Reducing emissions in Scotland
Progress Report to Parliament

Committee on Climate Change
October 2020

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The Committee

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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. He is Chairman of Valpak Limited and the Personal Investment Management and Financial Advice Association.

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Executive summary and recommendations for the Scottish Government

The past decade – low-carbon electricity and phasing out of coal

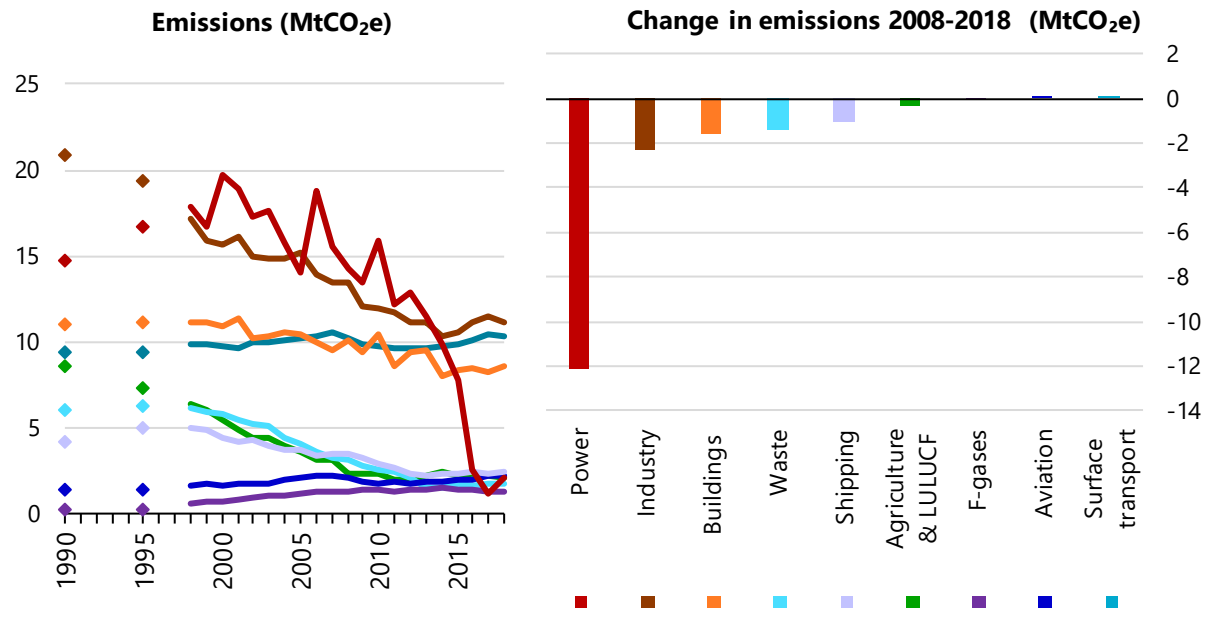
As Scotland enters its second decade with climate legislation, the Scottish economy has decarbonised more quickly than the rest of the UK, and faster than any G20 economy since 2008. Emissions have fallen rapidly while the economy has grown.

However, the vast majority of emissions reductions have been limited to the power sector.

- The power sector has contributed to two-thirds of the total fall in emissions in Scotland from 2008 to 2018. Renewable generation has almost tripled and unabated fossil-fuelled generation has fallen by 70%, including the closure of Scotland's last coal-fired power plant in 2016.
- Emissions from all other sectors outside of electricity generation have fallen by just 14% over the same period.

Scotland missed its annual emissions target in 2018, and prior to the COVID-19 pandemic it was not clear that Scotland was on track to meet its legislated target for emissions reductions in 2020. The impact of the lockdown means that the 2020 target will almost certainly be met,[1] but the key structural changes that will drive emissions reductions in sectors outside of electricity generation have not yet been achieved.

Figure 1. Two-thirds of emissions reductions in the last decade have occurred in the power sector



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.*
Notes: No emissions data are available for Scotland for 1991-1994 or 1996-1997. Does not reflect forthcoming revisions to peatland emissions or global warming potentials (see Box 2.1).

[1] This will be confirmed when emissions data for Scotland in 2020 are published in Summer 2022.

