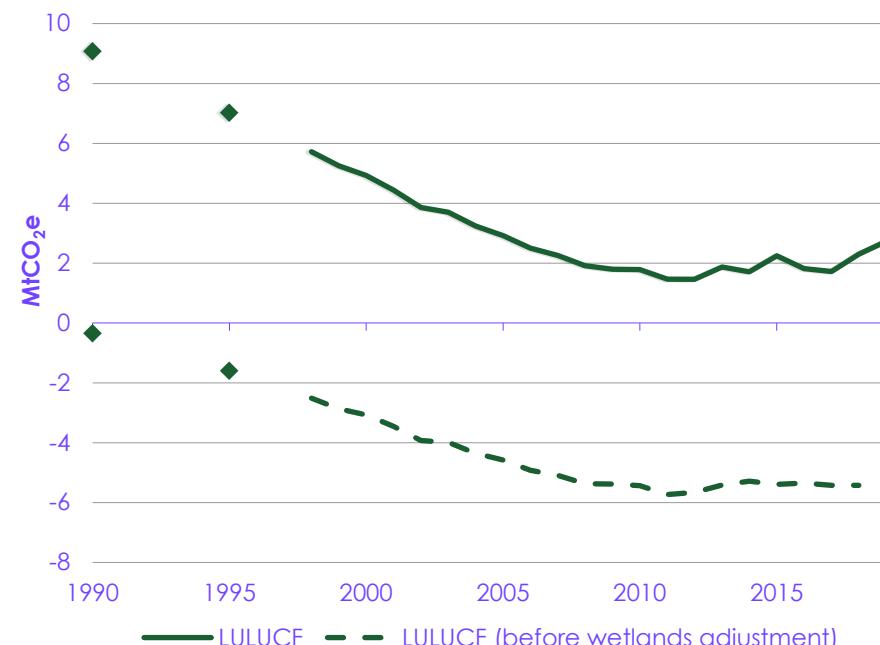
There were significant revisions in the Scottish GHG inventory in 2019, which added 7.7 MtCO₂e to the estimated level of this sector's emissions in 2018 (see section 6 for more on methodological changes to the emissions inventory):

- The main change has been better representation of emissions from drained and rewetted organic soils (peatlands) and updated estimates of grassland emissions, now assessed to be a source of emissions rather than a sink.
- These revisions mean the LULUCF sector is now estimated to be an overall net source of emissions of 2.7 MtCO₂e in 2019, compared with a net sink of 5.4 MtCO₂e in 2018 under the old methodology.

Excluding inventory changes, land use emissions rose by 0.4 MtCO₂e in 2019, largely due to a continuing rise in peatland emissions. The amount of carbon sequestered from forests in Scotland has also reduced over the past decade or so, from 9.5 MtCO₂e sequestered in 2008 to 8.1 MtCO₂e in 2019.

10,700 ha of new woodland were planted in 2020-21, a slight reduction from the previous year, and short of the Scottish Government target of 13,500 ha per annum. Nevertheless, 80% of new UK woodland was planted in Scotland, 95% of which was undertaken by the private sector. The majority (65%) of new planting in Scotland is fast-growing conifer species destined for use as softwood products in construction and products with a short lifespan such as wood fuel, paper, wood chip and sawdust. Planting of broadleaved woodlands makes up a smaller proportion of new planting. There is scope to expand sustainably managed broadleaved forests and woodlands, creating opportunities to improve the supply and quality of hardwood timber as well as providing other benefits such as biodiversity.⁸

Figure 1.13 Land use emissions in Scotland (1990-2019)



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.

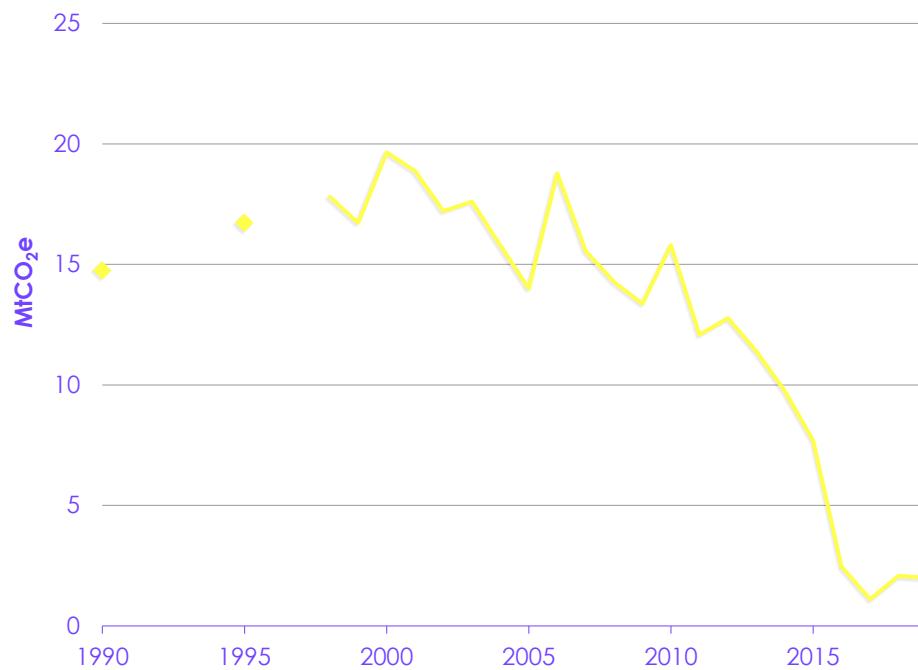
i) Power

Emissions from electricity generation fell by 4% in 2019 and by 85% since 2009. Electricity generation now accounts for just 4% of Scotland's emissions.

Emissions from electricity generation in Scotland fell 4% in 2019, to 2.0 MtCO₂e. Emissions have now fallen by 85% since 2009, similar to the UK-wide decarbonisation of the power sector over the last decade (Figure 1.14). Electricity generation now accounts for just 4% of Scotland's total emissions:

- The emissions reduction in 2019 reflects a 17% reduction in electricity generation from unabated gas. The much larger reduction since 2010 has been driven by the closure of all coal plants in Scotland.
- The reduction in electricity generated from fossil fuels was more than offset by a 14% increase in renewable generation in 2019. The majority of the rise in renewables was due to an increase in wind generation, which rose by 15% in 2019. Wind comprised around 45% of Scottish electricity generation in 2019.
- The significant net increase in Scottish electricity generation in 2019 means that net exports of electricity to England and Northern Ireland increased, rising by 17% in total.

Figure 1.14 Power sector emissions in Scotland (1990-2019)



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.

j) Waste

Emissions from waste declined by 4% in 2019 and by 73% since 1990. Emissions in the past few years have remained largely flat.

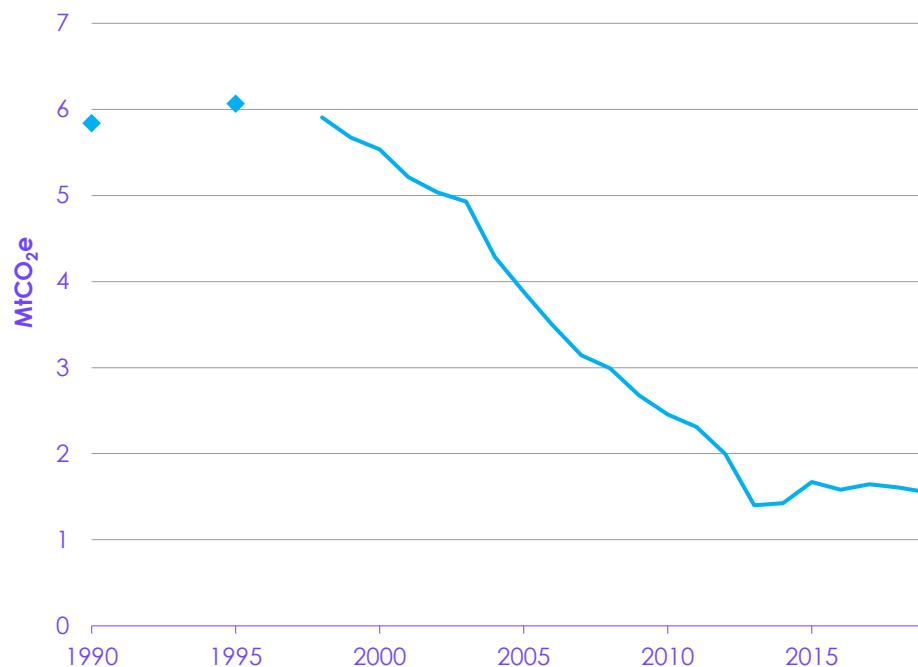
There was an increase of 72% in the volume of waste being incinerated in 2019. EfW emissions in Scotland are rising more steeply than the UK level trend of recent years.

In 2019 emissions from waste in Scotland were 1.6 MtCO₂e, accounting for 3% of Scotland's total emissions. This is a slight (4%) decline on 2018 levels and in line with the trend of recent years in which emissions from the sector have remained largely flat, following an earlier period of steep decline (Figure 1.15). Overall, emissions from this sector have fallen by 73% from 1990 levels.

- Scotland's reported waste sector emissions are almost entirely associated with methane produced by waste which has been sent to landfill. However, this doesn't include emissions from Scotland's Energy from Waste (EfW) plants, which are instead reported within the power sector – the Scottish inventory does not report these separately from other forms of electricity generation.
- Scotland saw a huge increase in the volume of waste being incinerated in 2019 (up 72% compared to 2018),⁹ reflecting increased diversion of waste from landfill. This indicates EfW emissions are rising more steeply than the UK level trend of recent years.*

Household recycling rates in Scotland have plateaued in recent years at around 45% and it looks unlikely that Scotland will have met its 60% recycling target for 2020.¹⁰

Figure 1.15 Waste emissions in Scotland (1990-2019)



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.

* UK emissions from Energy from Waste and incineration rose by 12% between 2018 – 2019 and 15% between 2017-2018.

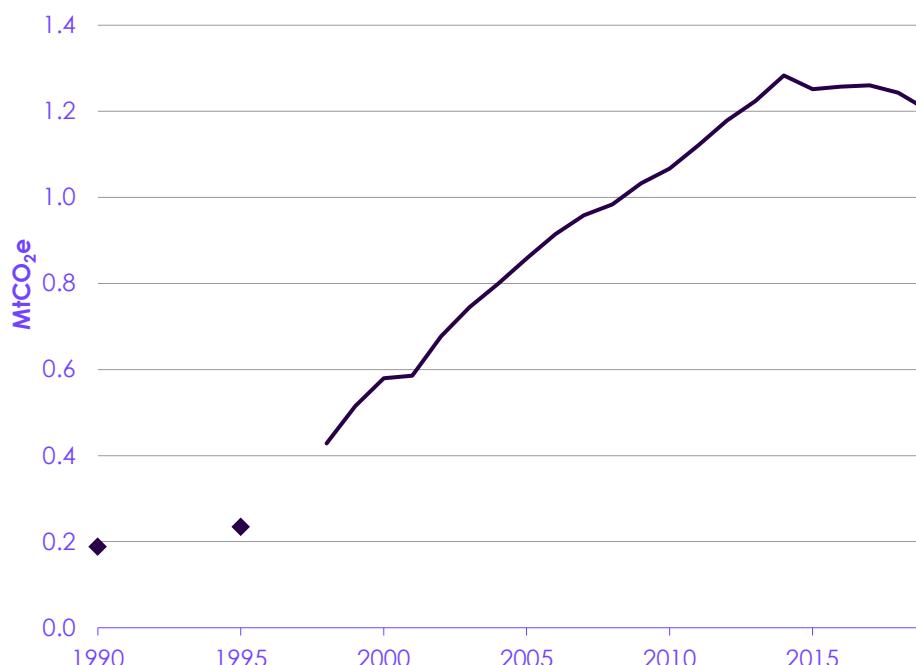
k) F-gases

F-gas emissions fell by 3% in 2019, continuing the declining trend since the sector's peak in 2014. Emissions are still over four times higher than in 1990.

Emissions from this sector were 1.2 MtCO₂e in 2019, a fall of 3% on 2018, continuing the trend of declining emissions every year since a peak in 2014. Emissions remain 17% higher than 2009 levels and over four times higher than emissions in 1990, although their decline since 2015 has been sustained (Figure 1.16):

- The largest source of F-gas emissions – in Scotland and for the whole of the UK – is the refrigeration air-conditioning and heat pump (RACHP) sector.
- Reductions in F-gas emissions since 2015 have been the result of industry pressure and strong EU regulation on their use (which was in effect until 2019), driving innovation and product shifts.

Figure 1.16 F-gas emissions in Scotland (1990-2019)



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.

5. Progress in reducing Scotland's carbon footprint

The emissions data reported under the Climate Change (Scotland) Act reflect GHGs emitted within Scotland's borders, together with Scotland's share of emissions from international aviation and international shipping (IAS).

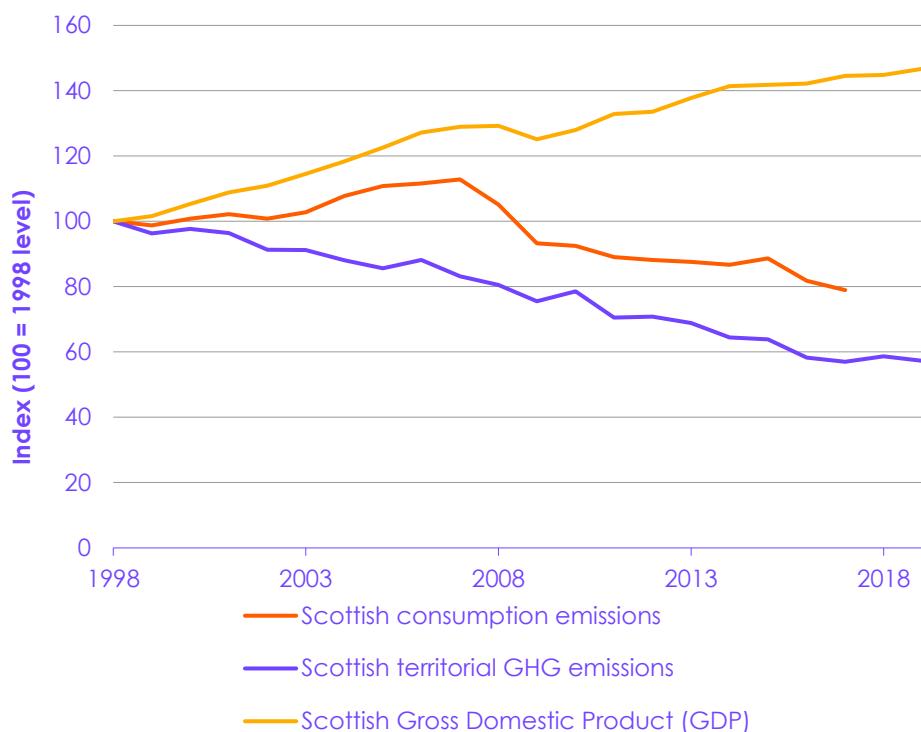
While this 'territorial' approach is aligned with the Paris Agreement, a more complete picture emerges when also looking at emissions on a 'consumption' basis. This approach captures embodied emissions in goods/services consumed within Scotland but produced elsewhere. The sources of Scotland's consumption emissions are summarised in Box 1.1.

Scotland's consumption emissions have fallen more slowly than territorial emissions, although the pace of reduction has picked up in recent years.

Scotland's consumption emissions have fallen over the last decade but are higher than territorial emissions and, until recently, were falling at a slower rate. Figure 1.17 compares the historical territorial and consumption emissions data for Scotland:

- Consumption emissions in 2017, the most recent year for which consumption emissions data are available for Scotland, were 49% higher than territorial emissions in the same year.
- Relative to 1998 levels, consumption emissions had fallen by 21% in the period to 2017, compared to 43% for territorial emissions over this period.

Figure 1.17 Scottish consumption and territorial emissions



Source: Scottish Government (2021) Scotland's Carbon Footprint 1998-2017; ONS (2021) Regional gross domestic product: all International Territorial Level (ITL) regions; NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019; CCC analysis.
Notes: GDP in real terms, chained volume measure.

To date, the reduction in Scotland's consumption emissions has mainly been due to increased production efficiency in the UK as a whole. However, demand-side measures may be necessary for this trend to continue in the long term.

The CCC's Sixth Carbon Budget report¹¹ outlined several levers to manage consumption emissions, including consumer action to reduce demand for high-carbon goods:

- Total consumption has increased in Scotland since 1998, along with an increased population.
- Meanwhile, the carbon-intensity of consumed products and services has fallen, resulting in the overall reduction of consumption emissions.

CCC recommendations on demand-side measures, which can help to reduce consumption as well as territorial emissions, are yet to be addressed by Scottish Government in some areas.

Previous CCC recommendations to the Scottish Government regarding demand-side measures are yet to be addressed (see agriculture and land use and aviation sections in chapter 3). Such measures are also likely to be required to meet Scotland's territorial emissions reductions targets.

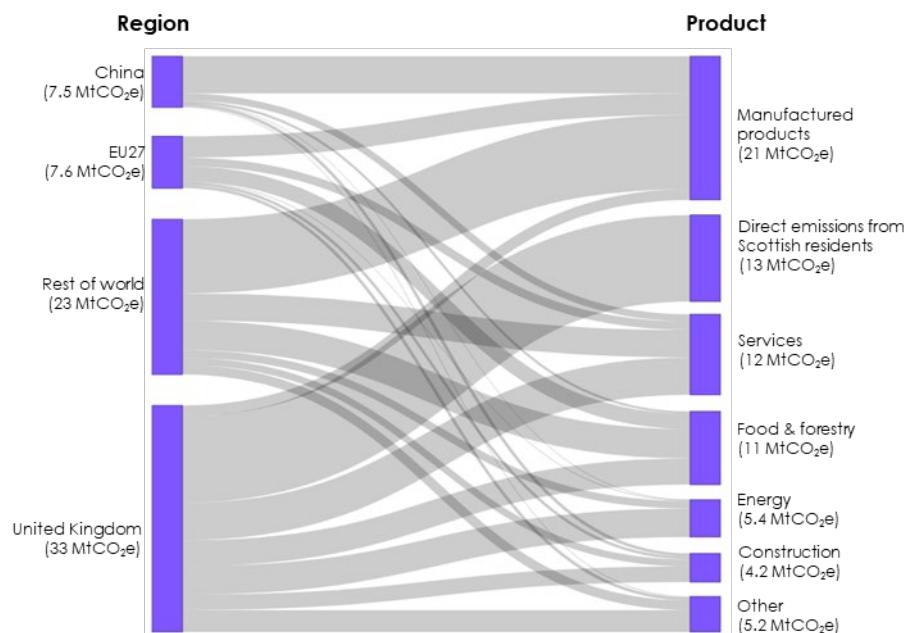
Box 1.1

Where do Scotland's consumption emissions come from?

Scotland's consumption emissions can be broken down by type of product, and region of origin (Figure B1.1). Some of the key sources are outlined below:

- **Emissions from UK sources.** 47% of Scotland's consumption emissions are also accounted for in the UK's territorial inventory. Of these, direct emissions from Scottish residents from car travel and household heating make up 38%, with other sources including energy (12%), food (11%), and construction (7%).
- **Imported emissions.** The remaining 53% of Scotland's consumption emissions are embodied in goods imported from other countries, particularly China and the EU (11% each). This fraction is increasing as the UK's territorial emissions fall.
- **Manufactured products.** These account for the 30% of Scotland's carbon footprint. Emissions from manufactured products consumed in Scotland come almost entirely from countries outside the UK (92%).
- **Food & forestry products.** A significant proportion of the UK's and, consequently, Scotland's food is imported from other countries. As highlighted by the UK's National Food Strategy, producing the UK's food requires an area of land far greater than the size of the UK.

Figure B1.1 Scotland's consumption emissions by product and region in 2017



Source: Scottish Government (2021) *Scotland's Carbon Footprint 1998-2017*; ONS (2021)

Notes: 'Direct emissions from Scottish residents' includes heating and car travel; 'Other' consists mostly of transportation services.

6. Effects of past and future methodological changes

Methodology changes to the emissions inventory are designed to increase the transparency, accuracy, consistency, comparability, and completeness of emissions estimates.

Changes in the scope of the inventory to include emissions from peatland and changes in the global warming potentials used, alongside other minor changes, will add the equivalent of 8 MtCO₂e to estimated 2018 emissions.

Methodology changes to the UK National Atmospheric Emissions Inventory (NAEI) are designed to increase the transparency, accuracy, consistency, comparability, and completeness of emissions estimates (see Box 1.2). Scotland's 'base inventory' method for assessing targets (set out in section 3) is designed to be robust to these types of methodological changes in the near term and is used for assessing Scotland's progress against its targets. However, annual emissions are reported on the basis of the standard emissions inventory (i.e. the NAEI).

There are two significant changes to the scope of the inventory and the GWPs used occurring in the early part of this decade, which combined with other minor inventory changes will add the equivalent of 8 MtCO₂e to estimated 2018 emissions:

- **Peatlands.** The scope of the inventory changed in 2021 to include emissions from peatlands, following the implementation of the Wetlands Supplement.¹² Inclusion of the wider range of peatland emissions, alongside other minor inventory changes, added approximately 7.3 MtCO₂e to the emissions inventory for 2018* (and 8.9 MtCO₂e for 1990). For comparison, until 2020, less than 0.1 MtCO₂e of emissions associated with wetlands in Scotland were within the scope of the inventory.
- **Global Warming Potential (GWPs)** are used to aggregate different GHGs together into a common metric, showing their equivalence to carbon dioxide. A change in the internationally agreed methodology on GWPs will be implemented by 2024, increasing the headline figure for Scottish emissions by around 0.7 MtCO₂e for 2018 (and 1.4 MtCO₂e for 1990), largely from sectors which have significant methane emissions (i.e. agriculture, land use and waste):
 - The current emissions inventory (published in 2021) uses GWPs from the IPCC 4th Assessment Report (AR4), which was published in 2007. At COP24, in December 2018, the international community decided to standardise reporting under the Paris Agreement transparency framework using the 100-year GWP values from the IPCC 5th Assessment Report (AR5), with changes to be implemented by 2024. Two methodologies were presented in AR5, both higher than the AR4 values used in the current emissions inventory.
 - At COP26 an agreement was reached to use the lower AR5 GWP values for reporting to the Paris Agreement.¹³ Through the requirement in the Climate Change Act for international alignment, this is expected to be implemented within the UK's accounting system by the agreed date of 2024.

* The inclusion of a wider range of peatland emissions added 7.7 MtCO₂e to emissions in the LULUCF sector in 2018, with changes that reduced emissions in other sectors slightly offsetting the increase from peatland.

The CCC's pathways and recommendations factored in subsequent inventory changes before final decisions on methodologies had been made. We made cautious assumptions, which assumed greater impacts of changes than the final chosen methodologies.

Our pathways and recommendations on the Net Zero greenhouse gas target in 2045, as well as the interim targets in 2030 and 2040, considered these two methodological changes before final decisions on the peatland methodology or GWPs had been made. In doing so, we cautiously assumed that the impact would be at the higher end of estimated ranges for potential changes being considered. Our published emissions pathways are based on the higher AR5 GWPs and are therefore higher than emissions under the newly-adopted lower AR5 GWPs.

Box 1.2

Uncertainty and changes in convention and scope in the greenhouse gas emissions inventory

There are three primary sources of uncertainty in the emissions inventory: uncertainty in emission factors and activity data used in estimating emissions, uncertainty in Global Warming Potentials (GWPs) assigned to GHGs and uncertainty in inventory scope.

- **Uncertainty in the current GHG inventory.** This comprises the uncertainty in emission factors and activity data used in estimating emissions. It is internal to the inventory, is well quantified and it is possible to formally assess the probability of errors through methods set out in IPCC guidelines. For the 2014 inventory, the uncertainty was estimated as ±3% with 95% confidence for the UK as a whole, but this was up to ±10% for Scotland. This measure was higher in Scotland because the uncertainty is concentrated in sectors involving complex biological processes or diffuse sources such as waste, agriculture and land use, land use change and forestry (LULUCF), which have a greater share of emissions in Scotland.
- **Uncertainty in Global Warming Potentials (GWPs) assigned to GHGs.** GWPs are used to convert emissions from different gases into a single comparable metric (tonnes of CO₂-equivalent, or tCO₂e). As agreed internationally, the inventory uses the GWP evaluated over a 100-year time frame (GWP100). There have been multiple changes to the GWP estimates used for CH₄, N₂O and F-gases since the inception of the inventory. Future changes to GWPs will significantly affect emissions as measured in MtCO₂e.
- **Scope of the inventory.** Some sources of emissions and activities (e.g. most peatland emissions) were not included in previous versions of the inventory but have been included over time, thus adding to overall GHG estimates.