The next decade – a new era for climate action in Scotland

Scotland made good progress in reducing its emissions throughout the 2010s. The 2019 updates to the Climate Change (Scotland) Act significantly increased the ambition of Scotland's emissions reduction targets and the challenges facing the Scottish Government today are very different to those it faced ten years ago. The following factors mark the beginning a 'new era' for climate action in Scotland at the beginning of the 2020s:

- The adoption of a **Net Zero target for 2045** and the recognition that all parts of the Scottish economy will need to contribute fully.
- The prospective **end of unabated fossil-fuelled electricity generation** and the **rapid rise of cheap low-carbon electricity** in Scotland. The challenge for the next decade is to accelerate the decarbonisation of other sectors of the economy, much of it via electrification and to increase flexibility in the power system to help meet the challenge of operating a system using large amounts of energy from renewables.
- The **COVID-19 pandemic** has set a new context for all policymaking and will have a lasting impact on the way we live, work and travel. In 2020, global emissions are expected to fall by a record 5-10%, with a potentially larger fall in Scotland. This effect is only temporary. Greenhouse gas emissions must be cut consistently year after year until they reach net-zero globally to slow and halt global warming. The pandemic has also demonstrated how quickly social change can occur – and the role of government in driving that change. These are strong conditions for Government to reinforce the climate-positive behaviours that have emerged during the lockdown, including increased remote working, cycling and walking. Public sector leadership can play a key role in the forming of new social norms and expectations.
- **Glasgow's role as host city of COP26**, and other major international events including the G7 summit and the UK's exit from the EU. COP26 is a clear opportunity to demonstrate Scotland's climate leadership on both climate change mitigation and adaptation, and to help catalyse the necessary efforts to increase climate ambition around the world.

In recent years, the Scottish Government has taken important steps to embed Net Zero as core Government policy, framing major fiscal and Parliamentary events around climate action. Promising new policies are in development, particularly a finalised strategy for energy efficiency in homes, public sector decarbonisation, and financial support for tree planting and peatland restoration in the next decade.

In Scotland, important institutions and outreach programmes have also been established to inform the societal change and citizen engagement that is needed to achieve Net Zero. This includes the Big Climate Conversation and Citizens' Assembly, the Scottish National Investment Bank, the Infrastructure Commission for Scotland, the Just Transition Commission, and plans for a National Planning Framework that is "aimed at radically accelerating emissions reduction".

A Climate Change Plan for Net Zero and a resilient recovery

COVID-19 creates a dramatically different context for policies to address the climate change priorities. The Scottish Government has delayed the planned update to the Scottish Climate Change Plan from April to December this year, a decision with which the Committee agreed. We welcome the intention to reframe that Plan in the context of a 'green pathway' to aid an economic recovery in line with Scotland's statutory Net Zero targets.

The Committee acknowledges the difficulties in updating Scotland's climate plans as the impacts of the pandemic unfold. We have not been able, therefore, to appraise Scottish Ministers' plans to meet the goal of Net Zero. Much rests on the Climate Change Plan update due later this year, which should set the foundations for a new era of climate change action in Scotland. It must:

- Be **consistent with achieving Net Zero** by 2045.
- Put Scotland on the path to deliver meaningful **reductions outside of the power sector.**
- Help Scotland to build a **resilient recovery** from the pandemic, be consistent with a changing climate, and complement Scotland's efforts to improve resilience to climate change.
- Reaffirm Scotland's status as an **international leader.**

In parallel with the Plan update, the Scottish Government must also take actions to improve Scotland's resilience to climate change by integrating adaptation into all Government policy.

The Committee looks forward to assessing policy progress in detail from next year onwards, with reference to the updated Climate Change Plan.