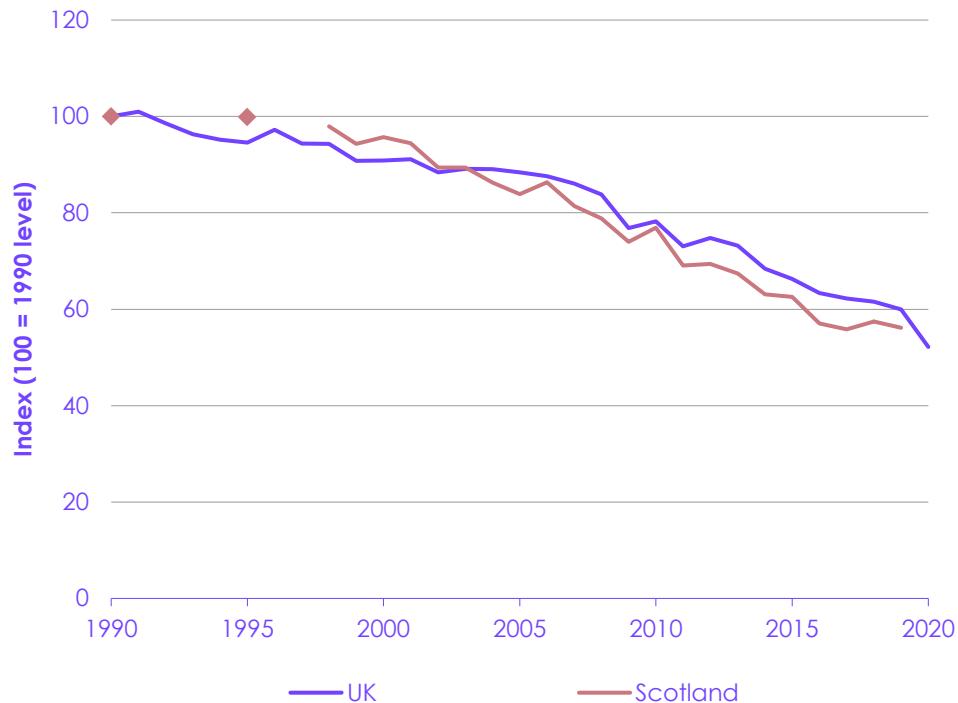
7. Impacts of COVID-19 on emissions in 2020 and beyond

2020 emissions data for Scotland have not yet been published but the COVID-19 pandemic is expected to result in a significant drop in emissions in 2020, similar to that seen for the UK as a whole.

While 2020 emissions data for Scotland have not yet been published, the COVID-19 pandemic, and the restrictions put in place in response to it, led to a record decrease in UK emissions in 2020 of 13%. We expect Scottish emissions to have fallen by a similar proportion as lockdown measures in place in Scotland mirrored those in the UK closely for most of the year.

Historical data show significant correlation between changes in emissions in the UK and in Scotland (Figure 1.18). Assuming that sectoral emissions in Scotland fell in line with sectoral emissions in the UK between 2019 and 2020, Scottish territorial emissions might be around 10% lower in 2020 than in 2019.

Figure 1.18 Changes in UK and Scotland emissions since 1990



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019; CCC analysis.

Our indicative analysis suggests that Scotland may have met its legislative emissions reduction target for 2020, largely as a result of the COVID-19 pandemic.

The impact of the pandemic on Scotland's emissions remains uncertain in the absence of 2020 emissions data, but our indicative analysis suggests that Scotland may have met its legislative emissions reduction target for 2020:

- Scottish emissions would need to have fallen by around 9% between 2019 and 2020 in order for the 2020 target of a 56% reduction relative to 1990 – under the base inventory methodology – to be met.
- UK emissions over this period fell by 13%, but the reduction in emissions in Scotland may be lower, at around 10%, given the differing contribution of sectors to emissions in Scotland:

- Aviation emissions, which fell significantly during the pandemic, represent a smaller proportion of emissions in Scotland (2% relative to 8% in the UK).
- Agriculture emissions, which did not fall as significantly during the pandemic, represent a higher proportion of emissions in Scotland (17% relative to 9% in the UK).

Emissions reductions as a result of COVID-19 are likely to be largely transient. Some rebound in 2021 and 2022 is expected.

Even if Scotland meets its 2020 target, it will be largely as result of the effects of the COVID-19 pandemic. There will be some rebound in emissions in 2021 and 2022 – if this can be limited, particularly in sectors where activity has not yet fully rebounded (e.g. aviation) it may still be possible to meet annual targets for 2021 and beyond (see Chapter 3).

As outlined in our 2021 Progress Report to UK Parliament, much of the reduction in 2020 UK emissions compared to 2019 levels was caused by demand reduction in specific sectors, including aviation, shipping and surface transport.

Almost two years on from the onset of the pandemic, restrictions in Scotland and in the rest of the UK have lessened and the economy has rebounded.¹⁴ This economic recovery – combined with the fact that pandemic-related emissions reductions were not associated with underlying structural changes to their respective sectors – means Scottish emissions are likely to recover in 2021. This conclusion is supported by pre-COVID trends in Scottish emissions, which suggest a lack of significant underlying progress in decarbonising sectors other than power (see section 4).

However, there is potential for longer-lasting impacts on emissions brought about by permanent changes in working and transport behaviour in some sectors, including surface transport, buildings and aviation.

Working patterns are likely to have changed for the long term. In April 2020, 44% of Scotland's workforce did some work from home,¹⁵ and recent data suggests many UK workers want to continue with some level of home-working after the pandemic.¹⁶ This may result in:

- **A reduction in business travel**, reducing aviation and surface transport emissions. A recent survey found that over 90% of UK companies had replaced some domestic business trips with virtual meetings during the pandemic, but that domestic business travel would likely recover to slightly below pre-pandemic levels following the complete easing of restrictions.¹⁷ In 2018, business travellers accounted for 21% of all passengers at Edinburgh airport and 47% of passengers at Aberdeen airport.¹⁸ Sustaining the reduction in business travel by air observed during the pandemic¹⁹ has the potential to reduce emissions.
- **A reduction in commuting**, reducing surface transport emissions. In Scotland in 2019, it is estimated that 68% of people travelling to work did so by car or van.²⁰ A recent survey of UK drivers²¹ found a reduction in those expecting to commute by car five days a week, compared to pre-pandemic levels.
- **Changing emissions from domestic and non-domestic buildings**. Increased home energy demand will increase emissions from domestic buildings, although some of these emissions may be offset by emissions savings in non-residential buildings (e.g. office blocks).

Additionally, there are indications that personal transport choices have changed:

- Data²² suggest that during most of the first six months of the pandemic, cycling levels in Scotland were higher than the baselines (June 2019), although walking activity apparently decreased relative to the baseline during this period. This may be due to not accounting for an increase in recreational walking.
- International aviation is likely to be suppressed in the medium term if transmission of COVID-19 continues globally. Flight numbers in Scotland in September 2020 – six months from the onset of the pandemic, and two months after tourism reopened – were still at just 38% of September 2019 levels.²³
- Public transport use has recovered more slowly than car use. By September 2020, car traffic in Scotland had returned to approximately 90% of 2019 levels, while rail passenger numbers remained at less than 40% of 2019 levels.²⁴

It has been encouraging to see the Scottish Government focusing on a ‘green recovery’ from the pandemic, integrating measures to reduce greenhouse gas emissions and adapt to climate change into efforts to support the recovery from COVID-19. Net Zero considerations feature prominently in the most recent Programme for Government, with specific policies including:

- In the transport sector, investment is being directed toward public transport and active travel including significant investment in bus priority infrastructure, and there is a commitment to continuing investment into Scotland’s rail network. 10% of the total transport budget has also been committed to active travel by 2024-25.
- There has also been a focus on green jobs and skills, with £100 million of funding committed over the next five years to a Green Jobs Fund, aimed at allowing businesses to create job opportunities in green sectors and allow individuals to retrain and develop skills (see chapter 3).

The Scottish Government’s focus on a ‘green recovery’ from the pandemic is welcome. Scotland must continue to invest in climate-resilient low-carbon infrastructure, job creation and training and reskilling the workforce.

This focus on a green recovery is welcome. To ensure interventions are effective in the longer term, Scotland must invest in key assets to build capacity and enable productive activity in the future. This means investing in climate-resilient low-carbon infrastructure, continuing to invest in job creation in low-carbon and climate-resilient industries, and training and reskilling the workforce. Public money should not support industries or infrastructure in a way that is not consistent with the future net-zero economy or that increases exposure to climate risks.

Endnotes

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- ²⁴ See 24

Chapter 2

The updated Climate Change Plan

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Introduction

Following the ratification of the Paris Agreement and the declaration of climate emergency by the UK Parliament in 2019, the Scottish Government updated Scotland's 2009 legislation to reflect new, more ambitious targets, including the UK's target to reach Net Zero by 2050.

The 2019 Scottish Climate Change Act set a Net Zero target by 2045 for Scotland. This signified a big increase in ambition from previous targets. The Act also set out:

- Legally binding interim targets for 2020, 2030 and 2040.
- Statutory annual targets for every year until Scotland reaches Net Zero.
- The obligation to report on progress on these targets through an annual monitoring report.

The increase in ambition of the 2019 Act required new policies and proposals to be added to the 2018 Climate Change Plan, which had been designed to deliver the previous target of reducing emissions by 80% on 1990 levels by 2050. The 2020 update to the Climate Change Plan reflects the new, higher ambition needed to drive deeper cuts in Scotland's emissions to deliver Net Zero.

Our key messages regarding the updated Climate Change Plan are:

- **The Scottish Government has set out laudable ambitions.** The Climate Change Plan update (CCPu), published in December 2020, together with the more recent Programme for Government (PfG), describe a highly ambitious decade of decarbonisation. These contain a host of broad policy pledges, some large financial commitments and a welcome focus on a just transition.
- **Delivery of rapid emissions reductions cannot wait.** It has taken 30 years to halve Scottish territorial emissions; they must halve again in a decade to meet the legislated 2030 target. Although a broad set of policies and proposals have been announced, there is still relatively little detail on exactly how committed public funding will be spent and how emissions will be reduced in practice. A comprehensive, detailed policy framework must now be completed for decarbonisation in Scotland, so the focus can be on implementation and delivery of real-world progress in reducing emissions at the necessary rate. Progress must also be monitored closely, and policy corrected as appropriate, to ensure that delivery stays on track.
- **Greater transparency is needed.** The CCPu sets out pathways to 2032 for sectoral emissions. If delivered, they would meet the legislated targets. However, we have not been able to establish whether and how policies and proposals in the CCPu add up to the required emissions reductions. We recommend that the Scottish Government publishes, as soon as possible, a detailed and transparent quantitative breakdown of how the announced plans will achieve the sectoral pathways to which it has committed. Only with this detail will we be able to assess progress properly, and to give due credit to the Scottish Government where delivery is on track.

- **The annual targets during the 2020s will be very difficult to meet**, even with the strongest climate policies. Emissions in 2019 were above the annual target. This represents a warning in respect of future annual targets, as there is unavoidable inertia in scaling-up policy to reduce emissions in those sectors that have made only slow progress to date. Electricity generation is already substantially decarbonised, providing very limited scope for further gains in that sector, in contrast to the rest of the UK. After the pandemic, efforts to lock in behavioural changes that reduce emissions (e.g. increases in working from home and in walking and cycling) can maximise the lasting impact on emissions, but only action now will limit the extent of the post-pandemic rebound in emissions. This is key to avoiding the gap to meeting the annual targets widening, which ultimately will undermine the credibility of Scottish climate policy and the targets framework.
- **Meeting the 2030 target.** Climate policy in Scotland must focus on the transition to Net Zero and the need for rapid progress by 2030. Major changes are required across the Scottish economy, including lasting, systemic changes in most sectors. These are best achieved by aiming for the outcomes required by 2030, 2040 and 2045. We view the balance of effort across sectors in the CCPu to meet the 2030 target to be broadly appropriate, albeit extremely stretching. The aim should be for a smooth path to 2030 and beyond, especially for the decarbonisation of buildings and transport, rather than the ‘sharp reduction and then plateau’ profile presented in the CCPu for those sectors. Given the risks to meeting the 2030 interim target across a range of sectors, ambition will have to be increased in those areas where rapid gains are still feasible, especially through peatland restoration, achieving healthier diets and reducing aviation demand.
 - **Peatland restoration.** Our assessment is that peatland restoration could occur at a significantly higher rate than that committed to by the Scottish Government, which is less than half that in the Committee’s Balanced Pathway.
 - **Healthier diets.** Reduction in consumption of meat and dairy can both improve the health of Scottish citizens and contribute to the emissions targets, through reduced agricultural emissions and the release of surplus land that can be used to remove CO₂ from the atmosphere. Demand-side options are not sufficiently considered in the CCPu.
 - **Aviation demand.** None of the recent policy documents or consultations set out an explicit intent to limit aviation demand growth. Indeed, the Aviation Strategy Consultation sets out the objective of working with the aviation industry to help restore and increase international connectivity. However, a commitment has been made to review Air Passenger Duty ahead of its devolution to Scottish Government to ensure alignment with climate change goals.
- **Travel demand.** The CCPu’s targets for a 20% reduction in car-miles by 2030 and the establishment of 20-minute neighbourhoods go well beyond the ambitions on travel demand elsewhere in the UK. If achieved, they would bring benefits for the climate and for the health and wellbeing of Scotland’s citizens, through improved air quality, increased walking and cycling, and better access to services. The PfG recognises this will require major interventions and investments to make it easier to walk, cycle and travel by public transport, but at present those plans for delivery are not clear.

- **Heat in buildings.** The CCPu sets out a very stretching pathway to reduce emissions from Scottish buildings. To a large extent, this is supported by the Scottish Government's ambitious Heat in Buildings Strategy, with its target of decarbonising 1 million homes by 2030, over a third of the stock, backed by a strong set of energy efficiency and low-carbon heating milestones, and by the PfG's major financial commitment to invest £1.8 billion over this Parliament. However, more detail is needed to clarify how this budget relates to targets in the Strategy and the extent to which additional private investment is required. If delivered, this would put Scotland at the forefront of heat decarbonisation in the UK, with a notably stronger focus on supporting domestic energy efficiency than UK Government policy.
- **There is still an urgent need for post-CAP low-carbon agriculture policy.** The CCPu sets out a high-level vision of how agriculture could look in the future. However, there is no comprehensive framework to deliver this vision. There is also no plan for shifting to healthy and low-carbon diets (see Chapter 3).
- **Engineered greenhouse gas removals (GGR).** The CCPu's ambition for 2030 relies on a substantial contribution from GGR, using carbon capture and storage (CCS). The UK Government recently announced that the proposed Scottish CCS cluster is only a reserve project, behind the two 'Track 1' clusters in the North of England. Although further clusters are expected to follow, failure of the Scottish CCS cluster to secure Track 1 support raises important questions about whether the CCS infrastructure and GGR facilities can now be developed in time to be operational by 2030. The Scottish Government must make a quick decision on whether to continue to plan for removals to contribute to the 2030 target or to change course. Clear contingency plans will have to be developed for meeting the 2030 target if it should turn out that GGR cannot be delivered at scale on the necessary timetable, accompanied by a clear date – no later than 2023 – to implement these contingency plans if developments on CCS do not provide confidence that they can deliver by 2030.
- **Cooperation with the UK Government.** The Scottish Government has made ambitious commitments in some areas that require going ahead of the UK-wide path, often in areas where policy is not clearly devolved to Scotland. Following on from the recent publication of the UK Net Zero Strategy, an agreement is needed as a matter of priority for the Scottish and UK Governments to work together to deliver specific decarbonisation solutions in Scotland ahead of other parts of the UK, to meet the faster deployment required in Scotland this decade. In effect, the roll-out of many solutions will have to begin in Scotland before moving south. This may require the Scottish Government to complement UK-wide funding schemes with its own funding.

1. The Climate Change Plan update (CCPu)

The Climate Change Plan update sets out how the Scottish Government intends to achieve a 75% reduction in emissions by 2030.

The Climate Change Plan update (CCPu) sets out how the Scottish Government intends to meet the highly challenging emissions reduction targets legislated by the Scottish Parliament in 2019.¹ The key focus is on meeting the 2030 interim target, for a 75% emissions reduction on 1990 levels.

The plan is designed in such a way as to take a whole-system approach to decarbonisation and achieve structural changes across all economy sectors. The Scottish TIMES model was used to identify least-cost pathways to Net Zero, but off-model adjustments were necessary in order to ensure that overall effort is sufficient to meet the targets.

The plan is underpinned by themes on green recovery, public engagement and a just transition.

The plan is underpinned by a few key themes:

1. Green recovery
2. Wider public engagement
3. Just Transition

Tying them all together is the Scottish Government's intention for the emissions-cutting aspects of the recovery from COVID-19 to be sustained in the long term and help the delivery of Scotland's targets.

Box 2.1

The 2018 Climate Change Plan

When published, the 2018 Climate Change Plan aimed at delivering an 80% reduction of emissions on 1990 levels by 2050.

It was the third set of Proposals and Policies designed to deliver Scotland's climate targets. By the time of publication, Scotland was well on track for delivering on its climate ambition. However, after its declaration of climate emergency and setting of the Net Zero target for 2045 and interim targets for 2030 and 2040, the Scottish Parliament requested that the Plan be updated to reflect the increase in ambition.

The 2018 Plan remains largely relevant in principle. However, the 2020 update:

- Revises the emissions envelopes to reflect the new pathway required to meet the more ambitious targets.
- Accelerates action on some policies and proposals in the original Plan and adds a few new ones to support the new sector trajectories.
- Adds abatement measures to make up for the 2017 and 2018 Scottish annual targets being missed.
- Updates the monitoring framework for the 2018 Plan to match the new ambition.

While the 2020 Plan update sets out a significant change in emissions pathways to 2032, it has not made the 2018 Plan entirely obsolete; it is advised that the two documents are treated as complementary.

Source: Scottish Government (2020), *Update to the Climate Change Plan 2018-2032: Securing a Green Recovery on a Path to Net Zero*.

Following advice by the Committee, the Scottish Government embedded the recovery from the pandemic into its climate policy.

Green recovery in the CCPu

Originally meant to be published in April 2020, the CCPu was delayed due to the COVID-19 pandemic.

- The pandemic caused a strong slowdown in economic activity around the world, which impacted many sectors (e.g. industrial production). Travel, and by extension transport emissions, also saw a major drop during periods when lockdowns were in place. Our 2021 Progress Report to the UK Parliament looked more closely at the impact of the pandemic on emissions across the UK; overall, in 2020, they are estimated to have fallen by 13%.²
- In May 2020, the CCC wrote to the devolved governments with advice on how to sustain emissions savings caused by the impact of the pandemic into their recovery and use stimulus funding to drive climate-friendly investments.³ This advice was distilled into six principles for a green recovery.
- The Scottish Government took the opportunity created by delay in the publication of the CCPu to integrate green recovery within it. There is a particular focus on modal shifts in transport away from car use and towards public transport and active travel. The CCPu also outlines a renewed emphasis on financially supporting sustainable and green businesses, and on building up the green jobs and skills market, tying the recovery to a just transition to a low-carbon economy.

Public engagement

A people-centric approach to climate policy has led to the publication of Scotland's public engagement strategy, making it a leader in the UK.

The CCPu emphasises ensuring that stakeholders and the public inform the development and delivery of the various aspects of the plan, including the green recovery. The Scottish Government has made commendable efforts to centre its policy-making on its citizens and those affected by it; following the publication of Scotland's public engagement strategy in 2021, they have been leading the UK in integrating public engagement into climate policy.⁴

Climate Change – Net Zero Nation, the Scottish Government's public engagement strategy, focuses on educating and encouraging action on climate change mitigation and adaptation. It recognises that public engagement and the participation of stakeholders are required to achieve Net Zero. The public engagement strategy is an important step towards creating the conditions to deliver the CCPu's call to action to the wider public.

The CCPu also outlines how it has taken into consideration attempts from the Scottish Government to design policy with its citizens, instead of imposing it on them. Central to this are the findings of the Scottish Climate Assembly, and the ongoing consultations on making pandemic-related emissions reductions more sustainable in the long-term. While at the time of the CCPu publication the Climate Assembly was still in session, the Scottish Government has committed to officially responding to their recommendations and considering how to integrate them into the policy-making process. We look more closely at the recommendations of the Climate Assembly in Chapter 3.

Just Transition

Transitioning from a carbon-intensive economy to an economy aligned with Net Zero is a theme that underpins the CCPu. This is of particular importance in Scotland, because of its large oil and gas industry, and growing renewables sector. However, as with green recovery, the Scottish Government is taking a wider-economy view, to try to ensure that people are not left behind. In 2019, the Scottish Government convened a Just Transition Commission, to advise on how to ensure a just transition to Net Zero in Scotland.

A just transition to a low-carbon economy is key for Scotland; emphasis on green job creation, upskilling and cost-sharing will be needed to ensure it.

The CCPu addresses just transition issues mainly by emphasising the upskilling and reskilling of the Scottish workforce to enable it to respond to the changing demands for skills that are expected in a future low-carbon economy. The focus is also aimed at creating a robust green jobs market in Scotland through heavy investment, to ensure that the workers most affected by changes in their sectors will continue to find opportunities locally.

The Scottish Government uses its sectoral plans set out in the CCPu to look into how the transition to a low-carbon economy will be funded, and recognises the importance of costs split equally across the economy and shared between the UK and Scottish Governments, as well as the public and private sectors, although this is an issue that needs to be explored further as the transition begins.

Just transition is used as a theme that weaves together place-based approaches to policy-making, labour market issues, green recovery and public engagement in the CCPu. Recent policy developments related to it are discussed in more detail in Chapter 3.

Box 2.2

An updated Monitoring Framework

When the 2018 Climate Change Plan was published, it was accompanied by a Monitoring Framework with indicators for tracking progress against the policies for each sector included in the Plan. Two Monitoring Reports were published before the Plan was updated, in 2018 and 2019.

The 2021 update to the Climate Change Plan was used to refresh the original Monitoring Framework to include new indicators that reflected the boosting of policy commitments. Annual reporting on the Plan's progress was also made a statutory duty through Scotland's 2019 Climate Change Act.

The updated Monitoring Framework is structured on three levels:

- Economy-wide and sectoral level greenhouse gas emissions statistics.
- Policy outcome indicators, which include cross-sectoral social and economic indicators, measuring progress towards specific policy outcomes set out in the Plan update.
- A policy tracker, monitoring the implementation of specific policies and proposals.

The Monitoring Framework has been designed to gather sufficient data to measure progress on the updated Plan while considering both the efficiency of policy implementation and the effectiveness of policy outcomes. The Scottish Government has also declared that they will ensure that policy objectives are Specific, Measurable, Achievable, Realistic and Time-limited (SMART) so that they can be monitored through the Framework.

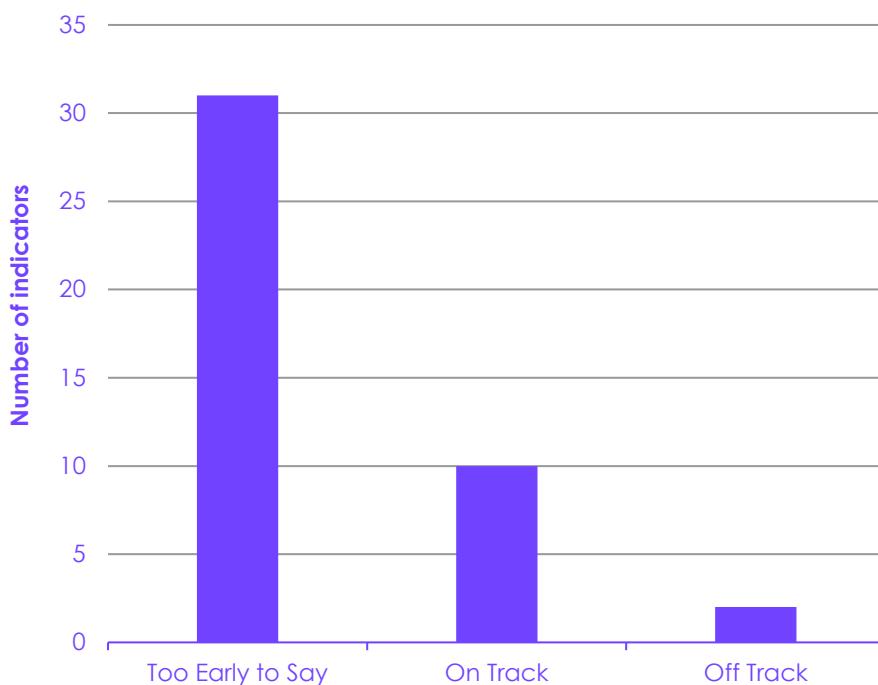
The collection of policy outcome indicators in the Plan is well developed, and in most areas has sufficient coverage to assess progress. As the Plan (and its update) underpins

several of the National Indicators of Scotland's National Performance Framework (NPF), the Monitoring Framework is also aligned with the NPF.

The inclusion of the cross-sectoral indicators to measure impacts on the workforce, employers and communities is a particular strength of the updated Framework. It will provide a holistic view of real-world progress, in addition to the usual focus on deployment indicators. The current framework, however, acknowledges that data availability is not sufficient to monitor these effectively yet. This area should be developed further to better understand the wider societal impacts of the Plan.

Following the publication of the first statutory Monitoring Report on the updated Plan in May 2021 (and the third Monitoring Report since the publication of the 2018 Plan), the Scottish Government announced that it was still too early to determine whether 31 out of the 43 policy outcome indicators were on track.

Figure B2.2 Overview of progress against policy outcome indicators



Source: Scottish Government (2021), Climate Change Plan: monitoring reports – 2021 compendium.

Source: Scottish Government (2021), Update to the Climate Change Plan 2018-2032: Securing a Green Recovery on a Path to Net Zero, Scottish Government (2021), Climate Change Plan: monitoring reports – 2021 compendium

2. Comparison of CCPu and CCC pathways to Net Zero

If emissions reductions planned in the CCPu are delivered, Scotland will meet its very stretching 2030 target.

The Scottish Parliament has set some extremely stretching targets on the path to Net Zero by 2045, which require a highly ambitious delivery plan. The CCPu sets out a quantified plan for emissions reductions across the sectors that, if delivered, would constitute an ambitious and exciting decade of decarbonisation for Scotland.

The overall path for emissions set out in the CCPu would meet the legislated targets by:

- Reducing total emissions to meet the legislated target of a 75% emissions reduction by 2030 on 1990 levels.
- Decarbonising existing emitting sectors rapidly, especially transport and buildings, supported by greenhouse gas removals in the land use sector and engineered removals using carbon capture and storage (CCS).

Table 2.1
Climate Change Plan update emissions envelope (MtCO₂e)

Sector	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Agriculture	7.0	6.8	6.5	6.3	6.0	5.8	5.7	5.6	5.6	5.5	5.5	5.4	5.3
Electricity	1.7	1.6	1.6	1.5	1.4	1.3	1.0	0.8	0.5	-	-	-	-
Industry	11.5	11.3	11.1	11.0	10.8	10.7	9.8	9.4	8.4	7.7	7.3	6.9	6.5
Waste	1.6	1.5	1.3	1.2	1.0	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Transport	11.0	10.2	9.4	8.7	7.9	7.1	6.9	6.6	6.5	6.5	6.5	6.5	6.5
Buildings	8.0	7.6	7.1	6.7	6.2	5.6	5.0	3.9	3.1	2.6	2.6	2.6	2.6
LULUCF	0.6	0.5	0.4	0.2	0.1	-0.1	0.3	0.3	0.4	0.5	1.8	2.1	2.3
Engineered Removals	-	-	-	-	-	-	-	-	-	-0.5	-3.8	-4.7	-5.7
Total	41.6	39.5	37.5	35.4	33.4	31.3	29.4	27.3	25.1	23.0	20.6	19.4	18.3

Ambition

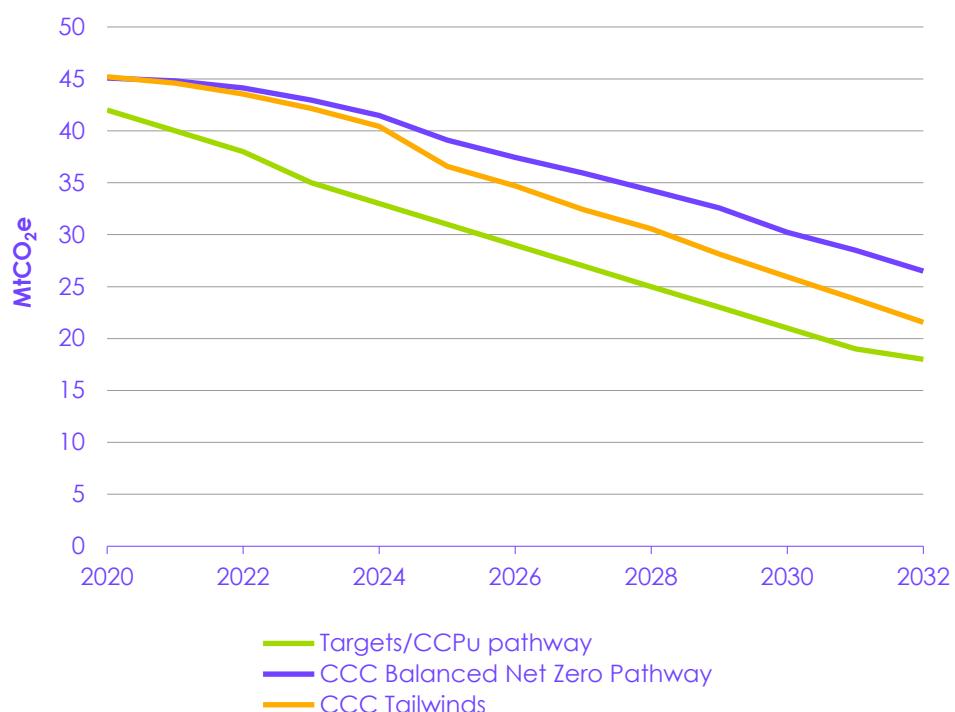
Ambition in the CCPu goes beyond the Committee's pathways in several areas, and also beyond the limits of the Scottish Government's TIMES modelling.

The emissions pathways in the CCPu are rooted in modelling using Scottish TIMES. However, owing to the very stretching nature of Scotland's legislated target for 2030, the ambition in the CCPu necessarily goes beyond the Committee's pathways on the way to Net Zero by 2045 (Figure 2.1) and beyond the limits of what could be achieved within the TIMES model.

- The 2030 target remains extremely stretching for Scotland, and reaching it will require the mobilisation of every part of the Scottish economy, along with significant support from the UK Government in areas where policy is still reserved.
- The CCC's Balanced Net Zero Pathway, designed to be a highly ambitious path to the legislated Net Zero target that is balanced and achievable, sees Scotland reach a 64% reduction in emissions by 2030 against 1990 levels, from a starting point in 2019 44% below 1990 levels.
- Our Tailwinds pathway gets closer to Scotland's legislated targets, achieving a 69% reduction in 2030. However, as described in the Committee's advice on the Sixth Carbon Budget, Tailwinds is an exploratory, "highly optimistic scenario, stretching feasibility in a wide range of areas and going beyond the current evidence in others... We consider it unlikely that the Tailwinds scenario could be delivered across the board."⁵
- We further note that the Scottish Government's own TIMES modelling was also unable to produce a pathway that could meet the 2030 target, with off-model adjustments being required across a range of sectors to get from a 72% reduction to meet the 75% target.⁶

The CCC's exploratory, highly optimistic Tailwinds scenario gets the closest to delivering the 2030 target.

Figure 2.1 The legislated targets require more rapid emissions reductions in the 2020s than are achieved in the CCC's pathways



Source: CCC Sixth Carbon Budget, Scotland Climate Change Plan Update, CCC analysis.

Note 1: The Tailwinds scenario has been used as the most ambitious CCC scenario to indicate our assessment of the upper limit of the rate of feasible emissions reductions for Scotland. Comparisons are against the CCC Balanced Net Zero scenario.

Note 2: The CCC's pathways do not assume an enduring impact on emissions from the COVID-19 pandemic, nor do they attempt to quantify the impact on emissions in 2020 across the economy. A short-term reduction in emissions from aviation was modelled. The level of actual emissions in 2020 will be significantly below that in the CCC's pathway, and there may also be some lasting downward impact for subsequent years.

Note 3: CCC and CCPu pathways were designed using different GWP values as base assumptions. For the purposes of this comparison, CCC pathways have been converted to the same GWP values as those used in the CCPu pathway.

Delivery

Scottish emissions will have to halve in a decade.

It has taken 30 years to halve Scottish emissions – they will now have to halve again in a decade. Furthermore, progress in cutting emissions outside of electricity generation has been slow in recent years. There is now very limited remaining scope to reduce emissions from electricity generation further. Reductions in other sectors will need to be stepped up rapidly to make the necessary progress.

Ambition in the CCPu's sectoral pathways would be sufficient for aggregate emissions to meet the 2030 target. However, there is a large gap between this pathway and the CCC's Balanced Net Zero Pathway, which is our assessment of a balanced, feasible transition to Net Zero in Scotland by 2045. There is a major challenge to achieve the necessary emissions reductions this decade, which requires ambitious plans in all areas and a real focus on delivery.

More clarity is needed on how the policies in the CCPu will deliver the necessary abatement.

Since the publication of the CCPu, many policies and proposals have been announced – the CCPu also sets out a list of planned policies to support its delivery. While these sometimes include allocated funding, there remains relatively little detail on exactly how the committed money will be spent and how the emissions reductions will be delivered.

In addition to new policy, the Scottish Government must ensure that the policies it has already announced and is in the process of implementing deliver fully on their climate ambitions. Net Zero, and its delivery through the CCPu, should be prioritised across the board in governmental decision-making processes.

Attracting and leveraging private investment will be critical for the success of climate policy, which will require stable policy frameworks. There is also an important role for public procurement to drive emissions reductions (e.g. through supporting the roll-out of EVs or embedding the principles of circular economy).

The Scottish Government must now make clear and outline in detail how the emissions reductions will be delivered, and focus on achieving this. Progress will need to be monitored closely, and policy corrected quickly when necessary, to ensure that delivery stays on track.

Working with the UK Government

The Scottish and UK Governments need to establish effective ways of working together to deliver their respective Net Zero targets.

Certain key areas of policy, such as electricity generation, industry and decisions on developing greenhouse gas removals remain reserved to the UK Government to a large extent. Meeting Scotland's legislated emissions targets will require substantial progress in reserved policy areas. The Scottish and UK Governments need to find an effective way of working together to deliver Scotland's climate policy.

The Committee has consistently stressed the importance of Scotland's role in helping the UK achieve its 2050 Net Zero target. Scotland's own climate targets, especially for 2030, will also necessitate the delivery of specific decarbonisation solutions in Scotland ahead of other parts of the UK. In effect, the roll-out of many solutions will have to begin in Scotland before moving south. This may require the Scottish Government to complement UK-wide funding schemes with its own funding.

The two Governments must establish a constructive way of engaging with each other going forward, so that Scottish and UK emissions targets can be met in a timely and cost-effective manner (Box 2.3).

Box 2.3

The UK Net Zero Strategy

In October 2021, the UK Government published its much-anticipated Net Zero Strategy, setting out how it plans to meet its Net Zero target in 2050 by achieving a 78% reduction in its emissions between 1990 and 2035. Overall, the Strategy was a positive development for climate policy in the UK, bringing the country a step closer to delivering on its target commitments.

The Strategy demonstrates a good level of ambition, which is well aligned with the 2050 Net Zero target and backed up by sufficient investment and credible implementation plans for most economic sectors. The Strategy:

- Brings together sectoral strategies and policy already in place and adds further ambition and policy where necessary to reflect the UK's targets.
- Sets out different scenarios of how the country can meet Net Zero in 2050, but also emphasises what needs to be prioritised over the next decade.
- Outlines sectoral ambitions that add up to a pathway that delivers the UK's Nationally Determined Contribution for 2030 and the Sixth Carbon Budget. These ambitions are backed by decarbonisation delivery policies for most sectors.
- Identifies cross-cutting challenges, such as innovation, public engagement, green jobs and embedding Net Zero in government, and sets out plans to tackle them.

There are a few important gaps remaining, most notably the lack of sufficient demand measures and policies enabling implementation, as well as a strategy for the agriculture sector and credible delivery plans to meet the ambition in the buildings sector.

In relation to Scotland, the Strategy included a number of important policy announcements:

- Scotland's North East cluster did not receive Track 1 funding for the development of CCS infrastructure at this stage, despite completing the impact assessment. This means that Acorn will act as a back up to the HyNet and East Coast Clusters and will potentially be developed over the next decade.
- Scotland will be receiving £26 million to future-proof its industrial sector through the Industrial Energy Transformation Fund (IETF).
- The emphasis on innovation and technological solutions rather than demand-side measures to reduce emissions in hard-to-decarbonise sectors, such as aviation and shipping, will likely have an impact on the Scottish Government's ability to deliver some of its commitments in these sectors, particularly if they are still reserved.

While the Strategy takes stock of devolved targets and climate policy, the extent to which it treats them as material for the whole of the UK and integrates them on a strategic level is unclear. An example of this is the decision not to prioritise Scotland's North East Cluster for CCS development; given the reliance of the Climate Change Plan update on greenhouse gas removals to achieve its 2030 target, the Strategy could have a powerful knock-on effect on Scottish climate targets.

Source: UK Government (2021), *Net Zero Strategy: Build Back Greener*.

The 2030 target

The stretching 2030 interim target is now only nine years away.

Climate policy in Scotland must focus on the transition to Net Zero and the need for progress by 2030 on the major systemic changes required. The 2030 interim target is now only nine years away, and in addition to its difficulty, the Scottish Government will face other barriers to meeting it.

The sectoral balance of emissions set out in the CCPu to meet the 2030 target is broadly appropriate, albeit very stretching. The level of ambition is so high that it leaves little leeway, with substantial delivery risks across a range of sectors:

High ambition in the CCPu translates into delivery risks across sectors.

- The CCPu relies heavily on greenhouse gas removals (GGR) to drive emissions down by 2030; however, there are risks over whether infrastructure for carbon capture and storage and GGR facilities can be developed in time to be operational by 2030. Decisions are required quickly on whether to continue to pursue this contribution from GGR on the 2030 timescale.
- The CCPu's targets for a 20% reduction in car-miles by 2030 and the establishment of 20-minute neighbourhoods go well beyond the ambitions on travel demand elsewhere in the UK.
- Plans to reduce emissions from heat in buildings are also very ambitious, and come with significant delivery risks as a consequence.

Under the economy-wide targets, underperformance in one area must be made up for by increased action in other areas. Considering the range of delivery risks – especially in relation to GGR, given that policy is reserved to Westminster – the Scottish Government should develop options to go beyond its existing plan in case delivery falls short in one or more areas. This should include increasing ambition in sectors where this is feasible, including peatland restoration, low-carbon diets and aviation demand.

The path in the 2020s

The annual targets for the 2020s will be extremely difficult to meet, particularly in the first half of the decade.

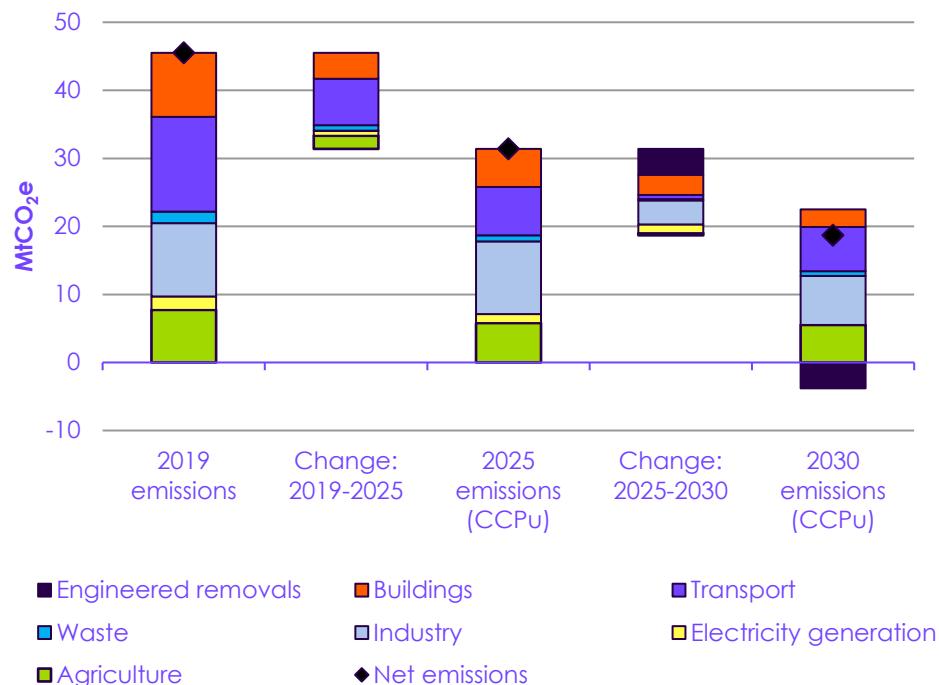
Despite the CCPu's emphasis on deep emissions cuts during the first half of the 2020s, the Scottish Government's annual targets during the 2020s will be very difficult to meet, even with strong climate policies.

- Now that emissions reductions from electricity generation have largely been exhausted, achieving the annual rate of emissions reduction required in the 2020s will be more difficult in the earlier years, before more rapid reductions are available from mass-market take-up of EVs and heat pumps, and the deployment of CCS for industrial decarbonisation and GGR.
- The profiles of sectoral emissions reductions in this period looks less appropriate than the plan approaching 2030. Given the importance of a smooth transition to Net Zero, particularly those aspects involving action required by individual citizens, the Scottish Government should plan on continuing strong emissions reductions in transport and agriculture emissions post-2025 and buildings emissions post-2029, rather than the plateaus seen in the CCPu (Figure 2.2, and the transport and buildings sector sections below). This will also help to mitigate risks to meeting the targets from under-delivery in other sectors and avoid a cliff-edge of a sudden drop in demand for buildings services.
- Emissions in 2019 were above the annual target, and future annual targets require a relatively fast pace of emissions reductions every year this

decade. In addition, Scotland's legislation requires that each time an annual target is missed, additional abatement is brought forward to make up for the emissions gap. Should the path for emissions fall more slowly than the rate required by the legislated targets, a shortfall in abatement will accumulate quickly.

- Efforts to lock in recent behaviours that reduce emissions (e.g. increases in working from home and in walking and cycling) can maximise the lasting impact on emissions and give Scotland a much-needed early start – action now to limit the extent of the post-pandemic rebound in emissions will be key to ensuring that the gap to meeting the targets does not widen.

Figure 2.2 The CCPu trajectory for Scottish emissions across the 2020s



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019; Scottish Government (2021) Update to the Climate Change Plan 2018-2032: Securing a Green Recovery on a Path to Net Zero; CCC analysis.

Sectoral emissions pathways

A comparison of the CCC and CCPu pathways for Scotland gives some insight on risks and opportunities in relation to the Scottish Government's decarbonisation ambitions.

Scotland's climate legislation is designed in such a way that the Scottish Government chooses its own path to meeting the legislated emissions targets even if the overall emissions reduction targets are set to align with the Committee's pathway. Nevertheless, it is instructive to compare the sectoral emissions trajectories and planned deployment of measures against the Committee's assessment, in order to identify areas of particularly high or low ambition, and where delivery risks or opportunities might lie.

In doing so, we find that the CCPu sets out a more ambitious emissions trajectory than the Balanced Net Zero Pathway for most sectors.

This is to be expected, considering the CCPu aims to deliver a significantly more stretching 2030 interim target than the one previously advised by the Committee (Figure 2.1), with significantly greater ambition for deployment of some measures (Table 2.2).

Table 2.2

Headline actions in the update to the Climate Change Plan compared to the CCC pathway

Headline actions	Scottish Government commitment	CCC pathway
Electric vehicles	Phase-out of the need for new petrol and diesel cars and vans by 2030	Phase-out of all new fossil-fuelled car and van sales by 2032
Car travel	Reduction in total car-kilometres travelled of 20% by 2030, relative to 2019 levels	Reduction in total car-kilometres travelled of 6% by 2030, relative to UK DfT baseline growth, implying broadly flat demand in absolute terms
Heat pumps in homes	80,000-100,000 heat pumps installed cumulatively over 2021-2026	136,000 heat pumps installed cumulatively over 2021-26
	170,000 heat pump installations in 2030	83,000 heat pump installations in 2030
Low-carbon heat networks (all buildings)	Around 5 TWh of low-carbon heat networks by 2030	2.6 TWh of low-carbon heat networks by 2030
Industry	38% emissions reduction from 2018 to 2030	47% emissions reduction from 2018 to 2030
Aviation demand	No specific commitment made	Reduction of aviation demand of 16% relative to baseline demand, implying a 4% reduction in absolute terms
Diet change	No specific commitment made	20% shift away from consumption of meat and dairy products by 2030
Tree-planting	18,000 hectares/year by 2024/25	15,000 hectares/year by 2024/25
Peatland restoration	20,000 hectares/year from 2021 onwards	50,000 hectares/year from 2022 to 2045
Greenhouse gas removals	3.8 MtCO ₂ /year by 2030. First delivery-scale installations begin operation in 2029	UK removals deployment by 2030 is CCS retrofit to existing large-scale biomass plants, which are not located in Scotland

Note: The CCPu's Industry sector comprises manufacturing, mining and quarrying, construction and downstream oil and gas, making it broadly the equivalent of the combination of the CCC's manufacturing & construction and fuel supply sectors.

Note 2: Heat pump targets were calculated by assuming some households in the Scottish Government's announced targets for 'zero-emissions heat installations' are met by low-carbon heat networks.

Note 3: The number for low-carbon heat networks considers scenarios where 0 to half of 1.2 TWh of existing heat networks convert to low-carbon by 2030

Emissions profiles are relatively aligned in power and also in agriculture, once differences in assumed global warming potentials are accounted for. The CCPu is driven by greater ambition on GGR, transport, waste management and buildings, but its industry pathway falls short when compared to the CCC's. There are significant methodological differences in the land use, land use change and forestry sector, making it difficult to compare (see below).

The CCPu has a similar level of ambition to the CCC Balanced Net Zero Pathway for emissions reductions in electricity generation and agriculture.

- **Comparable ambition.** Areas where ambition in the CCPu and the CCC's advice is similar.
 - **Electricity generation.** both the CCPu and the CCC pathways for emissions from electricity generation recognise that the sector will decarbonise almost entirely in the next decade, with generation in the CCPu reaching zero emissions in 2029, while the CCC pathway reaches zero emissions slightly earlier.
 - **Agriculture.** While the CCPu and the Balanced Net Zero Pathway follow different paths, by 2030 the gap between them is beginning to close.
- **Higher ambition.** The CCPu has seen the Scottish Government increase ambition in some areas to surpass the Committee's Balanced Pathway to Net Zero (Table 2.2):
 - **Surface transport.** The CCPu sets out an extremely steep reduction in transport emissions, particularly in the early to mid-2020s. This is supported to some extent by commitments such as the phasing out of the need to buy new petrol and diesel cars and vans and reducing the total car-kilometres travelled by 20% by 2030.
 - **Buildings.** The Scottish Government has a target to install 200,000 zero-emissions heating systems in 2030. This translates to approximately 170,000 heat pumps in 2030, which outperforms that of the CCC's advised 83,000 heat pump installations in the same year.
 - **Tree-planting.** The Scottish Government has set a target of increasing woodland coverage by 18,000 hectares a year by 2024/25. This is significantly higher than the CCC's suggestion of 15,000 hectares by the same date (although that increases to 25,000 hectares after 2035).
 - **Waste management.** The CCPu demonstrates great ambition in cutting emissions from waste to below 1 MtCO₂e by 2030. This, however, does not take into account emissions from energy from waste (EfW), which, in Scotland, is recorded under electricity generation, making it difficult to compare with the CCC's ambition.
 - **Greenhouse gas removals (GGR).** The CCPu contains a contribution of 3.8 MtCO₂ of annual removals in 2030. While the CCC's pathways do have deployment of GGRs in the UK by 2030, this is assumed to be retrofit of carbon capture and storage (CCS) to existing large-scale biomass plants outside Scotland (see the GGR section below).

Despite containing greater overall ambitions for emissions reductions than the Balanced Net Zero Pathway, the CCPu does not match its ambitions in all sectors.

- **Lower ambition.** Overall ambitions for sectoral emissions reductions surpass the CCC's Balanced Pathway for most sectors, with the notable exception of industry. However, even where the CCPu sets out overall sectoral ambition at or above that in the CCC's pathways, there is scope to increase ambition in parts of some sectors.
 - **Industry.** While this is still one of the few areas where policy levers are reserved to the UK Government, the CCPu's trajectory only sees a 38% reduction in emissions between 2018 and 2030, compared to the Balanced Net Zero Pathway's 47% over the same period of time. Given ambition in the UK's Industrial Decarbonisation Strategy and Net Zero Strategy – both published after the CCPu – broadly match the CCC's pathway, greater emissions reductions could potentially be achieved in Scotland by 2030.
 - **Peatland restoration.** The Scottish Government's targets for peatland restoration are less than half of those suggested by the CCC. While to some extent this is due to methodological differences, the Scottish Government has scope to increase ambition.
 - **Healthier diets.** Reduction in consumption of meat and dairy can both improve the health of Scottish citizens and contribute to the emissions targets, through reduced agricultural emissions and the release of surplus land that can be used to remove CO₂ from the atmosphere. Demand-side options are not sufficiently considered in the CCPu.
 - **Aviation demand.** None of the recent policy documents or consultations set out an explicit intent to limit aviation demand growth – indeed the Aviation Strategy Consultation sets out the objective of working with the aviation industry to help restore and increase international connectivity. However, a commitment has been made to review Air Passenger Duty ahead of its devolution to Scottish Government to ensure alignment with climate change goals (see section on Aviation in Chapter 3).
 - **Agriculture strategy.** While the cut in sector emissions planned is broadly similar to that suggested by the CCC, there is currently no strategy in place for achieving it. The lack of effective supporting policy to drive emissions savings suggests that the ambition demonstrated might not be deliverable (see Chapter 3).

Given the risks to delivery of various aspects of the CCPu pathway, both due to its extremely stretching ambitions in a range of areas and due to reliance on concerted action on areas reserved to the UK Government, we recommend that the Scottish Government increases ambition in the delivery of reducing emissions in the agriculture sector and locks in behaviour changes leading to emissions reductions that occurred during the COVID-19 pandemic.

In the following sections, we look at the CCPu in more detail through a sectoral breakdown of its emissions trajectory.

Greenhouse gas removals

Engineered Greenhouse Gas Removals are necessary to reach Net Zero in the UK – but the CCPu makes them central to delivering Scotland's Net Zero target, too.

Engineered greenhouse gas removals (GGRs) are central to achieving Net Zero. Scotland has an important role to play in their delivery, not least due to its excellent and accessible offshore geological CO₂ storage potential under the North Sea and the highly applicable skills and experience of Scotland's oil and gas workforce. However, there is a clear difference in the expectations for GGR deployment between the CCC's Sixth Carbon Budget and CCPu scenarios. Note that the CCPu refers to GGR as Negative Emissions Technologies – NETs, here we use GGR for consistency with the Committee's other reports.

- The CCPu has an emissions trajectory dedicated to GGR. Based on this, Scotland has at least one operational engineered removals facility by 2029, removing 3.8 MtCO₂e annually by 2030 and increasing thereafter.
- The CCC's pathways to Net Zero all include GGR, with pre-2030 deployment in the Balanced Pathway focused on Bioenergy with CCS achieved through retrofit of CCS to existing large biomass power plants.
- While Scotland has some small biomass power plants (Steven's Croft, Markinch) the UK's larger biomass power plants, which would be capable with CCS retrofit of delivering MtCO₂e per year scale GGR by the late 2020s, are presently located in England.

In addition, the Scottish Government is hoping to use a future GGR sector to develop its green jobs market.