The Scottish Government has taken strong climate actions before and during the pandemic

One year on from legislating a Net Zero target, in a twelve-month period that included a UK general election, departure from the European Union and the COVID-19 pandemic, the Scottish Government has made some important steps towards the policy changes that are required to prepare for the Net Zero:

- The Scottish Government fully achieved five of the 11 policy milestones the Committee set out in the 2019 Progress Report, and has made partial progress on a further three milestones.
  - **Milestones met.** The Scottish Government has – in line with our recommendations – set out substantive new funding for buses and active travel; is on track to legislate new standards for new build homes; has set new targets and funding for tree planting and peatland restoration in the next decade; and launched the first round of seabed leasing for offshore wind in Scottish waters in over a decade.
  - **Partial progress** has been made in three policy milestones. The Scottish Government has made some progress on assessment and skills in the buildings sector, and Scotland's waste reduction targets have been defined but not yet legislated.
  - **Remaining gaps.** Some milestones were not met in the agriculture sector – where Scotland's future plans for rural support to replace the EU Common Agricultural Policy have not yet been set out – and in the waste sector where the landfill ban on biodegradable waste was pushed back from 2021 to 2025.

- The UK Government has delivered on only one of 16 policy milestones from in the 2019 Scotland Progress Report for reserved policies that have direct impacts on Scotland, though it has made partial progress on the majority of these.
- Of the five policy milestones that required the closest balance of devolved and reserved policies, one has been fully delivered and partial progress has been made in a further three areas.

In May 2020 the Committee wrote to the Cabinet Secretary for Environment, Climate Change and Land Reform setting out recommendations for a resilient recovery from COVID-19. Scottish Ministers have taken meaningful actions against each of those recommendations.

Measures in the Programme for Government, published in September 2020, were substantially designed around the Net Zero goal and a 'green recovery'. The 2020-21 Scottish Budget – published before the pandemic – also contained strong Net Zero policy commitments. These included notable commitments for a package of low-carbon infrastructure investment, as well as new support for peatland restoration and tree planting, energy efficiency in homes and initial funding for an agricultural transformation programme.

The challenge for the Scottish Government is to transform short-term economic support and stimulus measures into a long-term strategy to develop Scotland's productive low-carbon capacity. It is critical, therefore, that the Scottish Government's new programme of infrastructure investment drives progress towards Net Zero and adaptation and provides certainty for investors in low-carbon and climate resilient technologies.

Priorities for the next year

For the first time, recommendations in this Progress Report have been grouped by each major sector of Scotland's economy with responsibilities apportioned to relevant Scottish Cabinet Secretaries. A set of tables, detailing climate policy priorities, follows this summary. These recommendations focus on Net Zero, but there are also high-level recommendations for climate change adaptation.

Our recommendations are not intended to be prescriptive, where different means could achieve the same ends. Nor should they imply that policy should be developed in silos. Rather, they are intended to give a clear list for Ministers and officials to guide their planning – and to aid scrutiny in Parliament. We will review progress against these recommendations in our 2021 Progress Report.

Overall, the strategic priorities are:

- Deliver a **Climate Change Plan** update before the end of 2020 to put Scotland on a path to sharper emissions reduction in the near-term, and establish a course to Net Zero by 2045.
- Develop a **UK Emissions Trading System** that is aligned to Net Zero, in partnership with the UK Government, Welsh Government and Northern Ireland Executive.
- Set out a coherent strategy for the **future of low-carbon heat and energy efficiency in Scotland's homes and other buildings**. This will be highly contingent on UK Government decisions such as the future of the gas grid and energy taxation.
- Develop a new **rural support scheme that builds towards Scotland's climate goals**.

- Make it **easy for people to walk, cycle, use public transport, and work from home in Scotland**, and ensure electric vehicle charging infrastructure and other enabling measures are in place to eliminate the need to buy a petrol or diesel car in Scotland by 2032 at the latest.
- Lead a strong cross-government **response to the most urgent national risks set out in the third UK Climate Change Risk Assessment**.
- **Accelerate investments in low-carbon and climate adaptation infrastructure** to stimulate Scotland's economy, build long-term productive capacity and improve climate resilience.
- **Engage with people and businesses in Scotland** – building on the insights of the Just Transition Commission, Big Climate Conversation, and Climate Assembly UK – to develop skills for the net zero transition, help people understand what the transition means for their lives, and make it easy to make low-carbon choices.

Embedding Net Zero and adaptation as core Scottish Government objectives

Table 1. Recommendations for the First Minister; Deputy First Minister; Cabinet Secretary for Finance; Cabinet Secretary for Economy, Fair Work and Culture; Cabinet Secretary for Environment, Climate Change and Land Reform, and all Cabinet Secretaries.