The Scottish Government's vision for 2030 and 2045 also includes the development of a GGR sector as part of its green recovery, with multiple projects operating in Scotland by 2045 playing a major role in supporting the just transition from oil and gas. To date, the Scottish government has provided important financial support (SIETF, Emerging Energy Technologies Fund) to research and development and practical ways to decarbonise industry (North East Carbon Capture Use and Storage, Acorn) – see Box 2.2. To facilitate the implementation of GGR, and the associated scaling-up of CCS infrastructure, the following will be key:

- Understanding the effect on agriculture and land use in Scotland of the biomass demand from BECCS. This could be achieved through the Bioenergy Working Group, and the publication of a Bioenergy Action Plan (in time to inform the next CCPu in 2023).
- Managing risks around expectations for the timing and scale of Scotland's GGR sector. These include in technology development where Direct Air Capture is presently immature and its pathway to large scale application remains uncertain, and in international demand for Scotland-based CO₂ storage services (the ambition to secure about 40% of the European CO₂ market).

Decisions on GGR policy are reserved to the UK Government.

Underpinning all these is the need to continue and strengthen work with the UK Government to coordinate on the critical reserved policy areas including developing CCS infrastructure and GGR market mechanisms, especially as the proposed Scottish CCS cluster was not selected as one of the first two clusters to be taken forward in the UK Government's Net Zero Strategy (Box 2.3) and is instead the reserve project.⁷ This is discussed further in Section 3.

Box 2.4

The Acorn CCS cluster plan

The Climate Change Plan update outlines how the Scottish Government is supporting the development of CCS and GGR capacity in Scotland, with the aim of deploying them from the mid-2020s to a large enough scale to be one of the main drivers of the decarbonisation of the Scottish economy by 2032. This includes funding from the Energy Transition Fund, the Emerging Energy Technologies Fund and support for the North East Carbon Capture Use and Storage (NECCUS) industry, research and government platform. This latter is intended to coordinate the development of the CCS sector in Scotland through developing a Net Zero road map for the industry and working to attract funding for CCS and blue hydrogen production.

St Fergus has been identified as the main hub for Scotland's first CCS cluster due to its sitting close to potential offshore CO₂ storage sites and existing gas pipeline infrastructures that might be reused. A number of parallel projects sharing CCS infrastructure are envisaged at the St Fergus site:

- Acorn CCS built onto the existing St Fergus gas plant cited to be operational by 2024.
- Acorn Hydrogen, cited to be in operation by 2025, to reform North Sea natural gas into hydrogen for use either in the UK or export, with the CO₂ emissions captured and stored.
- Acorn Direct Air Capture plant, cited to follow on around two years after Acorn CCS.

Source: Scottish Government (2020), *Securing a green recovery on a path to Net Zero: Climate Change Plan 2018-2032 – update*

Transport

The CCPu trajectory for transport emissions implies a very sharp reduction in sector emissions.

A comparison of the CCPu and CCC pathways for transport is shown in Figure 2.4, together with historical emissions in this sector. The post-2020 CCPu trajectory displays greater ambition than the Balanced Net Zero Pathway in two ways:

- The starting points of the two projections for 2020 are considerably below the last recorded emissions point for 2019, and about 1 MtCO₂e apart. The CCPu projection for 2020 is approximately 3 MtCO₂e below emissions in 2019, while that from the CCC is approximately 2 MtCO₂e below. When both pathways were published in 2020, the pandemic was ongoing but the extent of its impact on emissions was subject to substantial uncertainty.
 - For the CCC Balanced Net Zero pathway, the drop in emissions between 2019 and 2020 is due to the effects of COVID-19 on aviation and shipping. By 2022, transport emissions are projected to bounce back to pre-pandemic levels, before beginning to fall again.
 - The CCPu trajectory does not include modelling from the pandemic. In this case the sharp decline in emissions appears to come predominantly from policies to reduce car miles and decarbonise transport. However, there is no quantification of how these policies map to the required emissions reduction.
- The CCPu trajectory is extremely ambitious in the short term, showing a rapid decarbonisation of the sector in the first half of the 2020s. By comparison, the Balanced Net Zero Pathway takes much longer to reach the level of emissions the CCPu aims to achieve by 2026.

Following the very steep trajectory between 2020 and 2025, decarbonisation effectively plateaus. This is largely a function of the Scottish Government's TIMES modelling, and the off-model adjustments that were necessary to align to the legislated emissions targets.

The Scottish Government should plan for continuous reductions in emissions in the transport sector rather than the CCPU's profile, which has sharp falls and then a plateau.

Given the vital contribution that continued reductions in transport emissions must make to meeting Scotland's emissions targets, it would make no sense to stop reducing transport emissions post-2025 even if these reductions were not required to meet the 2030 target. Continued and accelerating uptake of electric vehicles alone should lead to significant emissions reductions in the second half of the 2020s.

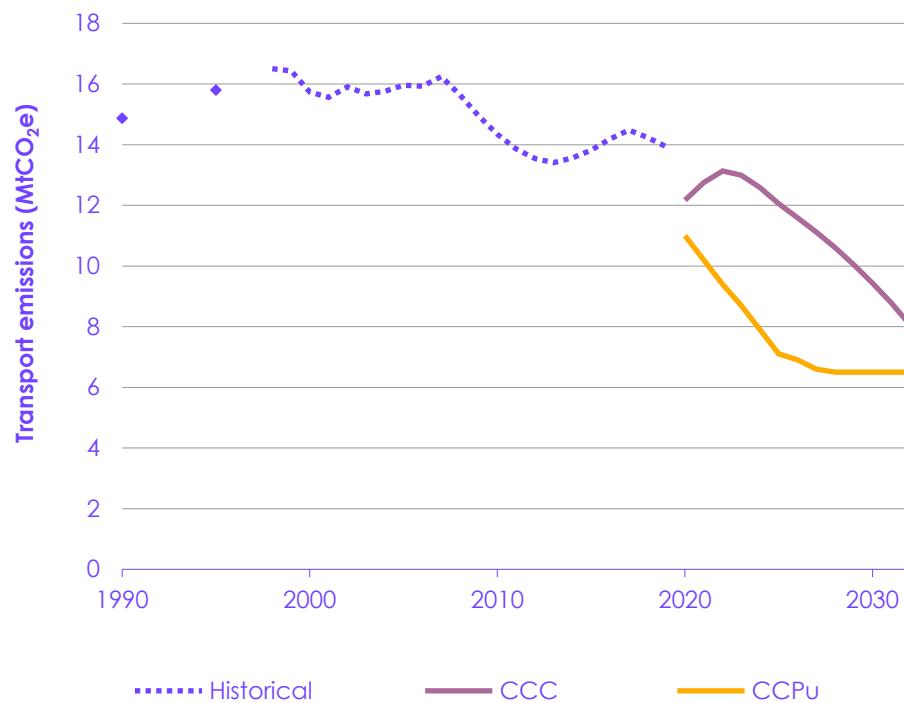
To support the ambitious cuts in transport emissions, the CCPU sets out a number of potentially very impactful policies:

- Reducing car kilometres travelled by 20% by 2030, relative to 2019 levels. The Scottish Government plans to create the conditions for achieving this by an increased emphasis on a location-focused approach to infrastructure and digital connectivity through the development of 20-minute neighbourhoods, and a Work Local Programme. This includes promoting a modal shift to active travel and public transport by investing in a range of bus schemes and pledging spending on active travel of £320 million – 10% of the total transport budget over the next Parliament.
- Phasing out the need for new diesel and petrol cars and vans by 2030. This date has been brought forward by 2 years, in line with the CCC's recommendation, and the Scottish Government is supporting it by investing in charging infrastructure, providing financial support for switching to ultra-low emissions vehicles, and working towards phasing out diesel and petrol light commercial vehicles.
- Committing to decarbonise passenger rail services by 2035, 30% of Government-owned ferries by 2032, and all scheduled flights within Scotland by 2040.

More clarity is needed to determine whether the amount of abatement from transport policies matches that required by the CCPU emissions trajectory.

While many of these policies are in line with CCC advice and are strong indications that the Scottish Government is moving towards systemic change, it is unclear what they translate to in terms of abatement or whether they will be sufficient to reduce emissions by the necessary amount. The Scottish Government has not provided a direct link between each policy and the amount of emissions savings to which it corresponds. The extremely ambitious trajectory set out by the CCPU will require clarity and swift and effective action to be delivered, including going to great lengths to lock in any emissions savings caused by the response to the COVID-19 pandemic.

Figure 2.3 The CCPu pathway for decarbonising transport is extremely ambitious



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019; CCC Sixth Carbon Budget; Scottish Government (2021) Update to the Climate Change Plan 2018-2032: Securing a Green Recovery on a Path to Net Zero; CCC analysis.

Note: The CCPu's transport sector includes emissions from aviation and shipping, and therefore corresponds to a combination of the CCC surface transport, aviation and shipping sectors, which are all included in this figure.

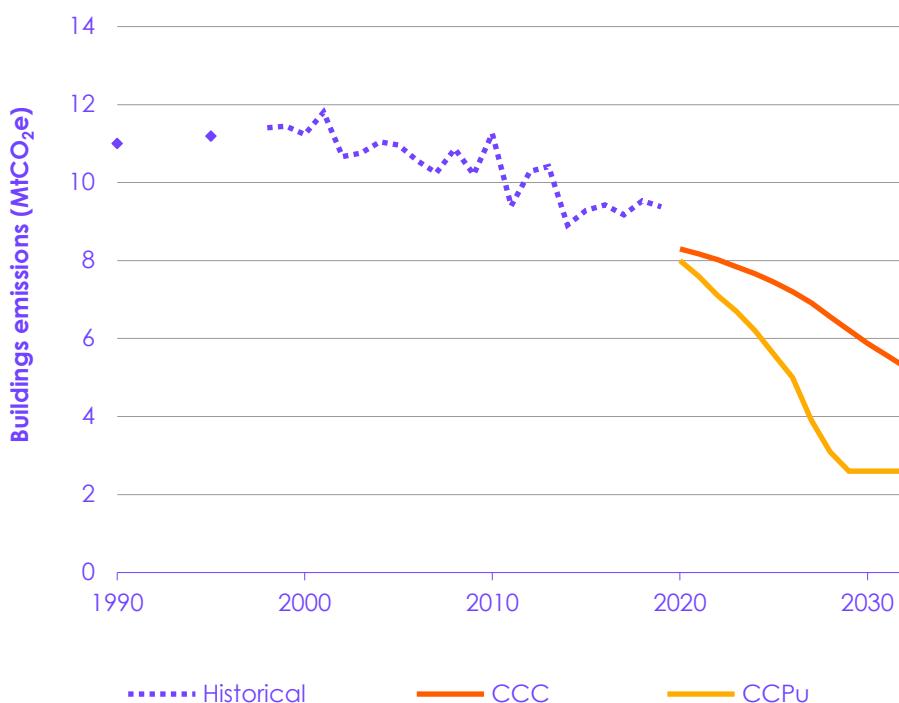
Buildings

The CCPu presents a very ambitious trajectory for emissions reductions from the buildings sector.

A comparison of the CCPu and CCC pathways for the buildings sector is shown in Figure 2.5, together with historical emissions in this sector.

- The CCPu sets out a pathway that sees emissions fall by nearly 72% on 2019 levels by 2029, compared with 34% for the CCC's pathway.
- As with transport, the Scottish Government has set out a highly ambitious course for decarbonising its buildings sector. This is demonstrated by the widening gap between the Balanced Net Zero Pathway and the CCPu's extremely steep trajectory. However, again, the CCPu trajectory for buildings starts to plateau in the late 2020s.

Figure 2.4 The CCPu sets out an ambitious path for decarbonising buildings by 2030



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019; CCC Sixth Carbon Budget; Scottish Government (2021) Update to the Climate Change Plan 2018-2032: Securing a Green Recovery on a Path to Net Zero; CCC analysis.

Note: The CCPu buildings sector combines emissions from domestic and public buildings, and therefore corresponds to a combination of the CCC domestic and non-domestic buildings sectors.

Note 2: The CCC's F-gases sector has been split between Buildings and Industry for the purposes of comparison with the CCPu, with approximately 2/3 of F-gases allocated to Buildings.

As with the plateau in the transport sector, it is neither plausible nor sensible for the decarbonisation of the buildings sector to pause in the late 2020s. Roll-out of measures such as heat pump installations and low-carbon heat networks, required to deliver the CCPu's decarbonisation trajectory throughout the 2020s, should continue after that point. The policies that will already need to be in place and driving decarbonisation at that point should be maintained, in order to mitigate risks of under-delivery in other sectors, meet post-2030 emissions targets and to ensure that the supply chains and related employment which develop are not disrupted.

The policies and funding supporting the decarbonisation of buildings can make a real difference in cutting emissions in the sector.

The CCPu pathway is supported by ambitious policy announcements and funding:

- The Scottish Government has published an ambitious Heat in Buildings Strategy that brings together concrete policy proposals which, if implemented, will result in significant progress in the sector (see Chapter 3).⁸
- Scotland has committed to 200,000 zero-emissions heat installations in Scotland in 2030. While not all of these will be heat pumps, an estimate of the number of heat pump installations it corresponds to is still double the number of heat pump installations required by the Balanced Net Zero Pathway for the same year (Table 2.2).
- The Scottish Government is also planning on approximately 5 TWh of low carbon heat networks by 2030, again nearly double the amount in the CCC's analysis.
- The announcement of ambitious updates of building standards and regulation, including zero-emission heating standards for new buildings, energy efficiency standards for the domestic private rented sector, and the review of the existing Energy Efficiency Standard for Social Housing. These are further elaborated on in the Heat in Buildings Strategy.
- The 2021/22 PfG and the Heat in Buildings strategy both include a pledge to spend £1.8 billion to decarbonise heat in buildings over the next decade.

As with the transport sector, however, more clarity on the link between policies and abatement, as well as how the funding will be spent, is needed.

While these efforts are commendable, it is difficult to see how the policies and proposals announced will lead to a decarbonisation trajectory that is steep enough to meet the sharp emissions reductions planned throughout the 2020s.

- A rough estimate of the amount of heat pump installations the Scottish Government can achieve between 2021-26 yields a smaller number than the Balanced Net Zero Pathway equivalent.
- There is no direct link between the policies announced and the amount of emissions savings they correspond to, making it difficult to track how the Scottish Government will be meeting its pathway through the 2020s and beyond.
- More detail is needed to clarify how the PfG budget for buildings relates to targets in the Heat in Buildings Strategy and the extent to which additional private investment is required.

Land use, land use change and forestry (LULUCF)

The methodological differences between the Scottish Government and the CCC approaches to land use emissions make it difficult to assess the CCPu LULUCF trajectory.

The different approaches and underlying methodologies for estimating land use emissions used in analysis by the CCC and the Scottish Government make it difficult to compare the CCPu's trajectory to the CCC's pathway. The Scottish Government will be revising its land use emissions trajectory to account for the impact of the Wetlands Supplement⁹ in their next Climate Change Plan.

A comparison of the CCPu and CCC pathways for land use, land use change and forestry is nevertheless shown in Figure 2.6, together with historical emissions in this sector. Emissions from the land use sector in the CCPu fall to zero before going up again by 2032.

Figure 2.5 Emissions from land use are difficult to compare because of methodological changes



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019; CCC Sixth Carbon Budget; Scottish Government (2021) Update to the Climate Change Plan 2018-2032: Securing a Green Recovery on a Path to Net Zero; CCC analysis.

Note: In this figure all emissions use the lower range of global warming potentials from the IPCC's 5th Assessment Report. This is the default for CCPu, whereas historical emissions and the CCC pathway have been adjusted (nominally they use values from the 4th Assessment Report and the higher range of the 5th Assessment Report, respectively).

There are significant differences between the baselines in the CCC and CCPu analyses:

- Both the CCPu and CCC pathways were developed before the 2021 implementation of the Wetlands Supplement,¹⁰ outlining how peatland emissions would be accounted for in the emissions inventory. As a result, the CCC and the Scottish Government used different sets of assumptions to determine their baselines.
- The CCPu baseline includes a future slowdown in emissions reduction from forestry, due in part to the legacy of low planting rates in the 1990s.

The CCC and the CCPu assumed different global warming potentials, again due to uncertainty over future decisions on which will be used to estimate emissions in future. Both are taken from the IPCC's 5th Assessment Report, with the CCC pathway conservatively using the higher end of the range and the CCPu pathway using the lower end of the range (see Chapter 1). However, the CCC pathway in Figure 2.6 has been adjusted to use the lower value, for comparison.

The Scottish Government has set out plans to increase woodland creation and peatland restoration. However, those plans are less ambitious than the CCC's recommendations.

The Scottish Government is making some progress in setting and delivering ambitious policy in the sector:

- In terms of increasing woodland acreage, Scotland is ahead of the rest of the UK in tree-planting rates. The Scottish Government has a current target to plant 12,000 hectares a year, which will be increasing to 18,000 hectares per year by 2024/25 – in 2020, Scotland came close to achieving the target by planting 10,660 trees.
- Scotland's significant emissions from peatlands will need to be managed for the land use sector to avoid derailing the CCPu emissions trajectories; about 80% of Scottish peatlands are degraded. The CCPu sets out plans to restore 20,000 hectares of degraded peatland annually, and 250,000 hectares by 2030, backed by funding of £250 million. So far, however, the annual target has been missed, with approximately 6,000 hectares restored annually over the past two years.

The Scottish Government recognises that, if the CCPu emissions trajectory for land use is to be delivered, an increase in the peatland restoration target and more effective action to meet it are urgently needed. In terms of abatement, the CCC and the Scottish Government diverge in their assumptions about the amount of peatland restoration that can happen in Scotland. The CCC include higher rates, reflecting the importance that restoration of degraded peat plays in meeting future targets. The Scottish Government's assessment is lower, but it is exploring any potential financial and structural barriers that are preventing it from achieving its current targets. Either way, action should be consolidated through a strategy as soon as possible.

Given changes in methodologies for estimating emissions in this sector, it has not been possible to undertake a full comparison of the respective ambition in the CCPu and the CCC pathways. We will continue to work with the Scottish Government to understand these differences.

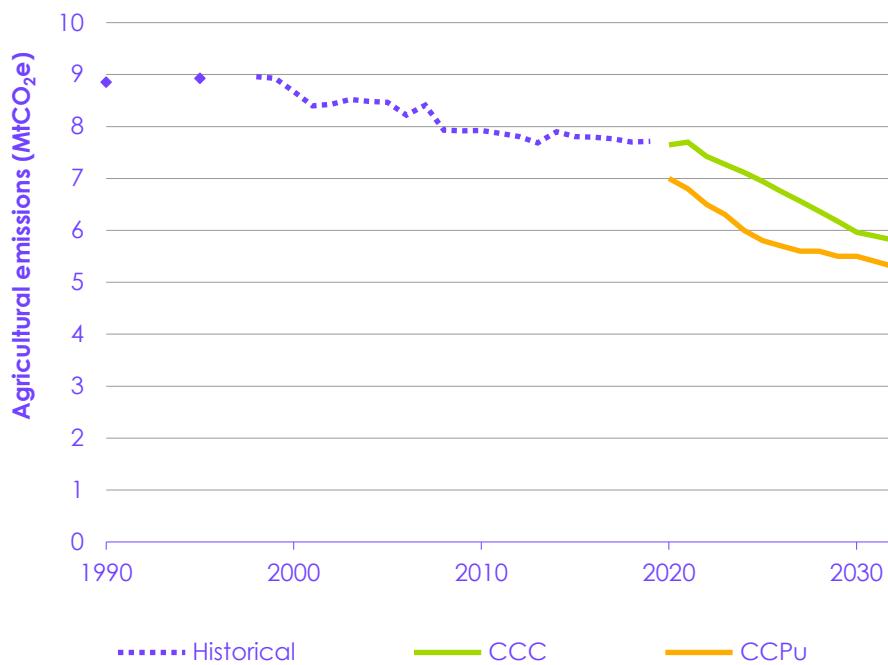
Agriculture

The CCPu shows a steady decline in agricultural emissions in the next decade, despite relative lack of progress in the sector so far.

A comparison of the CCPu and CCC pathways for the agriculture sector is shown in Figure 2.7, together with historical emissions in this sector.

- The emissions trajectory for agriculture in the CCPu shows a steady decline in emissions between 2020 and 2032.
- This is an ambitious trajectory for agriculture, which is considered a harder-to-decarbonise sector.
- The rate of emissions reduction is slightly more ambitious in the CCPu compared to the CCC's pathway, at least for the first half of the 2020s.

Figure 2.6 Agricultural emissions fall faster after 2020



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019; CCC Sixth Carbon Budget; Scottish Government (2021) Update to the Climate Change Plan 2018-2032: Securing a Green Recovery on a Path to Net Zero; CCC analysis.

Note: In this figure all emissions use the lower range of global warming potentials from the IPCC's 5th Assessment Report. This is the default for CCPu, whereas historical emissions and the CCC pathway have been adjusted (nominally they use values from the 4th Assessment Report and the higher range of the 5th Assessment Report, respectively).

Agriculture will be difficult to decarbonise; there is currently a significant policy gap in the sector to drive the required action.

The policies for agriculture set out in the CCPu are vague in implementation and cast some doubt as to whether they will be enough to drive the necessary emissions reductions:

- Emissions from agriculture have remained relatively stable in Scotland, at least for the past six years. Agriculture is a difficult sector to decarbonise and requires robust forward planning to see any results in the future.

- A much-needed post-CAP agriculture strategy is long overdue, and the CCPu makes no significant advances on the subject. Instead, it marks the strategy as still in development and focuses on low-emissions farming practices and the introduction of environmental conditionality, which will require that all farmers and crofters undertake environmental actions (without going into detail as to how these might reduce emissions).
- The Scottish Government will be scaling up its Agricultural Transformation Programme, which supports practice change and acquiring equipment that will help farmers and crofters reduce their emissions. This, however, does not substitute for the scale and level of emissions cuts that could be driven by a coherent sector strategy.
- A shift towards healthier, low-carbon diets, with the potential of releasing surplus land through the reduction of consumption of meat, is not sufficiently considered in the plan. The Scottish Government has confirmed that they are in the consultation stages of exploring potential measures in this regard, but there are currently no concrete steps ready to be taken in terms of policy.

Overall, the CCPu is light on the two types of intervention that are potentially the most impactful: a strategic approach to cutting emissions, and demand-side measures to drive change. While there are plans to introduce an Agriculture Bill in Scotland in 2023, this is likely to be too late to result in the necessary reductions to meet the CCPu path; it is also too early to tell whether it will cover all aspects sufficiently.

In addition to a robust plan to cut emissions in the sector, the future Bill will also need to provide clarity on the types of funding available for land-based mitigation and sequestration.

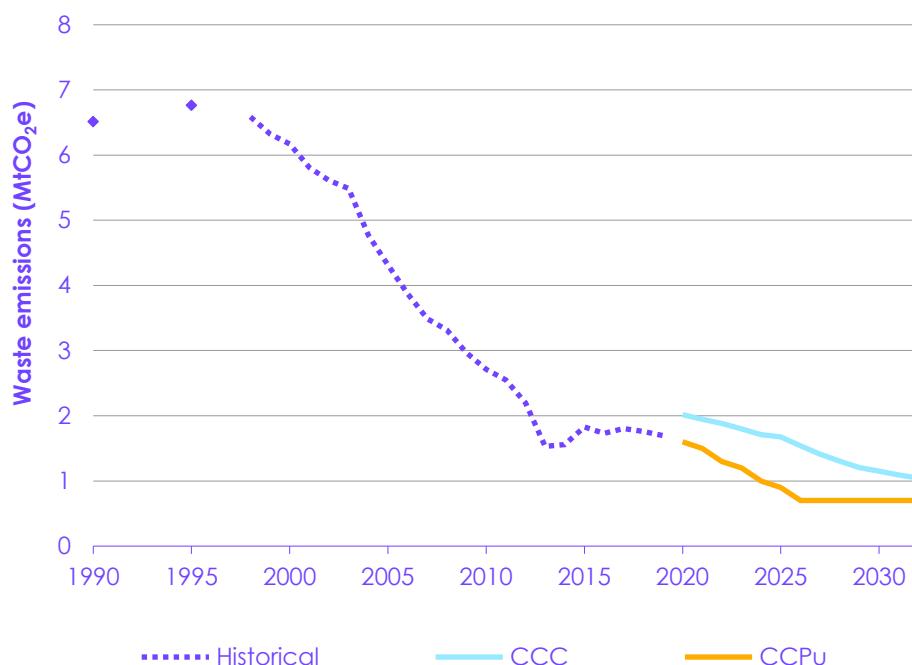
Waste management

Scotland has high ambitions for a largely decarbonised waste management sector by 2030.

The CCPu presents an ambitious trajectory for reduction of emissions in the waste sector, which sees emissions fall below 1 MtCO₂e in 2025. A comparison of the CCPu and CCC pathways is shown in Figure 2.8, together with historical emissions in this sector.

- It should be noted that the CCC classifies Energy from Waste (EfW) as waste emissions. The Scottish Government, however, records EfW under electricity generation. This explains the fact that, in 2020, the Balanced Net Zero Pathway's projected emissions for Scotland were higher than the CCPu's.
- The CCPu's rate of decarbonisation is steeper than that of the Balanced Net Zero Pathway. However, the usual "plateauing" effect of the TIMES model can be observed after 2026, as policies in other sectors become more cost-effective ways of decarbonising.

Figure 2.7 Emissions from waste management



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019; CCC Sixth Carbon Budget; Scottish Government (2021) Update to the Climate Change Plan 2018-2032: Securing a Green Recovery on a Path to Net Zero; CCC analysis.

Note: In this figure all emissions use the lower range of global warming potentials from the IPCC's 5th Assessment Report. This is the default for CCPu, whereas historical emissions and the CCC pathway have been adjusted (nominally they use values from the 4th Assessment Report and the higher range of the 5th Assessment Report, respectively).

Note 2: The CCC waste sector includes emissions from Energy from Waste (EfW), which the CCPu and historical emissions records under electricity generation.

A landfill ban and emphasis on recycling and resource efficiency support ambition in the sector.

To support its ambition for the sector, the Scottish Government has put in place measures that can have a significant impact on emissions:

- A 2025 ban on biodegradable municipal waste going to landfill, with a plan to reduce the amount of all waste going to landfill to 5% by 2025.