Recommendation	Timing
Continue to embed Net Zero as a core Government goal and strengthen focus on climate adaptation. • 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
Set out an ambitious Climate Change Plan that puts Scotland firmly on the pathway to net zero in 2045.	2020
Develop and implement plans to make all public buildings and vehicle fleets zero-carbon in the long term. 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.	Now and ongoing 2021
Lead a strong cross-government response to the most urgent national risks set out in the third UK Climate Change Risk Assessment (CCRA3) (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))	Following publication of CCRA3 in July 2021
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
Consolidate Scotland's net zero and adaptation objectives more closely within the National Performance Framework.	Next Parliament
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
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

Table 1. Recommendations for the First Minister; Deputy First Minister; Cabinet Secretary for Finance; Cabinet Secretary for Economy, Fair Work and Culture; Cabinet Secretary for Environment, Climate Change and Land Reform, and all Cabinet Secretaries.

Recommendation	Timing
Deliver an Infrastructure Investment Plan that tackles Net Zero and adaptation infrastructure priorities, taking on board the recommendations of the Infrastructure Commission for Scotland.	Draft Plan was published in September 2020 (too late to be assessed in this report)
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).	Ongoing
Priorities for all directorates: • Integrate Net Zero into all policymaking, and ensure procurement strategies are consistent with Scotland's climate objectives. • 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. • Follow best practice shown by leading businesses to monitor and verify their paths to a net-zero and climate resilient future.	Now and ongoing

Table 2. Transforming Scotland's buildings. Recommendations for Cabinet Secretary for Communities and Local Government and Cabinet Secretary for Transport, Infrastructure and Connectivity.

Recommendation	Timing
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
• 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
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:	
• Finalise – and then act on – the clear direction for energy efficiency in the Energy Efficient Scotland Programme.	2021
• 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
• Set an equally stretching pathway for non-residential buildings in the next phase of the Energy Efficient Scotland Programme.	2021
• 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
• Make accurate performance testing and reporting widespread, committing developers to the standards they advertise.	2021
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
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

Table 3. Decarbonising transport: getting there sooner and other transport priorities. Recommendations for the Cabinet Secretary for Transport, Infrastructure and Connectivity.

Recommendation	Timing
Active travel and public transport: Continue to strengthen schemes to support walking, cycling and public transport. Invest in infrastructure connectivity to lock-in positive behaviours that reduce travel demand e.g. home-working.	2020 and ongoing
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
Strengthen electric vehicle charging infrastructure to ensure the EV transition works for all road users in Scotland.	2020 and ongoing
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.	2020-2021

Table 4. Transforming agriculture and delivering low-carbon land use. Recommendations for the Cabinet Secretary for Rural Economy and Tourism and the Cabinet Secretary for Environment, Climate Change and Land Reform.

Recommendation	Timing
Set out new recommendations for Scotland's future rural support policy, and make provisions for Ministers to create new policy or reform existing policy. Policy to reduce emissions on farms and increase land-based sequestration should also deliver co-benefits for wider environmental goals. Scotland's rural support policy should include: • 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). • **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), which should also support the clear co-benefits for wider environmental goals e.g. flooding, biodiversity, air quality etc. • **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. • **Policies to encourage consumers to shift to healthier diets and reduce food waste** e.g. public sector taking the lead and development of an evidence-based strategy on diets; and target setting in the public and private sector to reduce food waste. • **Interim policies** should be implemented to avoid a hiatus in action before the new framework is fully in place. It is important that a hiatus in the take-up of measures required for delivering net zero is avoided while awaiting the implementation of new policies. It is therefore critical that 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
Deliver Scotland's increased ambition for tree planting and peatland restoration in the next decade building towards at least 18,000 hectares of trees planted per year and 20,000 hectares of peatland restored per year by 2024-25.	2021 and ongoing