- A target to recycle 70% of all waste by 2025.
- A Food Waste Reduction Action Plan to reduce food waste by one third against a 2013 baseline by 2025.
- An emphasis on circular economy, which will be embedded as a principle in Scotland's green recovery, and will be factored in to the Fourth National Planning Framework (NPF4), with updated planning policies to encourage reduction and reuse of materials and facilitate the relevant infrastructure to do so.

Improved efficiency of Energy from Waste plants and preparedness for CCS will be key for the decarbonisation of the sector.

The CCPu also includes a policy proposal to improve the efficiency of EfW plants, with the potential of making them fit for future use with CCS technologies. At this stage, it is difficult to assess the effectiveness of these measures or whether they will deliver the emissions cuts required.

Electricity Generation

Electricity generation in Scotland is largely decarbonised already, leaving little scope for further emissions reductions in the sector.

Scottish electricity generation is already largely decarbonised. A comparison of the CCPu and CCC pathways is shown in Figure 2.9, together with historical emissions in this sector.

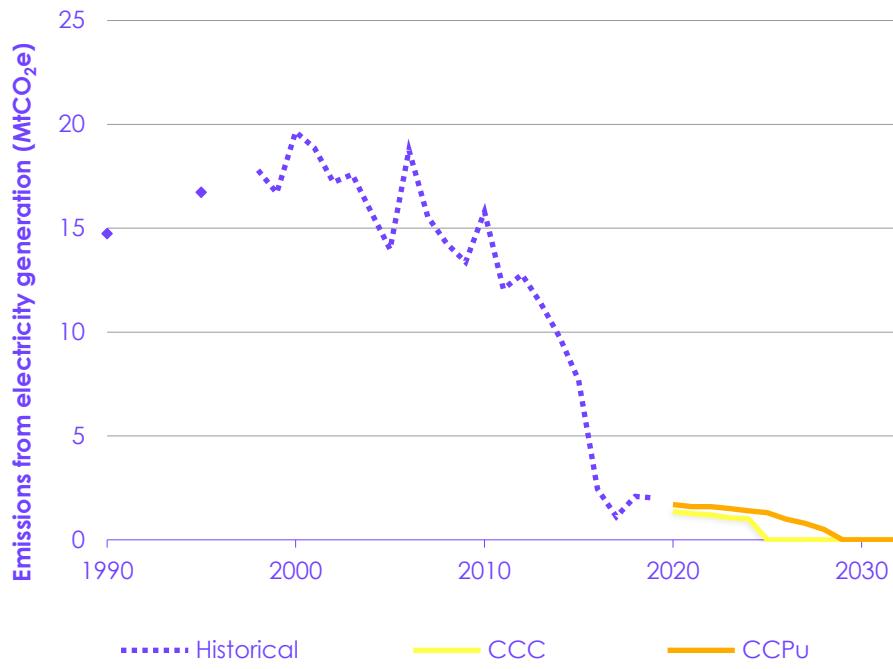
- CCC and Scottish Government projections follow similar trajectories to eliminating the remaining 1 MtCO₂e, which is a necessary step not only to support general ambition in the CCPu and the 2030 target, but also to set the conditions for eventually deploying engineered removals in Scotland (Figure 2.9).
- The Balanced Net Zero Pathway shows generation reaching zero emissions slightly earlier than the CCPu's trajectory, possibly as a result of developments in generation across the UK.
- The CCPu trajectory and historical emissions include energy from waste, whereas the CCC pathway includes these in the waste sector.

Energy policy is reserved to the UK Government, but the Scottish Government can influence it through planning and investing in a robust supply chain.

Energy policy and regulation are powers that are still reserved to the UK Government, making the design of policy in the sector complex. However, while the UK Government holds most of the policy levers, planning is devolved, allowing the Scottish Government to exercise some influence, mainly through the National Planning Framework.

- **Offshore wind.** Property rights for the commercial use of the seabed in Scottish waters are granted by the Scottish Government. Since the publication of the CCPu, they have completed the first ScotWind leasing round for commercial scale offshore wind energy projects, with a further round being announced in this year's PfG.
- **Planning.** The fourth National Planning Framework (NPF4), due to be published shortly, has a key role in supporting decarbonisation and renewable generation through facilitating the project application process and taking into account the development of the necessary infrastructure, including large scale storage, high voltage electricity transmission networks, and a CCS network capable of supporting the future use of BECCS. As such, NPF4 will have to be aligned with Scottish targets and the CCPu.
- **Infrastructure.** While decisions on most key infrastructure for electricity, hydrogen and CCS are reserved to the UK Government, the responsibility for infrastructure of national significance lies with the Scottish Government; this includes supporting infrastructure such as ports and harbours, which can help ensure the security of the supply chain for the continued expansion of renewables.

Figure 2.8 Emissions from electricity generation



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019; CCC Sixth Carbon Budget; Scottish Government (2021) Update to the Climate Change Plan 2018-2032: Securing a Green Recovery on a Path to Net Zero; CCC analysis.

Note: In this figure all emissions use the lower range of global warming potentials from the IPCC's 5th Assessment Report. This is the default for CCPu, whereas historical emissions and the CCC pathway have been adjusted (nominally they use values from the 4th Assessment Report and the higher range of the 5th Assessment Report, respectively).

Note 2: The CCC waste sector includes emissions from Energy from Waste (EfW), which the CCPu and historical emissions records under electricity generation.

A joined-up approach between the UK and Scottish Governments is needed in the sector.

The Scottish Government has an additional role to play in the decarbonisation of electricity generation through continuing to invest in research and innovation, as well as the skills and expertise that will allow Scotland to maintain its place as an economy specialising in energy production while reaping the benefits of the just transition. Supporting the development of a green jobs market in Scotland will help secure this, and it is an important step towards ensuring the transition to a low carbon economy will be just.

The split of policy levers and the Scottish Government's reliance on major decisions outside of its hands, however, makes it clear that there needs to be a high degree of collaboration and good coordination between the UK and Scottish Governments in order for the latter to be able to deliver on the CCPu and its targets. Going forward, it is imperative to ensure that, when relevant decisions are made on a UK level, sufficient engagement between the two governments has allowed for the impact on Scotland to be taken into account.

Industry

Industrial decarbonisation policy is reserved to the UK Government, leaving limited scope for ambition in the CCPu.

Like electricity generation, industry policy is also largely reserved to the UK Government, making its decarbonisation in Scotland contingent upon the wider UK industrial strategy and the collaboration between the UK and Scottish Governments. Nevertheless, there are some policy levers the Scottish Government can utilise, and the CCPu does set a trajectory and targets for industry emissions in Scotland (Figure 2.10).

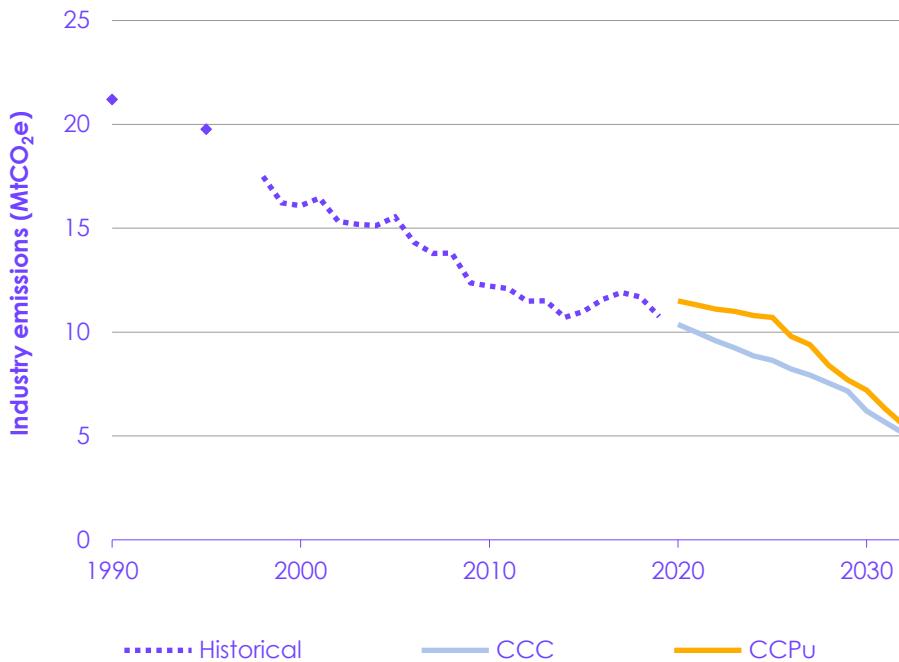
- The Balanced Net Zero Pathway takes a more ambitious approach to decarbonisation than the CCPu. This is because the Balanced Net Zero Pathway was designed with a focus on the UK, while the CCPu emphasises the policy levers available to the Scottish Government.
- Both trajectories project that emissions from industry will fall to below a quarter of their 1990 levels by 2032, although the Balanced Net Zero Pathway sets a faster and smoother decarbonisation course throughout the 2020s than the CCPu.
- The rate of decarbonisation in the CCPu trajectory is much steeper after 2027, which is presumably an artefact of the TIMES modelling. This indicates that industrial policies will be among the most cost-effective measures to drive decarbonisation.

The Scottish Government can, however, support the decarbonisation of industry through funding, supporting research and innovation, and ensuring the right workforce skills are being developed.

Designing industrial policy is a power reserved to the UK Government, but the Scottish Government has been using the policy levers available where possible:

- It has been supporting the commercialisation and scaling up of CCS, through investing in the Acorn CCS Project. The Scottish Government recognises the importance of CCS to meeting its 2030 target. This is an area that necessitates a close collaboration with the UK Government, however, as infrastructure and deployment of engineered removals are also reserved to the UK Government (see section on Greenhouse Gas Removals).
- It has set up the Emerging Energy Technologies Fund to support the development of hydrogen and CCS transport and storage in Scotland.
- Through supporting North East Carbon Capture Use and Storage (NECCUS) and their development of Scotland's Net Zero Roadmap to decarbonise Scottish industrial clusters.
- By supporting financially early-stage development of innovative CCS technologies, as well as wider investment in low-carbon manufacturing through provision of a number of smaller funds available to Scottish businesses.
- By boosting the development of the required skills through the Green Jobs Fund, ensuring that local economies will retain jobs and helping to ensure a just transition towards a low-carbon economy.

Figure 2.9 Emissions from industry



Source: NAEI (2021) Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2019; CCC Sixth Carbon Budget; Scottish Government (2021) Update to the Climate Change Plan 2018-2032: Securing a Green Recovery on a Path to Net Zero; CCC analysis.

Note: In this figure all emissions use the lower range of global warming potentials from the IPCC's 5th Assessment Report. This is the default for CCPu, whereas historical emissions and the CCC pathway have been adjusted (nominally they use values from the 4th Assessment Report and the higher range of the 5th Assessment Report, respectively).

Note 2: The CCPu industry sector comprises manufacturing, mining and quarrying, construction and downstream oil and gas, making it roughly the equivalent of the combination of the CCC's manufacturing & construction and fuel supply sectors.

Note 3: The CCC's F-gases sector has been split between Buildings and Industry for the purposes of comparison with the CCPu, with approximately 1/3 of F-gases allocated to industry.

UK Emissions Trading Scheme (UK ETS)

The UK ETS will be key in driving the decarbonisation of industry across the UK.

While it's difficult to draw a direct link between these policies and the amount of abatement they would result in, it is safe to assume that they are not sufficient to decarbonise Scottish industry by themselves. The CCPu recognises that the most effective mechanism for driving industrial decarbonisation across the UK so far has been the EU Emissions Trading System (EU ETS). This is due to be replaced by a UK ETS, jointly established by the four UK administrations, that will maintain a carbon price that continues to incentivise industrial decarbonisation.

The Scottish Government's strong preference is to link the UK ETS to the EU ETS, and the CCPu calls for that. The decision about the future of the UK ETS, however, needs to be made jointly with the other three administrations, a point which reinforces the need for a well-established, highly collaborative relationship between the Scottish and the UK Governments to deliver effective climate policy across the UK.

3. The 2030 target

It is clear that meeting the legislated 2030 target will be highly challenging even with successful implementation of climate policy across a wide range of areas. Even getting within a few percentage points of the 75% target would outperform the CCC's Balanced Net Zero Pathway and be a strong contribution to tackling climate change.

Meeting Scotland's 2030 legislated emissions target will be extremely challenging, and will almost certainly require further increases in ambition where feasible.

Nevertheless, the 2030 target is legally-binding, and all efforts must be made to meet it. This means that the Scottish Government must pursue the very strong emissions reductions it has set out in key areas, and must also increase its ambition in areas that fall short of the CCC's assessment of what can feasibly be achieved:

- Ensure delivery on the very high ambition in transport and buildings, despite significant risks of falling short.
- Increase ambition in areas where more can be achieved, such as peatland restoration, a shift to low-carbon diets and reducing aviation demand.

Engineered greenhouse gas removals have an important role in delivering the 2030 target in the CCPu, but implementation comes with delivery risks that are partly outside of the Scottish Government hands.

Furthermore, decisive action will be required to deliver the very important contribution of 3.8 MtCO₂e/year to the overall emissions reduction by 2030 that the CCPu has earmarked for engineered greenhouse gas removals (GGRs). This is complicated by the fact that not all policy levers are held by the Scottish Government:

- The decision of the UK Government not to award 'Track 1' status to the development of the Acorn carbon capture and storage (CCS) cluster makes it highly challenging for Scotland to have fully operational GGR facilities, able to remove 3.8 MtCO₂e by 2030, as envisioned by the CCPu.
- Acorn has been selected as a back-up option for the development of CCS, should plans with either of the Track 1 projects fail. CCS infrastructure is still a largely reserved area of policy, heavily reliant on the UK Government for funding and timelines for delivery. While Track 2 clusters could follow on quickly from the initial projects, and it is therefore not impossible for Scotland to have a mature enough CCS sector by 2030, this poses a major delivery risk to deployment of GGRs by 2029 as planned in the CCPu.
- The timescales for developing new carbon capture facilities at scale are subject to considerable uncertainty, which means that any delays now in developing the CCS cluster and CO₂ capture plant(s) significantly increase the risks relating to its delivery by 2030.
- As a result, there is a real risk that Scotland might not be able to rely on GGRs to the extent envisaged to reach a 75% reduction in emissions by 2030. This does not necessarily reduce the potential for GGRs to contribute to Net Zero by 2045, given that for bioenergy with CCS (BECCS) – a key GGR option – constraints relate more to the availability of sustainable biomass feedstocks. However, the margins around the 2030 target are now extremely narrow.

- Decisive action is therefore needed, either in working with the UK Government to secure commitments regarding CCS infrastructure and BECCS in Scotland to be delivered by 2030, or regarding a plan to meet the 2030 target in an alternative way. We recognise that the CCPu already includes highly ambitious pathways in most areas. However, we recommend efforts to increase ambition in shifting to low-carbon diets, limiting aviation growth and peatland restoration.

The Scottish Government needs to come up with a cut-off point for relying on the use of GGRs to meet its targets, as well as alternative solutions in case GGRs are unavailable.

We recommend that the Scottish Government identifies a cut-off point, by 2023 at the latest, beyond which it will seek to increase its efforts in other areas if commitments on CCS infrastructure and BECCS are not secured.

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Chapter 3

Policy progress and recommendations

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Introduction

This chapter outlines policy progress by the Scottish Government since the 2020 Scottish Progress Report (2020 SPR)¹ and recommended next steps. Significant advances have been made both in Scottish policy, including the publication of the update to the Climate Change Plan (CCPu),² and in the UK, including the publication of the UK's Net Zero Strategy.³

We summarise cross-economy developments, progress in each sector and assess the 50 specific recommendations laid out in the 2020 SPR. The assessments are given in tables in each section. For each sector, next steps are also discussed and a table of recommendations for the next year is given. A full list of recommendations for the next year is also given in a separate Annex.

The key messages in this chapter are:

- **Scotland must complete its policy framework.** Most of the key policy levers over decarbonisation are now in the hands of the Scottish Government. A comprehensive, detailed policy framework must now be completed for decarbonisation in Scotland.
- **The past year has seen significant advancements in Scottish climate policy ambition.** The CCPu, published in December 2020, sets out an ambitious pathway to Net Zero by 2045, with a focus on meeting the 2030 interim target of a 75% reduction on emissions compared to 1990 levels.
- **The Scottish Government is moving towards integrating Net Zero in all areas of policy.** The Programme for Government (PfG)⁴ is a strong signal of this, as is the addition of a Cabinet Secretary for Net Zero, Energy and Transport. New supporting ministerial roles working across the relevant sectors to support the transition to Net Zero have also been created, with policy portfolios covering issues such as employment, green skills, just transition, active travel and biodiversity.
- **The focus within the Scottish Government's plans on a 'just transition' and on public engagement are commendable.** The Scottish Government has accepted all the Just Transition Commission's recommendations, and has set out several positive commitments towards ensuring that the transition is fair. A new Public Engagement Strategy has been published, focusing on communicating climate change actions and their impact on people's lives, and encouraging participation of the public in shaping policy.
- **Progress has been made in many areas highlighted by the Committee, but important gaps remain.** Most of the recommendations made by the Committee last year have been achieved, at least in part, or are underway. However, important gaps remain, particularly in the agriculture sector. Of the 30 recommendations with an expected timeframe of 2021 (or earlier), 9 were scored as achieved, 5 as partly achieved, 13 as underway, 2 as not achieved and 1 as not yet assessed.
- **There is still an urgent need for post-CAP low-carbon agriculture policy.** The Scottish Government has consulted on options for future agriculture and land use support through a Bill to replace the current Common Agricultural Policy (CAP), with plans for an Agriculture Bill in 2023. This should clarify what funding will be available for land-based mitigation and sequestration. There should also be a clear plan to move towards healthy, low-carbon diets.

- **Scotland is ahead of the rest of the UK in setting out buildings decarbonisation policy.** Key milestones for energy performance certificates (EPCs) and boiler phase-out are generally five years earlier than UK milestones. The Scottish Heat in Buildings Strategy outlines more developed plans for delivering commitments on the ground than the UK Heat and Buildings Strategy, such as through local heat and energy efficiency strategies, and has set out proposals, ahead of the UK, to include an efficiency metric in EPCs.
- **Scotland's commitments on travel demand are very ambitious, but there is not yet a clear plan.** The Scottish Government is more ambitious than the rest of the UK on reducing car use and has introduced a new commitment to reduce total car mileage by 20% by 2030. However, detailed plans on how to achieve this commitment have not yet been laid out – this is required urgently. The commitment to a 2030 phase-out for sale of new petrol and diesel cars is in line with UK commitments.
- **Positive steps have been made towards funding decarbonisation,** including in some of the most challenging sectors, and to develop sectoral policies to deliver action. Key sectoral commitments made by Scottish Government in the past year include £1.8 billion of funding towards decarbonising buildings, increased expenditure on active travel, rising to £320 million (or 10% of the total transport budget) in the year 2024-25 and £500 million of investment in the natural economy over the course of this Parliament. However, there is relatively little detail on exactly how the committed money will be spent.
- **Ambition and policy development must be increased where feasible to mitigate delivery risks.** There are major delivery risks across the areas in which the Scottish Government has adopted high ambition, especially where delivery is not entirely in its control. Ambitions, and associated policy planning, must be stepped up in other areas to mitigate these risks.

We set out our assessment of policy progress in this chapter in the following three sections:

1. Summary of policy progress scores in the last year
2. Cross-economy progress and next steps
3. Progress and next steps by sector

1. Summary of policy progress scores in the last year

Recommendations from the 2020 Scottish Progress Report have been assessed.

This section summarises progress against the 50 recommendations made by the Committee to Scottish Government at last year's SPR.

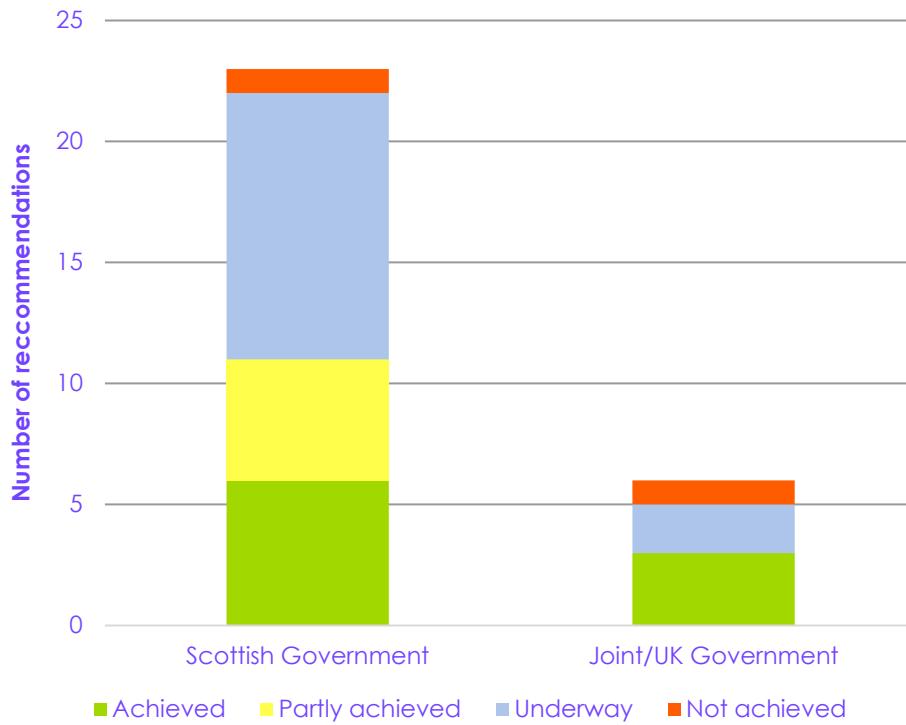
The recommendations from the 2020 SPR have been categorised as being: mainly the responsibility of the Scottish Government, mainly the responsibility of the UK Government, or – in the cases where there is a mix of devolved and reserved issues – joint responsibility. For some recommendations an associated timeframe was given, indicating when the milestone should be met. Others have an ongoing timeframe and are not necessarily expected to have been achieved at this point.

We have scored the recommendations as either 'achieved', 'partly achieved', 'underway' or 'not achieved'. 'Partly achieved' is used in cases where progress has been made but there are significant gaps; 'underway' represents situations in which progress has started, or an intention has been stated, but a publication is not yet out or there are missing pieces that are expected soon.

Progress has been made in many areas highlighted by the Committee, but important gaps remain.

- Of the 30 recommendations with an expected timeframe of 2021 (or earlier), 9 were scored as achieved, 5 as partly achieved, 13 as underway, 2 as not achieved and 1 as not yet assessed (Figure 3.1). The recommendations scored as not achieved are in the buildings and agriculture sectors:
 - There are no plans to make accurate buildings performance testing and reporting widespread, or to commit developers to the standards they advertise.
 - There are no policies to encourage a shift to healthier, more sustainable diets.
 - More broadly, the agriculture sector is lacking a comprehensive framework to deliver the high-level vision of the future given in the CCPu.
- Of the 20 recommendations with a date set later than 2021 or marked as ongoing, 3 were scored as achieved, 4 as partly achieved and 13 as underway.
- Some sectors were not given specific recommendations in the 2020 SPR, including aviation, shipping, and manufacturing and construction. In these cases, general policy progress is discussed in section 3.

Figure 3.1 Scores for recommendations for 2021 from the 2020 Scottish Progress Report



Source: CCC analysis.

Note: One recommendation has not yet been assessed and is not included in this figure.

2. Cross-economy progress and next steps

a) Policy progress in the past year

The update to the Climate Change Plan sets out an ambitious pathway to Net Zero in 2045.

The past year has seen significant advancements in Scottish climate policy ambition. All of the 2020 SPR recommendations have been assessed as achieved, partly achieved or underway (Table 3.1).

Most notably, the CCPu was published in December 2020 and describes an ambitious pathway to Net Zero in 2045 (2020 SPR recommendation) with a focus on meeting the 2030 interim target of a 75% reduction on emissions compared to 1990 levels. Particular strengths of the Scottish journey to Net Zero are the focus on ensuring a just transition and public engagement, both of which are discussed below.

In addition to the publication of the CCPu, the past year has seen a number of important advances in cross-economy climate policy:

The Scottish Cabinet now includes a Cabinet Secretary for Net Zero, Energy and Transport together with new supporting ministers.

- The Scottish Cabinet now includes a Cabinet Secretary for Net Zero, Energy and Transport with a number of new supporting ministers working across the relevant sectors to support the transition to Net Zero:
 - a Minister for Green Skills, Circular Economy and Biodiversity.
 - a Minister for Zero Carbon Buildings, Active Travel and Tenants Rights.
 - a Minister for Just Transition, Employment and Fair Work.
- The allocation of these ministerial portfolios is a big step forward in ensuring that Net Zero is being embedded as a core Government goal (2020 SPR recommendation). These additions occurred alongside a change in the Scottish political landscape, which saw the creation of a cooperation agreement and shared policy programme between the Scottish National Party and the Scottish Green Party.
- The 2021/22 PfG was published in September 2021 and is a strong signal that the Scottish Government is moving towards integrating Net Zero in all areas of policy across the economy (Box 3.1).
 - The Programme announced £1.8 billion of funding towards decarbonising buildings, which was later reiterated in the Scottish Heat in Buildings strategy. Contributing 18% of total Scottish emissions in 2019, and generally considered difficult to decarbonise, the buildings sector is a priority area in the CCPu.
 - Transport is another priority, contributing 20% of total Scottish emissions in 2019, with investment into active travel and the decarbonisation of passenger rail services and buses.
 - There was an increase in funding for peatland restoration, while a just transition for all sectors, including investment in green jobs and the reskilling of the workforce, were also prominent (see section on Just Transition below).

The Scottish Government is moving towards integrating Net Zero in all areas of policy.