Table 5. Reducing, reusing and recycling waste. Recommendations for the Cabinet Secretary for Environment, Climate Change and Land Reform.	
Recommendation	**Timing**
Resource efficiency and waste: • Maintain progress on enabling greater resource efficiency. A Circular Economy Bill should be reintroduced in the next Parliament that sets should set out specific plans for material efficiency, including material substitution, to reduce emissions through reduced demand. • Implement the 2025 landfilling ban for biodegradable municipal waste, and extend this ban to biodegradable non-municipal waste as well by 2025. Individual local authorities to 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. • Mandatory business food waste reporting, building on WRAP's existing voluntary scheme.	Next Parliament 2020-21 2021

Table 6. A low-carbon, flexible energy system: accelerated electrification, CCS, hydrogen, bioenergy and increased flexibility. Recommendations for the Cabinet Secretary for Transport, Infrastructure and Connectivity.	
Recommendation	**Timing**
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
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
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.	2021-2022
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

Table 7. Developing the skills for Net Zero. Recommendations for the Cabinet Secretary for Education and Skills and the Cabinet Secretary for Economy, Fair Work and Culture.	
Recommendation	**Timing**
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
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 and ongoing
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

Table 8. Preparing for the impacts of climate change on health and maximising the health benefits of achieving Net Zero. Recommendations for the Cabinet Secretary for Health and Sport.	
Recommendation	**Timing**
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
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
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

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Chapter 1: A new era for climate action in Scotland

This report assesses progress towards Scotland's climate goals using the latest available emissions data for Scotland, with a focus on trends in emissions across the ten-year period from 2008 to 2018.

Scotland made very significant progress in reducing its emissions throughout the 2010s. The challenges presented to the Scottish Government are now very different to those it faced ten years ago. The following factors mark a 'new era' for climate action in Scotland at the beginning of the 2020s:

- The adoption of a **Net Zero target for 2045**.
- The **almost-full decarbonisation of electricity generation** in Scotland.
- The **COVID-19 pandemic** which has set a new context for all policymaking.
- **COP26 in Glasgow**, and other major international events including the G7 summit and the UK's exit from the EU.

In the Committee's 2019 Progress Report to the Scottish Parliament, we gave our advice on the scheduled update to Scotland's Climate Change Plan. The core messages of that advice have not changed.

However, the global pandemic has changed the context in which the Plan will be delivered. The update to the Plan was delayed – with publication now due in December 2020 – as efforts shifted to deal with the immediate impacts of the pandemic. That update should now set the foundations for this new era of climate change action in Scotland and has the potential to be the first net-zero-compatible programme of policies produced in the UK and worldwide.

1. A new context for climate action in Scotland

a) The Net Zero target

Scotland's new Climate Change Act was passed in October 2019. It increases the legislated ambition for Greenhouse Gas (GHG) emissions reductions from the previous target of at least 80% in 2050 to at least 100% by 2045. The new target is to reach 'Net Zero' territorial emissions before the middle of the century. The UK has legislated for a Net Zero target for 2050.

Since the new legislation was passed, we have already seen promising signs of progress in Scotland. The Scottish Government has swiftly accepted the recommended target, and Net Zero is increasingly becoming part of central Scottish Government policy and policies across multiple key areas are under active development (e.g. heat and buildings, electric vehicles and land use). Additionally, the Net Zero objective has been embraced by business, local authorities and the wider public.[2]

Before the COVID-19 pandemic, the Scottish Government had already themed two major legislative and fiscal events around climate change. The 2019-20 Programme for Government and the Scottish Budget 2019-20 each contained a substantial amount of new policies and new money committed to climate change actions. These were expected to be followed with an update to the Climate Change Plan and a series of climate announcements in the run up to COP26 in Glasgow, though many of these were delayed by the COVID-19 pandemic. The Plan update was delayed until December 2020, and COP26 was postponed to November 2021.

[2] CCC (2020) *Reducing UK emissions – Progress Report to Parliament.*

Scotland's immediate response to the pandemic has also been shaped around Scotland's wider climate goals. The Scottish Government formally sought the Committee's advice on a 'green recovery' and the 2020-21 Programme for Government contained a substantial package of policy measures themed around an 'enhanced Green New Deal' with a range of measures to protect biodiversity, create green jobs and accelerate a just transition to Net Zero.[3]

Scotland's Net Zero target, legislated a year ago, requires a strategic shift in climate policy. The Committee's forthcoming advice on the UK's Sixth Carbon Budget, our publication of the next UK Climate Change Risk Assessment Evidence Report, the UK's role as host of the UN's COP26 summit and the 2021 meeting of the G7 countries provide clear milestones for the next steps in Scotland's efforts to reduce emissions and prepare for climate change.