A 'catch-up' report has been published in response to the Scottish Government missing its 2019 target.

- In response to missing its 2019 statutory target to reduce emissions by 55% compared to 1990 levels, and following the requirements of the 2009 Scottish Climate Change Act, the Scottish Government published a 'catch-up' report⁵ of proposals and policies.
 - If implemented successfully, these will reduce emissions by an additional 2.7 MtCO₂e over the period to 2032, making up for the amount by which the 2019 target was missed. The plans focus on transport and buildings and are aligned with those from the PfG.
 - There are also proposals to support businesses to transition to Net Zero, including mandatory annual disclosure of the impact of climate change on large businesses.
 - A carbon management plan and a commitment to reduce emissions consistent with Scotland's Net Zero target will be conditions for businesses hoping to access grants.
 - There are also plans to incentivise businesses to invest in locally-based and low-carbon production of food and drink, through a number of financial and marketing brand schemes.
- The 2021 Infrastructure Investment Plan⁶ for Scotland was published in February 2021 (2020 SPR recommendation), outlining a strategic approach to supporting infrastructure in Scotland in 2021/22 to 2025/26. The plan accepts 22 of the 23 recommendations of the Infrastructure Commission for Scotland,⁷ with one deferral on forming a body to provide independent long-term advice to Ministers on investment priorities.
- The Scottish Government is starting to lead by example with an ambitious target to decarbonise the public sector car fleet by 2025 and a consultation on decarbonising buildings by 2038, with some starting from 2024, backed by appropriate funding (2020 SPR recommendation). The next step is concrete implementation of these plans.
- The National Performance Framework⁸ continues to monitor a number of indicators related to Net Zero plans, including territorial emissions, carbon footprint, energy from renewable sources and journeys by active travel. In addition, a more comprehensive set of indicators are reported in the annual Climate Change Plan monitoring reports, the most recent of which was published in May 2021.⁹ These reports help to keep track of progress towards the Net Zero goal (2020 SPR recommendation).
- The CCPu reiterated the Scottish Government's commitment to aligning public sector procurement practices with Net Zero by promising to mobilise the £12.6 billion public procurement spend to support emissions reductions (2020 SPR recommendation). A Climate and Procurement Forum has been convened to coordinate efforts across the public sector, and guidance and a number of toolkits on the subject have been published. The Scottish Government has committed to additional future plans to make circular economy and climate considerations part of organisational procurement strategies. It should be ensured, however, that low-carbon choices will be prioritised, and no barriers are introduced from competing criteria such as reducing cost.

The 2021 Infrastructure Investment Plan accepts the recommendations of the Infrastructure Commission for Scotland, with one deferral.

There is a commitment to align the £12.6 billion public procurement spend with Net Zero.

- The Scottish Government has plans for a green recovery from the COVID-19 pandemic with significant funds available for public transport and active travel, as well as a Green Jobs Fund allowing individuals to retrain and develop skills in green sectors. More detail is given in Chapter 1.
- The National Planning Framework (NPF4) is due to be published in 2021, and will set out the long-term vision for development and investment for the next 20-30 years (2020 SPR recommendation). We will respond to this once it is available.

The UK Government has now published its Net Zero Strategy and various sectoral documents.

Track 1¹ funding was not awarded to development of a CCS cluster in Scotland, although it is a reserve project.

The past year has also seen significant advancements in UK climate policy, with the publication of the UK Government's Net Zero Strategy¹⁰ and sectoral strategy documents, including the Heat and Buildings Strategy,¹¹ the Transport Decarbonisation Plan,¹² and the Hydrogen Strategy.¹³

Key sectoral announcements that have a direct impact on Scottish climate plans are discussed in the sectoral sections. As discussed in Chapter 2, the decision of the UK Government not to award 'Track 1' funding to the development of a CCS cluster in Scotland makes the Scottish Government's ambitious aim to remove 3.8 MtCO₂e/year by 2030 particularly challenging.

A detailed assessment of policies and commitments addressing adaptation to a changing climate will be included in the Adaptation Committee's report on adaptation progress in Scotland, due to be published in early 2022. The Scottish Government has engaged proactively in findings from the Independent Assessment of UK Climate Risk,¹⁴ published in June 2021, including organising a National Resilience Summit. However, it should be noted that the recent Heat in Buildings strategy makes no mention of the highlighted issues.

Box 3.1

The 2021/22 Programme for Government

In September 2021, the Scottish Government published its annual Programme for Government (PfG), which sets out planned public sector spending over the next year. This was the first PfG following the publication of the Update to the Climate Change Plan.

Building a Net Zero Nation was a key theme and underpinned some of the most important funding announcements in the PfG, including:

- The pledge of £1.8 billion over this Parliament for green buildings. This sum includes £400 million for large-scale heat decarbonisation infrastructure and £465 million to support those least able to pay.
- Increased expenditure on active travel, rising to £320 million (or 10% of the total transport budget) in the year 2024-25.
- £287 million in total by 2025-26 for low- or zero-carbon initiatives in transport.
- £500 million dedicated to green jobs of the future, a £100 million Green Jobs Fund and a £500 million Just Transition Fund for the North East and Moray, to be used over a period of 10 years.
- Investing £33 billion over the course of this Parliament in the National Infrastructure Mission, including £1 billion in the Scottish National Investment Bank.
- £240 million spent in the next year, on industry and low-carbon technologies, along with hydrogen and Carbon Capture and Storage, through the Energy Transition Programme.
- £500 million invested in the natural economy over the course of this Parliament, including in the expansion of the Nature Restoration Fund, forestry and the restoration of peatlands.

Funding decisions were planned around supporting policy decisions aimed at delivering Net Zero in Scotland by 2045.

- Through the Heat in Buildings Strategy,^{B1} the funding for green buildings will be channelled towards decarbonising 1 million homes and the equivalent of 50,000 non-domestic buildings by 2030 by switching them to low- or zero-emissions heating.
- The importance of a just transition is recognised by the Scottish Government through the decision to publish Just Transition Plans for every sector of the Scottish economy, starting with the energy sector next spring.
- Funding for green jobs will be supporting setting up a Green Jobs Workforce Academy to upskill and reskill the workforce to match the future demands of the job market.
- The Scottish Government is undertaking steps to decarbonise its rail network and bus fleet by investing in priority bus infrastructure and a Zero Emission Bus Challenge Fund, as well as committing to decarbonise passenger rail services by 2035.
- The PfG announced further ScotWind leasing rounds in this Parliament.

Source: Scottish Government (2021). *A Fairer, Greener Scotland: Programme for Government 2021-22*. B1 - Scottish Government (2021) Heat in Buildings Strategy - achieving net zero emissions in Scotland's buildings.

A just transition

The Scottish Government's plans for Net Zero have a commendable focus on ensuring a just transition.

The Scottish Government's plans for Net Zero have a commendable focus on ensuring a just transition:

- **Planning and frameworks:**

- After convening a two-year long Just Transition Commission (JTC) to review the current situation in Scotland and publishing recommendations on moving forward in their final report in March 2021 (Box 3.2), the Scottish Government accepted the Commission's recommendations in full (2020 SPR recommendation). The Commission has also been re-established with a remit to provide longer-term support with more applicable advice by sector and across the economy on implementing a just transition.
- As recommended by the JTC, the Scottish Government now includes a Minister for Just Transition, Employment and Fair Work.
- The 2021/22 PfG announced that the Scottish Government is planning on publishing just transition plans for every emissions-intensive sector, starting with the energy sector next spring.

- **Workers and skills:**

- A Climate Emergency Skills Action Plan (CESAP)¹⁵ for the period 2020-2025 was published by the Scottish Government in December 2020, setting out priority areas and actions that will be taken to ensure skills needed to deliver the transition are in place. The Plan identifies priority areas for skills which align with the Committee's recommendations, such as construction (including the retrofitting of housing), manufacturing and agriculture and land use management (including forestry). The Plan also establishes a Green Jobs Workforce Academy to support employees in need of reskilling and a Green Jobs Skills Hub to inform the skills system on the jobs requirements of the transition. A

The Climate Emergency Skills Action Plan identifies priority areas for skills that align with the Committee's recommendations.

more detailed implementation plan is expected from the CESAP this year.

The Scottish Government has pledged substantial investment into future green jobs.

- The Scottish Government has pledged substantial amounts of investment into future green jobs and into upskilling and reskilling the workforce in line with the demands of a Net Zero job market. The 2021/22 PfG committed £500 million to green jobs of the future (including funding for skills), a £100 million Green Jobs Fund to help businesses create green employment through investment and a £500 million Just Transition Fund to support the transition in the North East and Moray.

- **Paying for decarbonisation:**

- The 2021/22 PfG also committed to setting out principles to underpin a fair heat transition which will inform the design of the Fuel Poverty and Heat in Buildings programmes, as well as to commission analysis of the distributional impacts of decarbonising buildings and the options to mitigate any negative impacts.
- The Heat in Buildings Strategy included consideration of fuel poverty and local communities, including a commitment to publishing a Fuel Poverty Strategy in 2021 and committed spend of at least £465m over the next five years to support those in fuel poverty.

It is important for workforce implications and skills requirements to be wrapped into upcoming sectoral Just Transition Plans.

These are significant and positive steps towards addressing the Committee's recommendations on ensuring a just transition to a Net Zero economy in Scotland made in last year's Progress Report, and we expect upcoming publications to finish addressing these issues. It will be important for workforce implications and skills requirements to be wrapped into upcoming sectoral Just Transition Plans and that actions identified in these plans are rapidly implemented, in particular in buildings, to avoid skills gaps resulting in delivery pinch points.

Box 3.2

Scotland's Just Transition Commission: Final Report

How did it work?

Scotland's Just Transition Commission was established by Scottish Ministers in 2019, to provide advice on how to deliver a just transition to Net Zero in Scotland. The Commission published its final report^{B1} in March 2021, following extensive engagement with a diverse range of individuals, communities, and industries. The purpose of this report was to provide practical recommendations to Scottish Ministers. The Commission had previously published an interim report in February 2020,^{B2} and also gave advice on a 'just green recovery' in July 2020.^{B3}

What did the Commission Recommend?

The final report emphasises the need for immediate action in some sectors to meet Scotland's climate targets, and that this action must be delivered in a fair and equitable manner. It highlights that rapid interventions are required to ensure that just transition principles address inequalities and prevent injustices occurring, rather than mitigating for these retrospectively.

The report makes a total of **24 recommendations**, grouped under **four key themes**:

- **The transition to Net Zero should be effectively managed and clearly planned.** Recommendations under this theme focus on delivering detailed roadmaps for Scotland's Net Zero transition, with Just Transition Plans for high-emitting industrial sectors and for Scotland's land and agriculture.
- **The skills and education system must be commensurate with the Net Zero economy and enable citizens to benefit from the transition.** The report provides specific

recommendations on a skills guarantee for workers in high-emitting sectors, and on providing advice and training to those using and managing Scotland's land.

- **The transition must include buy-in from individuals and local communities, and benefit local economies.** This theme focuses on mechanisms by which individuals and local communities can play an active role in and benefit from the transition. Specific recommendations include implementation of Green Participatory Budgeting and engagement with the recommendations of the Scottish Climate Assembly.
- **The benefits and costs of the transition should be shared equitably and in a way which tackles – rather than exacerbates – existing inequalities.** Recommendations in this theme include specific reference to ensuring all consumers benefit from changes in Scotland's electricity market, and that all additional costs for consumers are distributed on the basis of ability to pay.

The report also recommended three specific actions to enable delivery of the Just Transition agenda:

- The Scottish Government should make a senior cabinet official responsible for a Just Transition.
- The Scottish Government must provide capacity for independent scrutiny and advice on Just Transition considerations.
- The Scottish Government should launch a national call for action at COP26.

What next?

The Scottish Government published its response to the report from the Just Transition Commission in September. This included a commitment to begin **development of a National Just Transition Planning Framework**, with Just Transition Plans developed for high-emitting sectors, starting with the energy sector.

Having produced its recommendations, the Commission is in the process of being re-established to focus on advising on the delivery of government-led just transition plans, and providing assessment of their progress, including publishing an annual report.

Source: B1 Just Transition Commission (2021) *A national mission for a fairer, greener Scotland*; B2 Just Transition Commission (2020) *Interim Report*; B3 Just Transition Commission (2020) *Advice for a Green Recovery*.

Public engagement

The need for effective public engagement is recognised and a new Public Engagement Strategy has been published.

The Scottish Government recognises the need for effective public engagement in a successful and fair transition to Net Zero:

- In 2020, a Climate Assembly was convened (Box 3.3) in order to understand public perception of how Scotland should tackle the climate emergency. The findings of the Assembly were laid before the Scottish parliament in June 2021 and will be responded to within six months.
- In 2021, Scotland published a new Public Engagement Strategy,¹⁶ targeting those who work on engaging the public. The strategy focuses on communication of actions being taken to tackle climate change and how it impacts individuals lives, participation of the public in shaping the necessary policies, and ensuring that individuals take necessary actions to instigate change.

Box 3.3

Scotland's Climate Assembly

How did it work?

In November 2020, Scotland's Climate Assembly was convened, as required by an amendment to Scotland's Climate Change Act made in 2019. The aim of the Assembly was to understand public perception of the question: "How should Scotland change to tackle the climate emergency in an effective and fair way?".

105 citizens were selected by a civic lottery, with the findings of the assembly published in a report^{B1} and laid before Scottish parliament in June 2021.

What were the findings?

The report details 16 goals and 81 associated recommendations, relating to a wide range of sectors and topics. Here, we summarise some of the goals and recommendations relating to Scotland's highest-emitting sectors:

- **Surface Transport.** Goals in this sector focused on improving public transport, supporting active travel, and minimising emissions from necessary travel. Specific recommendations included reducing the price of public transport, subsidising rail infrastructure and developing convenient EV charging infrastructure by 2025.
- **Buildings.** Recommendations included ensuring all new housing is built to Passivhaus standards within the next 5 years, retrofitting the majority of existing homes by 2030 and strengthening building and trading standards to quality-assure energy efficiency work carried out by private companies. Additionally, the Assembly recommended that all public sector buildings should be net zero by 2030.
- **Agriculture and Land Use.** Goals in this sector emphasised the need to reduce emissions while supporting communities and landowners. Specific recommendations included committing to higher levels of restoration of peatland and native woodland, developing farming subsidies to support more sustainable land use, and encouraging retailers to buy and sell local produce at a fair price to farmers.

The report also detailed 22 "propositions of fairness", voted on by the Assembly members, as criteria their recommendations should meet in order to be considered fair. The two propositions receiving the most support focused on:

1. Considering the variety of needs of different communities across Scotland.
2. Ensuring measures targeted the highest-emitting organisations and individuals, so that they are required to make the biggest changes.

These propositions align closely with the major themes in the final report from Scotland's Just Transition Commission^{B2} (see box 3.2).

What next?

The Scottish Government must respond to the recommendations of the Assembly within six months of the publication in June 2021. The members of the Climate Assembly have committed to meeting again to discuss this response.

Sources: B1 Scotland's Climate Assembly (2021) *Scotland's Climate Assembly, Recommendations for Action*; B2 Just Transition Commission (2021) *A national mission for a fairer, greener Scotland*

Table 3.1

Delivery of policy cross-economy recommendations in 2020 and 2021

Recommendation (2020 SPR)	Timing	Primary responsibility	On track?
Continue to embed Net Zero as a core Government goal and strengthen focus on climate adaptation. <ul style="list-style-type: none"> Ensure directorates and delivery bodies are sufficiently resourced and are taking action as set out in this report. Ensure the COVID-19 recovery plans accelerate the transition to Net Zero and strengthen Scotland's resilience to climate risks 	Now and ongoing	Scottish Government	Underway
Set out an ambitious Climate Change Plan that puts Scotland firmly on the pathway to net zero in 2045.	2020	Scottish Government	Achieved
Develop and implement plans to make all public buildings and vehicle fleets zero-carbon in the long term.	Now and ongoing	Scottish Government	Underway
Set a target date and a plan for the Scottish Government estate to achieve zero direct carbon emissions well before the 2045 Net Zero target.	2021	Scottish Government	Achieved
Lead a strong cross-government response to the most urgent national risks set out in the third UK Climate Change Risk Assessment (CCRA3).*	July 2021	Scottish Government	Underway
Review guidance documents used in policy and business case development (e.g. the National Performance Framework, use of HM Treasury's updated Green Book) and ensure these are consistent with the requirements of Net Zero and account for the impacts of climate change.	2021	Scottish Government	Underway
Consolidate Scotland's Net Zero and adaptation objectives more closely within the National Performance Framework.	Next Parliament	Scottish Government	Achieved
Align the next National Planning Framework (NPF4) closely to Net Zero and adaptation, providing a favourable planning and consenting regime for a low-carbon and efficient energy system and climate-resilient infrastructure.	2021	Scottish Government	Underway
Implement the recommendations of the Just Transition Commission in all climate change policy, to ensure the transition to Net Zero in Scotland is fair and perceived as fair.	2021 and ongoing	Scottish Government	Underway
Deliver an Infrastructure Investment Plan that tackles Net Zero and adaptation infrastructure priorities, taking on board the recommendations of the Infrastructure Commission for Scotland.	2021	Scottish Government	Underway
Continue to monitor consumption emissions. These are important to ensure that action to decarbonise Scotland-based activities does not result in emissions moving offshore and to track progress in decarbonisation of imports to the UK, which in turn can inform future policy (e.g. border carbon adjustments).	Now and ongoing	Scottish Government	Underway
Integrate Net Zero into all policymaking, and ensure procurement strategies are consistent with Scotland's climate objectives.	Now and ongoing	Scottish Government	Underway

* Refer to CCC (2019) Final assessment of Scotland's first Climate Change Adaptation Programme for our most recent recommendations on adaptation for Scotland, based on the second UK Climate Change Risk Assessment (CCRA2).

Demonstrate adaptation planning for a minimum 2°C and consideration of a 4°C global temperature rise (by 2100 from pre-industrial levels). The Adaptation Committee's report on adaptation in Scotland, last published in 2019, contains specific recommendations across all sectors.	Now and ongoing	Scottish Government	Partly achieved*
Follow best practice shown by leading businesses to monitor and verify their paths to a net-zero and climate-resilient future.	Now and ongoing	Scottish Government	Underway
Develop a strategy for a Net Zero workforce that ensures a 'just transition' for workers transitioning from high-carbon to low-carbon and climate-resilient jobs, integrates relevant skills into the UK's education framework and actively monitors the risks and opportunities arising from the transition. This strategy should include the development and roll-out of plans for training and skills, with buildings and manufacturing being priority areas	2021	Scottish Government	Achieved
Consider the wider role of the education system in supporting the transition to a net-zero economy and preparing for the risks of climate change – including the need for greater public awareness and understanding – and the need for technical skills in the workforce.	Now and ongoing	Scottish Government	Underway
The Cabinet Secretary for Health and Sport should take an active role in climate policy development that also has health benefits, such as active travel, access to green space, air quality, better buildings and healthier diets	Now and ongoing	Scottish Government	Underway
Skills and training: Develop and roll-out a comprehensive, fully resourced training and skills plan for the Net Zero transition, with buildings and manufacturing being priority areas. Where possible, ensure alignment with equivalent plans that are developed in England, Wales and Northern Ireland.	2021	Scottish Government	Partly achieved

b) Next steps for cross-economy policy

The Scottish Government must now implement the full range of policies needed to reach the legislated targets.

Policies must be put in place now that lock in some of the emissions-reducing changes in behaviour that occurred during the pandemic.

Commitments around CCS infrastructure should be secured or alternatives to greenhouse gas removals considered.

With the publication of the CCPu laying out an ambitious pathway for emissions reductions, including a 75% reduction compared to 1990 levels, the Scottish Government must now implement the full range of policies needed to reach these targets.

Scotland missed its 2019 target and while the impact of the COVID-19 lockdowns means the 2020 interim target may be met, emissions in some sectors are likely to rebound for subsequent years even as further emissions reductions are required to meet the annual targets (see Chapter 1). Policies must be put in place now that lock in some of the changes in behaviour that occurred during the pandemic, resulting in a reduction of emissions. This is particularly important in the transport sector, where the CCPu pathway relies on major emissions reductions for the early 2020s compared to pre-pandemic levels.

Recommendations across the economy are given in Table 3.2. These include mitigating the significant risks of missing Scotland's interim targets, with a focus on CCS infrastructure and greenhouse gas removals and the possible consideration of alternative options.

* see Adaption Committee report in early 2022.

Further recommendations are given in relation to leading by example in the Scottish Government estate and building on progress made in public engagement.

Specific recommendations across sectors on adaptation will be provided in the Adaptation Committee's report on adaptation progress in Scotland due to be published in early 2022.

Table 3.2

New cross-economy recommendations

Recommendation	Timing	Primary responsibility
Work closely with the UK Government to secure commitments around deployment of CCS infrastructure and greenhouse gas removals in Scotland.	2022	Joint
Identify a cut-off point, no later than 2023, beyond which efforts should be increased in other areas if commitments on CCS infrastructure and greenhouse gas removals are not secured. This cut-off point should be identified as soon as possible in 2022.	2022	Scottish Government
Publish quantified emissions abatement from policies and plans in each sector, demonstrating how the annual and interim targets will be met.	2022	Scottish Government
Efforts should be made to lock in behaviours beneficial to emission reduction that emerged in the COVID-19 lockdowns. Taxation and investment should be used, alongside improvements in broadband, to embed reductions in travel demand that have arisen during the pandemic, replacing business travel with videoconferencing and online collaboration.	2022	Scottish Government
Review Net Zero policies in light of the recent evidence from the Independent Assessment of UK Climate Risk, published in June this year, which identified increasing climate risks across all sectors with associated implications for achieving Net Zero.	2022	Scottish Government
Develop policies to drive more resource-efficient construction and use of existing low-carbon materials. This should include setting out a plan for phasing in mandatory whole-life reporting followed by minimum whole-life standards for all buildings, roads and infrastructure by 2025, with differentiated targets by function, scale, and public/private construction.	2022	Joint
Implement plans to make all public buildings and vehicle fleets zero-carbon in the long term and monitor emissions in the Scottish Government estate.	Ongoing	Scottish Government
Ensure that the education system provides people with knowledge of climate issues and actions to support the transition to a Net Zero economy and prepare for the risks of climate change.	Ongoing	Scottish Government
Incorporate workforce implications and skills requirements into all sectoral Just Transition Plans and rapidly implement actions identified in these plans, to ensure that skills shortages do not slow down progress.	2021/22	Scottish Government

3. Progress and next steps by sector

a) Surface transport

Policy progress in the past year

Transport decarbonisation has seen significant progress in raising ambition and in strategy.

The past year has seen significant progress in the ambition and strategy for transport decarbonisation, both at a Scottish and UK Government level.

- At the UK Government level, we have seen major developments through the announcement of an end-of-sales date for new petrol and diesel cars and vans and the publication of DfT's Transport Decarbonisation Plan.¹⁷ This document set out plans to decarbonise the whole UK transport system, showing good levels of ambition but with more precise policy and targets required in some areas.
- The CCPu and the 2020/21 PfG go further than the UK Government's strategy in some key areas. They have also historically been more ambitious than the wider UK on timescales for transitions in the transport sector.
- The Scottish Government has also recently published a study commissioned from Element Energy assessing pathways through which Scotland's transport sector can be decarbonised.

The Scottish Government has committed to phase out the need to buy new petrol and diesel cars and vans by 2030, in line with UK commitments

The UK-wide commitment to a 2030 phase-out for new petrol and diesel cars and vans can align with what is required for the CCC's Balanced Pathway, provided the focus is on a transition to fully electric vehicles (EVs) and the role allowed for hybrids is limited. This aligns well with the Scottish Government's commitment to phase out the need to buy new petrol and diesel cars and vans by 2030 (2020 SPR recommendation, Table 3.3).

- Element Energy's recent study for the Scottish Government has recommended that plug-in hybrids should be included in the 2030 phase-out, ensuring that all new car and van sales are fully zero-emission at the tailpipe from then on.
- It will be important for both the UK and the Scottish Government to support delivery of this transition. The recent consultation on introducing a Zero-Emission Vehicle Mandate, requiring manufacturers to sell a rising proportion of EVs to reach 100% by 2030, is an important step in this regard.
- Scotland offers additional funding on top of the grants available from the Office for Zero Emission Vehicles (2020 SPR recommendation). This includes additional support for installing home chargers and the new Low Carbon Transport Loan, which is available for both new and used EVs and will help make the transition more affordable for consumers.

There are now more than 2,500 public chargers across Scotland, of which over 650 are rapid chargers.

- There are now more than 2,500 public charging devices across Scotland, of which over 650 are rapid chargers. The Scottish Government recently published a report¹⁸ on opportunities for growth in this network, setting out the need to scale up deployment of public charging infrastructure to enable a smooth EV transition. This includes removing barriers to private-sector investment through a collaborative approach between the public sector and industry and building on the strengths of the ChargePlace Scotland network to deliver a consumer-focused charging network (2020 SPR recommendation).

The Scottish Government has committed to reduce total car mileage by 20% by 2030, however there are no detailed plans.

Scotland is notably more ambitious than the rest of the UK on reducing car use and has introduced a new commitment to reduce total car mileage by 20% by 2030 (2020 SPR recommendation, Table 3.3).

- This reduction would go further than the levels assumed in our Balanced Pathway and has the potential to act as an example for how demand reduction can be realised across the UK.
- The Scottish Government now needs to deliver detailed plans for how this ambition will be achieved. These plans should be set out within the next year and should include detailed measures both to make sustainable transport choices affordable, reliable and convenient, and to make it less appealing to drive where alternatives are available.
- The CCPu contained promising initiatives including pledging to prioritise investment decisions on the basis of a sustainable transport hierarchy and the focus on '20-minute neighbourhoods', while the PfG committed to increasing the share of Transport Scotland's budget spent on active travel to 10% by 2024/25. This will increase annual funding for active travel to at least £320m.
- We welcome the Scottish Government's commitment to no longer invest in road-building to cater for unconstrained increases in traffic volumes.

There is a commitment to remove diesel trains from passenger operations by 2035, five years sooner than the UK.

UK-wide consultations have also recently been launched on phase-out dates for ending the sale of new diesel HGVs and buses, while the Scottish Government has committed to remove diesel trains from passenger operations five years sooner than across the rest of the UK.

- DfT recently distributed the first tranche of funding for zero-emission HGV trials. One of these studies, assessing the suitability of hydrogen fuel cell HGVs for certain sectors, will be based in Scotland. Scottish Government funding has also been provided to a range of freight decarbonisation projects.
- The PfG introduced a new ambition to remove the majority of diesel buses from public transport services by the end of 2023. This will require the introduction of over 2,000 new zero-emission buses, which is being supported by a £120 million challenge fund.
- All diesel trains are to be removed from passenger services by 2035, five years earlier than in the CCC's Balanced Pathway. This will be achieved through an ambitious electrification programme of around 130 km/year and supported by £5 billion in total investment in the rail system within this parliament.

Table 3.3

Delivery of policy recommendations in surface transport in 2020 and 2021

Recommendation (2020 SPR)	Timing	Primary responsibility	On track?
Active travel and public transport: Continue to strengthen schemes to support walking, cycling and public transport. Invest in infrastructure connectivity to lock in behaviours that reduce travel demand (e.g. home-working).	2020 and ongoing	Scottish Government	Partly achieved
Consider bringing forward the target to eliminate the need to buy a petrol and diesel car or van in Scotland from 2032 to 2030, if feasible and backed up by a strengthening of the UK Government's target date.	2021	Joint	Achieved
Strengthen electric vehicle charging infrastructure to ensure the EV transition works for all road users in Scotland.	2020 and ongoing	Joint	Underway
Maintain 'top-up' subsidies for electric vehicles that build on existing UK Government grants and loans; plan for a transition to fiscally-neutral incentives in the longer term.	2020/21	Scottish Government	Achieved

Next steps for surface transport

New recommendations for surface transport focus on delivery of the committed targets.

Recommendations in surface transport are given in Table 3.4. They include policies to embed behaviours that lead to reduced emissions resulting from the COVID-19 lockdowns, as well as to rebuild confidence in public transport during recovery from the pandemic. The recommendations focus on delivery of the targets from the CCPu, for example the 20% reduction in car-kilometres by 2030, 20-minute neighbourhoods, removing diesel trains from passenger rail operations by 2035 and continuing to support the expansion of the EV charge point network.

Table 3.4

New recommendations for surface transport

Recommendation	Timing	Primary responsibility
<p>Publish, and start to implement, a strategy setting out how Scotland will achieve a 20% reduction in car-kilometres by 2030 and deliver 20-minute neighbourhoods. This should be supported by:</p> <ul style="list-style-type: none"> Continuing to strengthen schemes to support walking, cycling, and public transport. Investment in infrastructure connectivity to lock in positive behavioural changes that reduce travel demand (e.g. home-working). 	2021/22	Scottish Government
Support the public transport and shared mobility sectors to recover from the COVID-19 pandemic. This should include providing positive communications and messaging to rebuild public confidence in the safety of public transport and maintaining financial support for the sector while confidence and demand are rebuilt.	2022	Joint
Where public transport services have been downgraded during the pandemic, a timetable should be published setting out when these will be restored to pre-pandemic levels or enhanced to support reductions in car travel.	2022	Scottish Government
Take concrete steps towards reducing costs of public transport in order to reverse the increasing relative price advantage of car travel over public transport. Providing free bus travel to those aged under 22 is a good step in this regard.	2022	Scottish Government
<p>Support the delivery of Scotland's transition to electric cars and vans. This will require ensuring sufficient supply of and demand for vehicles in Scotland to ensure that sales rise throughout the 2020s to meet the 2030 phase-out commitment.</p> <ul style="list-style-type: none"> The Scottish Government should seek opportunities to influence consumers to choose fully electric vehicles over plug-in hybrids wherever possible. This transition should be supported by maintaining the provision of interest-free loans for EVs (now including second-hand EVs) on top of existing UK government grants. Plan for a transition to fiscally-neutral incentives as EV costs fall. 	2021-2030	Scottish Government
Continue to support the timely expansion of Scotland's public EV charge point network, to ensure the EV transition works for all road users in Scotland with well-maintained facilities, inter-operability between service providers and avoidance of market power.	Now & ongoing	Joint
Implement schemes to reduce use of internal combustion engine buses, HGVs and vans in urban areas (e.g. through use of electric buses, e-cargo bikes and urban consolidation centres), to reduce traffic, improve air quality and increase the safety of active travel.	2022	Scottish Government

b) Aviation and Shipping

Policy progress in the past year

In the past year there have been several important aviation policy commitments and announcements as well as a number of consultative documents published by both the Scottish Government and UK Government, in areas where policy is reserved and will have a direct impact on Scotland:

The Scottish Government has committed to decarbonise scheduled passenger flights within Scotland by 2040.

- **Scottish Government progress.** The CCPu and the 2021/22 PfG include targets and commitments to decarbonise the aviation sector. An Aviation Strategy Consultation was also published, seeking views on specific issues. Key developments include:
 - A commitment to decarbonise scheduled passenger flights within Scotland by 2040, in line with the UK-wide targets.
 - An aim to create the world's first zero-emission aviation region in partnership with Highlands and Islands Airports – although timescales for this have not yet been set. To deliver this, the Scottish Government are supporting trialling of low- or zero-emission aircrafts, including by kicking off the workforce transition through introductory courses in relevant areas (electrification, hydrogen, digital manufacturing and aircraft decommissioning) through the National Training Transition Fund. It has also committed to explore the potential for the purchase of zero- or low-emission aircraft by the Scottish Government, for lease back to operators.
 - Messaging on aviation demand from Scottish Government is mixed. None of the recent policy documents or consultations set out an explicit intent to limit aviation demand growth – indeed the Aviation Strategy Consultation sets out the objective of working with the aviation industry to help restore and increase international connectivity. However, a commitment to review Air Passenger Duty ahead of its devolution to Scottish Government to ensure alignment with climate change goals has been made. In September 2021, the Scottish Government published research conducted by Element Energy on its behalf¹⁹ which concluded that the transport sector will not be able to achieve its 2030 emissions targets without a reduction in aviation demand. With such stretching 2030 targets every abatement option will need to be pursued, including demand management.
- **UK Government progress.**
 - The Jet Zero Strategy Consultation set out pathways for the aviation sector with ambitious assumptions on technological improvements, alongside policy announcements to encourage this.
 - A consultation on a mandate for sustainable aviation fuels was also published, and the UK Government's Net Zero Strategy set out the intention to establish a mandate of 10% of SAF by 2030.

The UK Jet Zero Strategy Consultation has ambitious assumptions on technological improvements.

- As set out in the cross-economy section 2. The UK ETS is a joint responsibility between the UK Government and Devolved Administrations. A decision on the level of the UK ETS cap is expected soon. As the UK ETS covers some aspects of aviation (domestic flights and UK-EEA flights), decisions on the level of the UK ETS cap, or the potential for expansion of its scope, will also affect aviation in Scotland.

The Scottish Government has committed to examining low-carbon energy sources for the public sector marine fleet.

In shipping, unlike at the UK level, domestic vessels contribute the majority of Scottish shipping emissions. To help reduce this and stimulate development and production of low-carbon shipping fuels, the Scottish Government has committed to examining low-carbon energy sources for the public sector marine fleet and increasing the proportion of Government-owned ferries that are low-emission to 30% by 2032. The CCPu also introduced new commitments to ensure widespread adoption of low-emission solutions at Scottish ports by 2032.

On the international shipping front, the Scottish Government has committed to working with the UK Government to support proposals at the International Maritime Organisation to significantly reduce international shipping emissions.

Next steps for aviation and shipping

It is now necessary to introduce a mechanism to limit aviation growth.

Recommendations for aviation and shipping are given in Table 3.5. While both are largely reserved areas of policy, there are steps the Scottish Government can take to reduce emissions. A mechanism to limit aviation demand growth is necessary. In particular, policies should ensure the least-emitting modes of transport are the most financially attractive and that behaviours resulting from the COVID-19 pandemic, such as less business travel, are locked in. In shipping, the focus is on shifting to ferries with low-carbon energy.

Table 3.5

New recommendations in aviation and shipping

Recommendation	Timing	Primary responsibility
Assess airport capacity in the context of Net Zero. There should be no net expansion of airport capacity unless the sector is on track to sufficiently outperform its emissions trajectory and can accommodate the additional demand. A demand management framework will need to be developed (by 2022) and be in place by the mid-2020s to annually assess and, if required, control sector GHG emissions and non-CO ₂ effects.	2022	Joint
Take steps to address price imbalances between aviation and surface transport, once aviation taxation is devolved to Scotland, encouraging the low-carbon alternative (e.g. rail) for journeys where one exists.	2022	Scottish Government
Play a leading role in decarbonising the shipping sector by exploring opportunities to transition ferries operated by Transport Scotland to low-carbon energy and establishing appropriate business models to encourage their adoption.	Now & ongoing	Scottish Government

c) Manufacturing and construction

Policy progress in the past year

Whilst powers to reduce manufacturing and construction emissions remain largely reserved to the UK Government, the Scottish Government has taken steps to support decarbonisation in the areas which are devolved. These will need to be accompanied by significant policy action at the UK level.

The Scottish Government has announced investment in industrial efficiency improvements and deep decarbonisation technologies.

- The Scottish Government has announced investment in developing and supporting both industrial efficiency improvements and deep decarbonisation technologies. This has also involved securing access to UK-wide funding, through the Industrial Energy Transformation Fund.
 - The Emerging Energy Technologies fund has committed £100 million to support hydrogen projects, in line with the Hydrogen Policy Statement published in December 2020, and a further £80 million towards the development of a CCS transport and storage network.
 - A £5 million Carbon Capture and Utilisation Challenge Fund, announced in the 2020/21 PfG, will explore technologies and innovations that can capture and create value in CO₂.
 - There are also two ongoing funds, launched in 2020: the Low Carbon Manufacturing Challenge Fund (LCMCF), a £26 million fund to support innovation in low-carbon technology, processes and infrastructure, and the Scottish Industrial Energy Transformation Fund (SIETF), £34 million of investment in energy efficiency and deep decarbonisation projects at industrial sites.
- The Scottish Government has continued to provide support for industrial clusters:
 - It has established the Grangemouth Future Industry Board, which brings together key actors to maximise opportunities for low-carbon economic growth at Grangemouth, and the Scottish Industrial Decarbonisation Partnership (SIDP), which aims to build a shared narrative between government and industry on decarbonisation, and to disseminate best practice.
 - It has committed to provide grants of up to £300,000 to North East CCUS (NECCUS), the representatives of the Scottish industrial cluster, to attract further funding for CCUS and low-carbon blue hydrogen development.
- The Scottish Government has taken steps to ensure sufficient skills in industry, and a just transition for workers:
 - The Scottish Government invested £500 million in a Just Transition Fund for the North East and Moray, and a £100 million Green Jobs Fund, the first payments from which will be made this year.
 - The Advancing Manufacturing Challenge Fund was established as part of the National Manufacturing Institute Scotland, to support development of skills and to help drive efficiency and productivity across the manufacturing and industrial sectors.

The Scottish Government has taken steps to ensure sufficient skills in industry, and a just transition for workers.

- The Scottish Government has committed to several policies to support resource efficiency, which will help to reduce manufacturing emissions – see section h) on waste for details.

Next steps for manufacturing and construction

Recommended next steps focus on policies for resource efficiency, energy efficiency, innovation and embodied carbon.

Recommendations for the next year in manufacturing and construction are given in Table 3.6, with a focus on devolved policy areas. These include resource efficiency, energy efficiency, innovation and aspects of policy on the embodied carbon content of construction.

Policies and measures in these areas make an important contribution to reducing emissions from manufacturing and construction in the pathways set out for Scottish decarbonisation in the CCC's Sixth Carbon Budget advice. These accompany recommendations to the UK Government set out in our 2021 UK progress report.

Table 3.6

New recommendations in manufacturing and construction

Recommendation	Timing	Primary responsibility
Continue to support innovation and demonstration of technologies for decarbonising manufacturing and construction; ensure that learning is disseminated as widely as possible within industry.	2022	Scottish Government
Implement policies to enable delivery of substantial improvements in industrial energy efficiency.	2022	Joint
Work with business to encourage and enable consumers to share, lease and use products for longer whilst discouraging 'disposable' business models.	2022	Scottish Government
Improve the collection and reporting of industrial decarbonisation data to allow for progress to be monitored more effectively, particularly on energy and resource efficiency.	2022	Scottish Government
Develop policies to drive more resource-efficient construction and use of existing low-carbon materials. This should include setting out a plan for phasing in mandatory whole-life reporting followed by minimum whole-life standards for all buildings, roads and infrastructure by 2025, with differentiated targets by function, scale, and public/private construction.	2022	Joint
Renew efforts to improve resource efficiency, recycling and waste prevention, including by: <ul style="list-style-type: none"> Bringing forward the planned circular economy package for legislating within the forthcoming Programme for Government Ensuring key policies, such as Extended Producer Responsibility are on track to be in place well before 2025 Working with the waste sector and local authorities to set out a route-map detailing the policy and support needed to ensure the 2025 waste prevention and recycling targets (including the 70% recycling target) are delivered, and setting new ambitious targets for 2030. 	2022	Scottish Government

d) Fuel supply

Policy progress in the past year

A series of documents have been published that set out the Scottish Government's vision for a hydrogen economy.

The fuel supply sector covers fossil fuel, hydrogen, and bioenergy supply,* for which policy levers are largely reserved to the UK Government. Nonetheless, in the last year, the Scottish Government set out an ambition to develop low-carbon energy supplies in Scotland, thus supporting wider UK commitments. A series of documents have been published that set out its vision for a hydrogen economy in Scotland (2020 SPR recommendation, Table 3.7):

- The Hydrogen Policy Statement²⁰ signalled a high level of ambition, presenting aims to deploy 5 GW of hydrogen production capacity by 2030 and over 25 GW by 2045, while recognising the role for various sources of hydrogen production.
- The more recent Draft Hydrogen Action Plan²¹ confirmed these targets while setting out the timeline and steps required to develop a hydrogen economy in Scotland, including coordination with the power sector and industrial clusters. The deployment of hydrogen capacity in parallel to renewables and CCS should support the alignment of spatial planning and inform site requirements for hydrogen production projects ahead of scale-up. This in turn should encourage the delivery at scale and at pace of an integrated energy system.
- These documents are accompanied by supporting evidence, including the Scottish Hydrogen Assessment²² and the Scottish Offshore Wind to Green Hydrogen Opportunity Assessment,²³ which demonstrates how green and blue hydrogen could draw from synergies with renewable electricity capacity, CCS infrastructure in industrial clusters, and existing oil and gas infrastructure in the country.
- The Strategic Environmental Assessment²⁴ further considered the environmental impacts of hydrogen use and production. This evidence lays a good foundation to inform future hydrogen policies.
- The Scottish Government continued supporting the demonstration of hydrogen use, notably through the H100 Fife project that kicked off in 2021 to develop a hydrogen gas network. Further evidence will be needed to inform strategic decisions on hydrogen use in coordination with the UK Government.
- These plans are supported by funding. Indeed, the Emerging Energy Technologies Fund (EETF) has committed £100 million of funding to renewable hydrogen projects and £80 million to developing CCS.

A Bioenergy Update has been published, outlining steps for the sustainable use of bioenergy resource in Scotland.

In addition, the Scottish Government published a Bioenergy Update²⁵ that outlines the steps that would be taken to inform the development of a sustainable and appropriate use of bioenergy resources in Scotland. These represent a positive move toward ensuring a strategic and coordinated delivery of bioenergy policies.

* Fossil fuel supply includes oil refining, oil and gas production, oil and gas processing terminals, gas transmission and distribution networks and open and closed coal mines.

- In this update, the Scottish Government committed to establishing a working group in 2021 to develop a strategic framework for bioenergy and Net Zero.
- It aims to develop evidence on biomass availability, competing demands on land, sustainability standards, and technology readiness ahead of publishing a Bioenergy Action Plan in 2023.

Table 3.7

Delivery of policy recommendations in fuel supply in 2020 and 2021

Recommendation (2020 SPR)	Timing	Primary responsibility	On track?
Set out a long-term vision for hydrogen use (across power, industry, transport and buildings), production and infrastructure in Scotland's future net-zero economy.	2020	UK Government	Achieved

Policy recommendations for the next year

Recommendations for the next year in the fuel supply sector are given in Table 3.8. With fuel supply being largely a reserved policy area, the recommendations focus on policies that have Scottish Government or joint responsibility, including the need to identify areas suitable or not for hydrogen and schemes to support an appropriate and sustainable use of bioenergy.

Table 3.8

New recommendations in fuel supply

Recommendation	Timing	Primary responsibility
As part of the planned update to the Energy Strategy, and supported by the proposed new National Public Energy Agency, formalise the planning process, governance framework and timeline for decisions on infrastructure for the conversion to hydrogen of the gas transmission and distribution networks. Alongside this, identify priority candidate areas for hydrogen conversion and areas which are unlikely to be suitable to hydrogen conversion (such that electrification and alternatives can be prioritised), ensuring consistency with least-regret forward views on demand for hydrogen within Scotland and across the rest of the UK.	Q4 2022	Scottish Government
Together with UK Government, review existing – and, if necessary, develop new – schemes that support the sustainable production of biomass feedstocks and conversion of bioenergy in a way consistent with Net Zero. This should include dates beyond which new facilities should be built with CCS, and dates for when CCS will need to be retrofitted to biofuel facilities already in operation.	2023	Joint

e) Buildings

Policy progress in the past year

Scotland is ahead of the rest of the UK in developing buildings decarbonisation policy.

The Scottish Government has moved forward this year on its commitment to Net Zero buildings by 2045, legislating the Heat Networks Bill, and publishing an updated set of pathways for energy efficiency in buildings in its Heat in Buildings Strategy²⁶ in October 2021 (Box 3.4).

- The Scottish Heat in Buildings strategy sets a clear long-term vision for low-carbon heat, with emphasis on heat pumps and low-carbon heat networks (2020 SPR recommendation, Table 3.9). It takes a 'fabric first' approach, with regulatory milestones for energy efficiency improvements in different building types, whilst recognising the importance of low-carbon heat.
- The Strategy shows that Scotland is ahead of the rest of the UK in setting out buildings decarbonisation policy. Key milestones for Energy Performance Certificates (EPCs) and boiler phase-out are generally five years ahead of UK milestones. The Strategy outlines more developed plans for delivering commitments on the ground than the UK Heat and Buildings Strategy, such as through local heat and energy efficiency strategies (LHEES).
- In March 2021, the Scotland Heat Networks Bill became law, the first of its kind in the UK. It creates a regulatory framework and licencing system for heat networks and new rights for heat network developers to encourage investment in the sector. It requires all public sector building owners to assess whether they are suitable for connection to a heat network and requires local authorities to decide whether to designate certain areas as 'heat network zones'.
- In March 2021, the Net Zero Public Sector Buildings Standard was published. The standard is voluntary and intended to guide publicly funded new builds and refurbishment projects.
- The recommendations from the Scotland's Climate Assembly (Box 3.3) include: ensuring all new housing is built to Passivhaus standards within the next five years; retrofitting the majority of existing homes by 2030 and strengthening building and trading standards to quality assure energy efficiency work carried out by private companies.
- There has been an end of public subsidies for oil and LPG boilers, which came into effect in September 2021.

Key milestones for EPCs and boiler phase-out in Scotland are generally five years ahead of the UK.

The Scottish Government has committed to at least £1.8 billion for heat and energy efficiency projects.

In terms of funding, this year the Scottish Government has committed to providing at least £1.8 billion for heat and energy efficiency projects across Scotland over this Parliament. The full breakdown is not provided, but this will include:

- £465m over the next five years to support those in fuel poverty.
- £200m over the next Parliament for public sector estate decarbonisation.
- £400m over next five years in large-scale heat decarbonisation infrastructure.
- £200m in the next five years in Social housing Net Zero Heat Fund.
- Support for SMEs via Business Energy Scotland and SME Loans up until 2023.

The Strategy estimates the total investment cost will be over £33 billion, and the public sector can't cover all the costs. It commits to establishing a Green Heat Finance Task Force in 2021 to find ways to leverage private sector investment.

Recommendations on low-carbon heat are achieved or underway, with more action needed on enforcing standards and public sector decarbonisation.

The following points are related to specific recommendations in the 2020 SPR (Table 3.9). Recommendations relating to energy and low-carbon heat are generally achieved or underway, but more action is needed on recommendations around enforcing standards, public sector decarbonisation and adaptation to a changing climate:

- The Heat in Buildings Strategy sets out clear milestones for low-carbon heat in Scotland (1 million homes and 50,000 non-domestic properties are zero carbon by 2032). It does not establish how much of the £1.8 billion in funding committed over the next Parliament will go towards heat pumps and low-carbon heat networks, but it does confirm an overarching strategy to invest in strategic technologies in low- or no-regrets areas.
- Key milestones for energy efficiency for most buildings are outlined, with most buildings reaching EPC band C by 2030 (five years earlier than the UK plan). Some dates have been brought earlier than previously planned (private-rented sector and owner occupier homes) and others pushed later (mixed tenure housing and commercial buildings). Many of these milestone dates are pending consultation.
- The Scottish Government has put forward welcome proposals to reform EPCs to include an indicator for heating emissions, in addition to indicators for energy efficiency and the cost of heating. There has been no mention of concrete plans for in-performance testing in the Heat in Buildings Strategy.
- Work is underway to support effective enforcement of buildings standards, overseen by the Building Standard Futures Board. This includes plans to consult on a Compliance Plan approach to verification of works.
- No specific plans have been announced to benchmark embodied carbon in buildings. There has been some progress on increasing the use of sustainable timber, which was highlighted in the Construction Recovery Plan, prioritised in the Supply Chains Development Programme, and funding awarded to The Transforming Timber initiative.
- The Scotland Heat in Buildings Strategy sets a backstop date of 2038 for public sector buildings to have zero-emissions heating, and in June 2021 £200 million was committed to the new Scottish Green Public Sector Estate Scheme. A Net Zero Public Sector Buildings Standard, which includes voluntary reporting, has been published. A draft NHS Scotland climate emergency and sustainability strategy has been published, including an aim to achieve zero emissions of nitrous oxide by 2027. However, no finalised plans or policies have been announced for tracking emissions in schools.
- There is no mention of plans to address adaptation or risks of overheating in the Heat in Buildings Strategy or the Homes to 2040 Strategy.

There are no specific plans to benchmark embodied carbon in buildings.

There is no mention of adaptation in the Heat in Buildings Strategy or the Homes to 2040 Strategy.

Overall, it remains the case that Scotland demonstrates a strong example of action to develop an effective policy framework, leading the way across the UK.

Box 3.4

Scotland's Heat in Buildings strategy

The Heat in Buildings Strategy confirmed that:

Low-carbon heating

- Fossil fuel boilers will be phased out from 2025 in off-grid buildings and from 2030 for on-grid buildings.
- From 2024 new homes and most non-domestic buildings will need to use zero-emissions heating and to have 'high' levels of energy efficiency.
- There will be a new target for 2030: at least 22% of non-electrical heat in buildings will be directly supplied by zero-carbon sources.
- 1 million homes and 50,000 non-domestic buildings will have zero emissions heating systems by 2030. Zero emissions heat installations will scale to provide at least 124,000 systems between 2021-2026, peaking at 200,000 per year in the late 2020s. Heat pumps and heat networks will be prioritised.

Energy Efficiency

- Most buildings will achieve EPC band C by 2030, with earlier 'backstop' dates for the private rented sector (2028) and fuel-poor homes (2030) and later dates for commercial buildings and mixed tenure buildings. Many of these milestone dates are pending consultations.
- Domestic EPCs will be revised, possibly to cover three indicators: heat costs, emissions and energy efficiency. The consultation for this proposal was launched in July 2021.

Finance

- The total investment cost is estimated by the Scottish Government to be over £33 billion. A Green Heat Finance Task Force will be established in 2021 to find ways to leverage private sector investment.

Planning, coordination and delivery

- A National Public Energy Agency will be established to raise public awareness and coordinate delivery of investment and national, regional and local government.
- Local Heat and Energy Efficiency Strategies (LHEES) will set out the long-term plan across a local authority area for heat decarbonisation and energy efficiency.
- The Scotland Heat in Buildings Strategy was published several weeks ahead of the UK Heat in Buildings Strategy. The Scotland Strategy outlined the importance of close coordination with the UK government on various areas, to ensure Scotland can enforce building regulations and appoint a regulator for heat networks, and to support well-aligned incentives and investment for buildings decarbonisation across the UK.