The Net Zero target set a challenging new legal objective for GHG emissions in 2045, but Scotland's legislated target of a 75% reduction in emissions by 2030 – which went beyond the Committee's recommendation for a 70% target – will likely be even more challenging to achieve. The Committee will advise on pathway to Scotland's Net Zero target as part of our advice on the UK's Sixth Carbon Budget in December, and the extent to which Scotland's legislated emissions targets lie on that pathway.

b) The almost full decarbonisation of electricity generation in Scotland

In 2010, nearly half (48%) of all electricity generated in Scotland was from unabated, fossil-fuelled power stations, with 29% of all electricity produced from coal combustion. Emissions from power generation were 27% of Scotland's total emissions. Today, Scotland produces more than 90% of its gross electricity consumption from renewable energy sources[4] and is a net-exporter of low-carbon electricity to the rest of the UK:

- Since the closure of Longannet power station in early 2016, there has been zero coal-fired generation in Scotland, ending over a century of burning coal for electricity. Only one large gas-fired power station remains at Peterhead (1.2 GW).
- By 2018, more than half of all electricity produced in Scotland was produced from renewable sources (55%) with a further 28% from nuclear energy.[5] Emissions from power generation were just 5% of Scotland's total emissions.
- The decarbonisation of the power sector contributed to 65% of all emissions reductions in Scotland in the ten-year period from 2008 to 2018. Direct emissions from power generation in Scotland are now so low that the potential for further direct reductions in emissions has largely disappeared[6] – indeed there may be small increases in some years due to fluctuations in operation of Scotland's remaining fossil-fuelled generation, as seen in 2018.

Scotland's progress in the last decade should be commended. The power sector stands as an example of clear and effective GB electricity market policy bolstered by political and industrial support for renewables in Scotland, combined with a supportive planning and consenting system and the involvement of local communities. However, emissions reductions in Scotland will now stall in unless that type of progress is seen in other sectors.

[3] Scottish Government (2020) *Scotland's Green Recovery.*
[4] Scottish Government (2020) *Scottish Energy Statistics Hub.*
[5] This share was smaller than the previous year (37%) due to maintenance outages at two nuclear reactors.
[6] Although future deployment of biomass with carbon capture and storage (BECCS) technology could deliver negative emissions in the power sector.

The challenge for low-carbon electricity generation in Scotland is not complete – Scotland must now capitalise especially on the potential for inexpensive renewable generation by decarbonising other sectors of the economy via electrification, as well as increasing electricity exports to the rest of the GB system. New sources of flexibility in the power system must now be developed in order to help meet the challenge of operating a system using large amounts of energy from renewables.

c) The new context of COVID-19

It is not yet possible to foresee the full effect of the COVID-19 crisis, but it will have substantial social, economic, and environmental impacts. It has also highlighted the importance of evidence-led planning for systemic risks, which also applies to our preparations for climate change itself.

Working towards Net Zero and a climate resilient society in Scotland remains the appropriate long-term goal. The broad set of changes required in the long term to deliver Net Zero is likely to be roughly as expected before the COVID-19 crisis. However, the pandemic fundamentally changes the context for tackling climate change, not least the need to integrate net-zero plans in the economic recovery.