Source: Scottish Government, Heat in Buildings Strategy – achieving net zero emissions in Scotland's buildings, 2021

Table 3.9

Delivery of policy recommendations in buildings in 2020 and 2021

Recommendation (2020 SPR)	Timing	Primary responsibility	On track?
Low-carbon heat in buildings: set out the future direction of low-carbon heat in Scotland. This will be highly dependent on UK decisions on the future of the gas grid and wider energy policy through the Buildings and Heat Strategy:			
• Set a clear, long-term vision for low-carbon heat in Scotland in a Heat Policy Statement.	2020	Joint	Achieved
• Maintain existing support for 'low-regret' low-carbon heating options – particularly district heating and heat pumps in off-grid properties – through the RHI and 'top-up' Scottish Government grants.	2021-22	Joint	Achieved
Buildings targets and standards: implement a strong set of standards that ensure new and existing buildings are prepared for a changing climate and deliver high levels of energy efficiency and low-carbon heat.	2021	Scottish Government	Partly achieved*
Finalise – and then act on – the clear direction for energy efficiency in the Energy Efficient Scotland Programme.	2021	Scottish Government	Achieved
Deliver on the commitment to ensure that new homes built from 2024 onwards are highly energy efficient, use low-carbon heat and are designed for a changing climate through Scotland's new build standards (due to be legislated in 2021),	2021	Joint	Underway
Set an equally stretching pathway for non-residential buildings in the next phase of the Energy Efficient Scotland Programme.	2021	Scottish Government	Underway
Ensure that Scottish Government Buildings Standards are equipped to monitor and enforce compliance with buildings standards and ensure that local authorities are properly funded to enforce buildings standards.	Ongoing	Scottish Government	Underway
Make accurate performance testing and reporting widespread, committing developers to the standards they advertise.	2021	Scottish Government	Not achieved
Embodied carbon in buildings: Develop plans to rapidly scale up the levels of wood used in construction – capitalising on the good availability of quality timber frame in Scotland – and support the assessment and benchmarking of whole-life carbon in buildings.	2021	Scottish Government	Underway
Monitor and measure improvements in reducing emissions in schools and public buildings (and associated travel), aiming for zero-carbon buildings wherever possible, and ensure they are resilient to the future impacts of climate change.	Now & ongoing	Scottish Government	Partly achieved
A fully-funded plan is needed to address the risks of overheating in hospitals, care homes and care facilities, including consideration of home-based care.	2021	Scottish Government	Not yet assessed
Take actions to improve the carbon efficiency of the NHS in Scotland and reduce non-CO ₂ emissions (e.g. nitrous oxide and F-gases). For example, through remote consultations and other actions that can support reduced emissions from users of the health service.	Now and ongoing	Scottish Government	Underway

* Adaptation aspects to be assessed in the Adaptation Committee's upcoming report on adaptation progress in Scotland, due to be published early 2022

Next steps for Heat and Buildings

Next steps in buildings are to make concrete progress on the roadmap against targets for energy efficiency and low-carbon heating.

Recommendations for the next year in the buildings sector are given in Table 3.10. The Scottish Government's Heat in Buildings Strategy sets out an ambitious plan for energy efficiency measures and low-carbon heat. Now the focus must be on making concrete progress on the roadmap against targets for energy efficiency, funding and the roll-out of low-carbon heating.

The Scottish Government should continue its emphasis on a coordinated and inclusive transition by publishing detailed strategies for skills and fuel poverty and moving into effective delivery of LHEES and public sector decarbonisation.

Table 3.10

New recommendations for buildings

Recommendation	Timing	Primary responsibility
Clarify the allocation of the £1.8 billion of funding, making clear what amounts will go towards heat networks, heat pumps and energy efficiency measures and how these relate to the targets set in the Heat in Buildings Strategy for low-carbon heating and heat pumps.	2022	Scottish Government
Publish a monitoring and evaluation framework for the Heat in Buildings Strategy by summer 2022, or provide additional indicators in the annual climate change plan monitoring reports. These should include clear indicators for annual heat pump and low-carbon district heat network roll-out across residential and non-residential buildings. Use the development of the framework to identify data gaps and make plans to address them. Track implementation and its costs and use information in updates of the Strategy. For data on heat networks, BEIS should provide relevant data until implementation of the Heat Networks (Scotland) Act.	Summer 2022	Scottish Government
Make concrete progress on implementing the roadmap for energy efficiency and low-carbon heating improvements set out in the Heat in Buildings Strategy in 2022. This should include: <ul style="list-style-type: none"> Developing EPC regulations for the private rented sector and owner-occupiers Reviewing the EESSH2 standard for the social housing sector Developing an ambitious plan for zero-emission heating and energy efficiency in large non-residential buildings, based on the consultation(s) planned for 2022 on strengthening regulations for non-residential building heat supply and demand Setting out clear plans for how the late backstop date (2040-45) for mixed tenure buildings energy efficiency will be consistent with wider heating emissions targets for Net Zero. 	2022	Scottish Government
Ensure recommendations on buildings are implemented from the Adaptation Committee's upcoming report on adaptation progress in Scotland, due to be published early 2022.	2024	Scottish Government
Following the publication of the UK Heat and Buildings Strategy in October 2021, UK Government and Scottish government should now coordinate on harnessing UK proposals for a market-led mechanism for heat pump roll-out. The UK Government should confirm how Scotland will be enabled to appoint a regulator for heat networks.	2022	Joint
Ensure that Scottish Government Buildings Standards enable monitoring and compliance and ensure that local authorities are properly funded to enforce buildings standards.	2023	Scottish Government

Develop plans for in-use performance rating of buildings. Make accurate performance testing and reporting widespread, committing developers to standards. This can be achieved in homes by rolling out digital Green Building Passports across the stock.	2023	Scottish Government
Roll out Local Heat and Energy Efficiency Strategies (LHEES) across all local authorities, providing sufficient capacity and financial support to local authorities to ensure LHEES delivery plans are produced based on meaningful engagement with stakeholders, are effective tools in coordinating planning and investment for low-carbon heat, and are based on an evidenced assessment of priority local low carbon heating technology for the area.	2022	Scottish Government
Move into full implementation of decarbonising public sector buildings. Monitor and report improvements in emissions reduction across the public sector, including in schools and non-CO ₂ emissions in the NHS.	2022	Scottish Government
Publish the implementation plan for the Climate Emergency Skills Action Plan, outlining in more detail how skills for green construction and zero emissions heating will be developed and communicated to the construction sector.	2022	Scottish Government
Publish the Fuel Poverty Strategy in 2021, setting out targeted advice on how to ensure those at risk of fuel poverty are not adversely impacted by decarbonisation efforts.	2021	Scottish Government

f) Agriculture and land use, land use change and forestry (LULUCF)

Policy progress in the past year

There is still an urgent need for post-CAP low-carbon agriculture policy.

In August 2021, the Scottish Government published a consultation on options for future agriculture and land use support through a Bill to replace the current Common Agricultural Policy (CAP). The Bill is expected to be introduced in 2023 and aims to provide a framework for support to deliver climate mitigation and adaptation, biodiversity gain and move to low-emission agricultural production systems.

Scotland's CCPu sets out a high-level vision of how agriculture could look in the future. Elements include maximising the take-up of low-carbon farming practices, innovation in food and use of fertilisers, improving productivity, and contributing to climate and wider environmental and biodiversity targets.

There is not, as yet, an urgently needed, comprehensive framework to deliver this vision, but a number of new policies, that are 2020 SPR recommendations (Table 3.11), include:

- Access to advice and knowledge transfer.
- New schemes to support low-carbon farming (e.g. for Beef Suckler).
- Grant schemes for equipment to reduce emissions.
- New measures to reduce emissions from manure management, including slurry covers.
- Increased funding for agro-forestry on farms.
- Introduction of environmental conditionality for all farmers and crofters to undertake environmental measures.

There are limited plans to implement strong regulatory measures for GHG mitigation.

There are some, albeit limited, plans to implement strong regulatory measures for GHG mitigation in legislation (2020 SPR recommendation):

- Scotland has set out plans for a 'Nitrogen Balance Sheet' to be enacted in law by March 2022. This will set out a baseline figure for how efficiently nitrogen is used compared with losses to the environment. Once established, this will be reviewed and updated at regular intervals to help track progress on improving nitrogen use efficiency.
- There is no timeline to end damaging practices such as use of peat in horticulture. Instead, there is a proposal to phase out use by increasing uptake of alternatives.
- The second 'Clean Air Strategy' was published in July 2021. It aims to introduce environmental conditionality to deliver high environmental standards for emissions reduction and biodiversity in 2021/22, which will extend requirements to farmers and crofters to undertake environmental actions. However, precise details are as yet unclear. It does not contain measures to address enteric methane emissions from livestock.

The ambition for increasing woodland is in line with the Committee's pathway.

On land use more generally, Scottish Forestry is to receive £100 million to increase new tree planting, and Forestry and Land Scotland has been allocated £30 million to expand Scotland's national forests and land.

The Scottish Government has also agreed to provide £20 million to increase tree nursery capacity. This will support the target to increase woodland creation from the current level of 12,000 ha/year to 18,000 ha/year by 2024/5 (2020 SPR recommendation). This is in line with the ambition set out in the CCC's Balanced Pathway. The CCPu recognises the role for increasing trees on farms, but there is no specific target for this.

Peat soils cover around 1.7 million hectares, almost a quarter of Scotland. The Scottish Government announced funding of £250 million to support the restoration of 250,000 ha of degraded peat by 2030. This is higher than the previous target, but still significantly below the level of restoration needed to meet the CCC's Balanced Pathway. Work is being done to join up farmers, land managers and crofters in this area, including improving funding streams, addressing barriers to implementation, and improving awareness of the wider benefits and opportunities of peatland restoration. Further work is needed to deliver large-scale restoration projects, which should include opportunities to attract private investment in this area (2020 SPR recommendation).

There is no plan to move to low-carbon diets.

On the consumer side, the CCPu recognises the importance of healthy diets, but it does not set out how it sees agricultural production in Scotland changing to achieve healthy and sustainable food production (2020 SPR recommendation). However, it has set out detailed plans on how it aims to achieve its target of reducing food waste by a third by 2025 (2020 SPR recommendation).

Table 3.11

Delivery of policy recommendations in agriculture and land use in 2020 and 2021

Recommendation (2020 SPR)	Timing	Primary responsibility	On track?
Set out new recommendations for Scotland's future rural support policy and make provisions for Ministers to create new policy or reform existing policy to reduce emissions on farms and increase land-based sequestration.	2021	Scottish Government	Underway
Introduce a strong regulatory baseline that includes low-cost, low-regret options e.g. retain existing standards (e.g. Nitrate Vulnerable Zones) and introduce new legislation (e.g. to ban damaging practices on peat including rotational burning of peat, peat extraction and the use of peat in compost).	2021	Scottish Government	Partly achieved
Implement mechanisms for private and public financing of agricultural measures above the baseline and land-based solutions (e.g. innovative farming options, forestry, agro-forestry, peatland restoration and hedgerow creation).	2021	Joint	Underway
Set out measures to tackle non-financial barriers to change such as retraining and awareness raising, tackling tax treatment of woodland creation and tenancy and landlord constraints.	2021	Scottish Government	Partly achieved
Set out policies to encourage consumers to shift to healthier diets e.g. public sector taking the lead and development of an evidence-based strategy on diets.	2021	Scottish Government	Not achieved

Set out policies to encourage consumers to reduce food waste e.g. set targets in the public and private sector.	2021	Scottish Government	Achieved
Implement interim policies to avoid a hiatus in action before the new post CAP framework is fully in place. On-going public funding should continue, and where necessary be increased. In addition, the terms of funding available under existing programmes (e.g. Agri-Environment schemes) should be amended to incorporate measures that directly reduce emissions.	2021	Scottish Government	Partly achieved
Raise ambition and introduce measures to deliver increased tree planting in the next decade, building towards at least 18,000 hectares of trees planted per year by 2024-25.	2021 & ongoing	Scottish Government	Achieved
Raise ambition and introduce measures to restore peatlands in the next decade, building towards at least 20,000 hectares of peatland restored per year by 2024-25.	2021 & ongoing	Scottish Government	Partly achieved

Next steps for agriculture, land use, land use change and forestry (LULUCF)

A post-CAP policy framework and implementation of measures to reduce emissions is now needed, as well as a shift to low-carbon diets.

Recommendations for the next year in the agriculture and land use sectors are given in Table 3.12. These are largely devolved policy areas where the Scottish Government has identified the need to reduce on-farm emissions and has raised ambition relating to afforestation and peat restoration. Emphasis is currently placed on the provision of advice and guidance to steer land managers towards climate mitigation measures, but a focus on widespread implementation is now needed to ensure ambition is translated to delivery on the ground.

Post-CAP policies should support land use towards Scotland's climate goals, identify and address financial and non-financial barriers and, where appropriate, use legislation to strengthen the regulatory baseline and prohibit damaging practices. There is also a need to address food demand to move towards low-carbon, healthy and sustainable diets (e.g. through reducing meat and dairy consumption).

Table 3.12

New recommendations for agriculture, land use, land use change and forestry (LULUCF)

Recommendation	Timing	Primary responsibility
Ensure options for future agriculture and land use support through the proposed Bill to replace the current Common Agricultural Policy in 2023 provide a framework to deliver climate mitigation and adaptation as well as wider environmental objectives. This should cover support for measures to reduce on-farm emissions and strategic land use change away from traditional agriculture to reduce and sequester carbon.	2023	Scottish Government
Plans for Environmental Conditionality should clearly set out milestones and timelines for full implementation that align with the emissions path set out.	2022/23	Scottish Government
Legislate and strengthen the regulatory baseline to promote take up of low-cost, low-regret options. This should include:		Scottish Government

<ul style="list-style-type: none"> Deliver the commitment under National Planning Framework 4 not to support applications for planning permission for new commercial peat extraction for horticultural use. Strengthen controls to restrict development on peat and support its restoration. 	Now & ongoing	
<ul style="list-style-type: none"> Retain designations of Nitrate Vulnerable Zones and extend these where needed to protect water quality. 	2022	
<ul style="list-style-type: none"> Enact in law a 'Nitrogen Balance Sheet'. 	2022	
<ul style="list-style-type: none"> State clear timeframes to end domestic peat extraction and the phasing out of its use in horticulture and as a fuel, and end burning management of peatlands. 	2022	
Raise ambition and introduce measures to deliver increased tree planting in the next decade, building towards at least 18,000 hectares of trees planted per year per year by 2024-25. Identify and address financial and non-financial barriers to implementation.	Now & ongoing	Scottish Government
Raise ambition and introduce measures to restore peatlands in the next decade, building towards at least 20,000 hectares of peatland restored per year by 2024-25. Identify and address financial and non-financial barriers to implementation.	Now & ongoing	Scottish Government
Set out a pathway and implement policies to address on-farm emissions (e.g. through the Sustainable Agriculture Capital Grant Scheme and Agricultural Transformation Programme). Ensure there is a robust monitoring and verification system in place to track progress on:		Scottish Government
<ul style="list-style-type: none"> Delivering a high take-up of low-carbon farming practices covering soils, livestock and manure management. 	2022/23	
<ul style="list-style-type: none"> Decarbonising energy use in farm buildings and machinery. 	2022/23	
<ul style="list-style-type: none"> Measures to encourage on-farm sequestration e.g. through agro-forestry and hedges, which deliver wider benefits such as improved biodiversity. 	2022/23	
<ul style="list-style-type: none"> Planting biomass crops where appropriate. 	2022/23	
<ul style="list-style-type: none"> Fully implement regional land use partnerships to identify where resources have most positive climate impact. 	2022/23	
Implement mechanisms for private and public financing of agricultural and land-based solutions to deliver the level of ambition set out:		Scottish Government
<ul style="list-style-type: none"> Deliver current commitments of support for levering of private finance to incentivise woodland creation and diversification of the forest estate in Scotland. 	Now & ongoing	
<ul style="list-style-type: none"> Set out how public and private funding for peatland restoration will be aligned, how opportunities to attract increased private finance for peatland restoration will be developed, and support use of the Peatland Code as the verifiable standard. 	2022	
<ul style="list-style-type: none"> Define financial mechanisms to incentivise land-based approaches, such as low-carbon farm practices, agroforestry, hedgerows and energy crops, to support the scale of transition required. 	2022	
<ul style="list-style-type: none"> Current and future incentives for mitigation must also consider the wider co-benefits for environmental goals such as climate change adaptation and biodiversity. 	2022	
Identify and address the non-financial barriers that prevent changes to land use and management, including:		Joint
<ul style="list-style-type: none"> Maintain and enhance programmes and initiatives for advice and knowledge exchange for Scotland's farmers, crofters and land managers. 	Now & ongoing	

<ul style="list-style-type: none"> Support tenant farmers in making the long-term commitment and investment required to reduce emissions and sequester carbon on the land they manage. 	2022	
<ul style="list-style-type: none"> Continue to raise awareness and promote the development of skills in sustainable agriculture, alongside those needed at scale for restoration of semi-natural habitats such as peatlands and woodlands. 	2022	
<ul style="list-style-type: none"> Address tax treatment of woodlands where they are acting as a barrier to change. 	2022	
<ul style="list-style-type: none"> Explore the need to reform legislation to support woodland creation on agricultural holdings and publish recommendations. 	2022	
Set out plans to deliver Scotland's guidelines on healthy eating, to encourage a healthy, balanced and sustainable diet. This should include measures to encourage a reduction in the consumption of meat and dairy products e.g. through better information and labelling, the public sector taking the lead and development of an evidence-based strategy on diets.	2022	Scottish Government
Set out a target to reduce food waste and a comprehensive plan to deliver it. This should include reporting of food waste by businesses across the food supply chain, public sector and households.	2022	Scottish Government

g) Power

Policy progress in the past year

The Scottish Government committed to publish an updated Electricity Generation Policy Statement by 2022.

Electricity supply is a reserved policy area, meaning we would not expect a significant number of Scotland-specific policy announcements. In the CCPu the Scottish Government committed to publish an updated Electricity Generation Policy Statement by 2022, which should set out a plan for the electricity sector's contribution to meeting the 2045 Net Zero target. That should build on their ambition from October 2020 to aim for 8-11 GW of offshore wind by 2030.

Commitments to update assessments on the amount of low-carbon electricity generation are underway and details on alignment of the National Planning Framework to a Net Zero energy system are expected in its imminent publication (both SPR 2020 recommendations, Table 3.13).

Table 3.13

Delivery of policy recommendations in power in 2020 and 2021

Recommendation (2020 SPR)	Timing	Primary responsibility	On track?
Set out an updated assessment of how much renewable and low-carbon electricity generation will be required to meet Net Zero in Scotland and contribute cost-effectively to Net Zero in the UK, with a clear trajectory to 2045.	2020-21	Scottish Government	Underway
In conjunction with the UK Government and other devolved administrations, review the planned UK Emissions Trading System following the Committee's December advice on the Sixth Carbon Budget and adjust it to align to the Net Zero pathway.	H1 2020	Joint	Underway
Align the National Planning Framework (NPF4) to a Net Zero energy system – enforcing a favourable planning and consenting scheme for onshore wind and other renewables in manner that is consistent with other policies on land use, supporting repowering and life extension of existing wind power in Scotland, and aligning with adaptation priorities under the Scottish Climate Change Adaptation Programme.	2021-22	Scottish Government	Underway

Next steps for power

Recommended next steps for power focus on assessments of required low-carbon electricity and planning.

Recommendations for the next year in the power sector are given in Table 3.14. Since policy in electricity supply is reserved to the UK Government there are limited recommendations for this sector. Recommendations are on updating the assessment of the required amount of low-carbon electricity generation; spatial planning and consenting in the context of ambitions for low-carbon electricity generation; and working with network owners and system operators to ensure adequate electricity supply resilience.

We will review the implications of the Scottish Government's forthcoming NPF4 for electricity generation, and in particular what this means for network developments, spatial planning and consenting in the context of ambitions for low-carbon electricity generation.

Table 3.14

New recommendations for power

Recommendation	Timing	Primary responsibility
Set out an updated assessment of how much renewable and low-carbon electricity generation will be required to meet Net Zero in Scotland and contribute cost-effectively to Net Zero in the UK, with a clear trajectory to 2045.	2022	Scottish Government
Complete the definition and enforcement of a planning and consenting scheme for onshore wind and other low carbon generation in a manner that is consistent with other policies on land use, supporting repowering and life extension of existing wind power in Scotland, and aligning with adaptation priorities under the Scottish Climate Change Adaptation Programme. Ensure treatment of network developments that is consistent with ambitions for development of low carbon generation.	2022	Scottish Government
In conjunction with the network owners and system operator, outline what will be required to ensure adequate electricity supply resilience across Scotland in the late 2020s and into the 2030s as thermal generation in Scotland is retired.	2024	Scottish Government

h) Waste

Policy progress in the past year

The planned Circular Economy Bill was delayed due to COVID-19.

Development of waste and resource efficiency policy last year was disrupted by COVID-19, with key measures such as the planned Circular Economy Bill delayed. However, in the CCPu and 2021/22 PfG, the Scottish Government has renewed its efforts to address emissions within the sector, including setting out the following intentions, which respond to 2020 SPR recommendations (Table 3.15):

- Introduce the postponed Circular Economy Bill within this parliament and work with industry to strengthen resource efficiency in the production, consumption, and waste-management of products. Extend the 2025 ban on bio-degradable waste to cover non-municipal waste streams and provide support to improve landfill gas capture.
- Develop a route-map to get on course to delivering Scotland's 2025 waste targets, including 70% recycling, 33% food waste reduction and 15% total waste reduction, as well as setting ambition to 2030 and beyond.
- Introduce mandatory food-waste reporting for businesses.

Overall, Scotland's ambition to reduce emissions from waste is commendable.

These are complemented by broader measures to improve waste prevention and recycling including a commitment to ban certain single-use items; the introduction of a new £2 million Textile Innovation Fund to support businesses to reduce textile waste; and an assessment of Scotland's consumption-based emissions and how they can be reduced.²⁷

Table 3.15
Delivery of policy recommendations in waste in 2020 and 2021

Recommendation (2020 SPR)	Timing	Primary responsibility	On track?
Maintain progress on enabling greater resource efficiency. A Circular Economy Bill should be reintroduced in the next Parliament that sets out specific plans for material efficiency, including material substitution, to reduce emissions through reduced demand.	Next parliament	Scottish Government	Underway
Implement the 2025 landfilling ban for bio-degradable municipal waste, and extend this ban to bio-degradable non-municipal waste as well by 2025. Individual local authorities should move faster where possible (from 2021 onwards). Early investment is required to fully deliver on this target, along with Scotland's 70% recycling rate, 15% total waste reduction and 33% food waste reduction targets for 2025.	2020-21	Scottish Government	Underway
Mandatory business food waste reporting, building on WRAP's existing voluntary scheme.	2021	Scottish Government	Underway

Next steps for waste

It is now important to move quickly to deliver on ambitious targets in the waste sector.

Recommendations for the next year in the waste sector are given in Table 3.16. The Scottish Government has set ambitious targets to reduce waste and its associated emissions, proposing a raft of measures to achieve this. Now it is important to move quickly to deliver on ambition, by working with local authorities, businesses, and the public to drive effective implementation over the next few years. The focus must be on implementation and our recommendations reiterate the need to bring forward the necessary policy and funding for their plans to be realised.

Recommendations include ensuring Energy from Waste (EfW) plants are built or retrofitted with CCS capabilities and delivering on stated ambitions to improve waste prevention, recycling and resource efficiency.

Noting the issue of rising emissions from incineration and EfW, the Scottish Government has committed to undertake a review into the role these disposal methods play within the waste management hierarchy, and will consider options for future-proofing future EfW plants for CCS. Going forward we have asked that Scotland reports emissions from these plants separately from power sector emissions from other sources, to make it easier to track EfW emissions.

Table 3.16

New recommendations for waste

Recommendation	Timing	Primary responsibility
Complete and publish the planned review into the role of Energy from Waste and incineration in meeting Scotland's ambition to become a zero-waste nation, prioritising efforts to improve resource efficiency.	Q1 2022	Scottish Government
Work with the UK Government to develop a policy and funding framework to retrofit existing Energy from Waste plants with CCS from the mid-2020s, and ensure any new Energy from Waste plants are all built 'CCS-ready'.	2022/23	Joint
Bring forward the planned circular economy package for legislating within the forthcoming Programme for Government.	2022	Scottish Government
Ensure key policies, such as Extended Producer Responsibility are on track to be in place well before 2025.	2022/23	Scottish Government
Work with the waste sector and local authorities to set out a route-map detailing the policy and support needed to ensure the 2025 waste prevention and recycling targets (including the 70% recycling target) are delivered, and setting new ambitious targets for 2030.	2022	Scottish Government
Confirm that the 2025 ban on biodegradable waste is extended to cover commercial/industrial waste and implement measures to ensure the ban is delivered primarily through improved waste prevention, resource efficiency and recycling.	2022	Scottish Government
Start reporting emissions from Energy from Waste as a separate source within the Scottish GHG inventory.	2022	Scottish Government

Endnotes

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- ² Scottish Government (2020) *Securing a green recovery on a path to net zero: climate change plan 2018–2032 – update*. [https://www.gov.scot/publications/securing-green-recovery-path-netzero-update-climate-change-plan-20182032/](https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/)
- ³ UK Government (2021) *Net Zero Strategy: Build Back Greener*.
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- ⁴ Scottish Government (2021) *Programme for Government*. <https://www.gov.scot/programme-for-government/>
- ⁵ Scottish Government (2021) *Reducing greenhouse gas emissions - proposals and policies: report* <https://www.gov.scot/publications/report-proposals-policies-reduce-greenhouse-gas-emissions-following-annual-target-2019-not-being-met/>
- ⁶ Scottish Government (2021) *A National Mission with Local Impact: Infrastructure Investment Plan for Scotland 2021-22 to 2025-26*. <https://www.gov.scot/publications/national-mission-local-impact-infrastructure-investment-plan-scotland-2021-22-2025-26/>
- ⁷ Scottish Government (2021) *Infrastructure Commission for Scotland*.
<https://infrastructurecommission.scot/>
- ⁸ Scottish Government's *National Performance Framework*.
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- ¹⁴ Climate Change Committee (2021) *Independent Assessment of UK Climate Risk*.
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- ¹⁶ Scottish Government (2021) *Climate change - Net Zero Nation: public engagement strategy*.
<https://www.gov.scot/publications/net-zero-nation-public-engagement-strategy-climate-change/>
- ¹⁷ UK Government (2021) *Transport decarbonisation plan*.
<https://www.gov.uk/government/publications/transport-decarbonisation-plan>

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December 2021

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1 Victoria St, Westminster
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