The lockdown measures put in place as a response to the COVID-19 pandemic are likely to have different impacts across the short term, medium term and long term. Our 2020 UK Progress Report set out our analysis of the impacts of the COVID-19 lockdown and what is needed for a resilient recovery:

- **Short-term.** Dealing with the COVID-19 pandemic continues to be the priority. The lockdown imposed in response to the pandemic has a number of short-term effects that are likely to be largely temporary, but which may have impacts that persist in the longer term.
  - One of the most visible impacts of the COVID-19 crisis is the fall in both domestic and international travel, reducing emissions in the short-term, and improving local air quality in cities around the world.
  - The 26th Conference of the Parties (COP26), the UN climate summit that the UK was due to host in Glasgow in 2020, is now delayed to November 2021.
  - The crisis is already having an impact on workers and will inevitably lead to increased unemployment. Investment has also slowed, including in low-carbon industries globally, though emerging evidence suggests low-carbon investments have performed better than high-carbon investments over this period.[7] Given this, there is consensus around the need for economic stimulus, and a strong desire and potential opportunity to restart the economy and create jobs by building Net Zero and climate resilient infrastructure. Furthermore, low oil prices and low interest rates are likely to persist for the immediate future, providing a potential opportunity for Government action to stimulate investment away from high-carbon industries.
  - The transition to Net Zero and building resilience to climate change require a clear set of investments. Accelerating these investments can be a key part of the macroeconomic response to COVID-19 at a time when demand across the economy will be supressed, with wider economic benefits.

[7] HSBC (2020) *ESG stocks did best in COVID-19 slump.*

- **Medium-term.** Looking beyond the health impacts, COVID-19, and the restrictions to manage its spread, have affected livelihoods and reduced economic output across the globe. Lasting impacts will include many lost lives and livelihoods, economic impacts such as increased public and private debt (e.g. business loans, mortgages) as well as social and cultural impacts related to travel and working behaviours. International relations are also shifting. The medium-term responses to the crisis from the Scottish and UK governments will redraw the path of many aspects of decarbonisation and climate resilience, especially if it emphasises climate-positive behaviours, like remote working and active travel, which have emerged during the lockdown.
- **Long-term**, Scotland's climate goals remain unchanged. The actions needed to deliver them are largely as before, though if recent behaviour changes persist they could have a lasting impact on Scotland's emissions.
  - The need to prepare for climate change and to transition to a Net Zero economy remains a scientific and economic imperative and provides a positive vision for society. Addressing these priorities, alongside the parallel crisis of global biodiversity loss, can lead to multiple benefits through improving the condition of the natural environment and air quality, benefiting biodiversity and public health, as well as improving well-being and reducing society's exposure to external shocks. The systemic challenges and risks of climate change are increasingly understood and can be mitigated through strong preparations and strategic, flexible policies.
  - Whether the longer-term impact of the changes materially affect Scotland's Net Zero challenge is unclear but is also dependent on the policy response. Recent changes, such as increased working from home and reduced business travel, could, if sustained, lead to some permanent reductions in transport emissions. However, others, such as a reluctance to use of public transport in favour of cars, could have the opposite effect. Policy can help new social norms to form and put in place measures to encourage positive and avert negative changes.
  - The COVID crisis is a prescient reminder of how international collaboration can help address global risks, including climate change. Evidence suggests it is better and cheaper to respond to these risks in a co-ordinated way. At COP 26, the UK has an opportunity to renew the international effort on climate change.

d) COP26

The UK (with co-hosts Italy) will host the 26th United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP26) in Glasgow. Originally scheduled for November 2020, COP26 was envisaged as a key moment in efforts to raise global climate ambition with countries expected to resubmit their Nationally Determined Contributions (NDCs) for emissions reductions to 2030, and adaptation strategies, before the end of this year. When assessed prior to COVID-19 in 2019, the global emissions expected in 2030 based on current global ambition were not consistent with pathways expected to achieve the Paris Agreement's goal of limiting global warming to well-below 2°C above preindustrial levels and pursuing efforts to keep it below 1.5°C, but instead with those reaching around 3°C above pre-industrial levels by 2100.[8]

[8] UN (2019) *Emissions Gap Report 2019*.

COP26 has now been postponed by one year until November 2021 due to the ongoing COVID-19 pandemic. The time between now and COP26 represents a crucial period for global climate efforts. The infrastructure constructed around the world over the next few years as part of government responses to COVID-related economic impacts will be critical to the chances of achieving the Paris Agreement long-term temperature goal. Aligning post-COVID investment programmes with the agreed global climate goals of the Paris Agreement will be a core objective for global climate policy over the next 18 months.

Glasgow's role as a host city presents a clear opportunity to demonstrate Scotland's climate leadership on both climate change mitigation and adaptation, and for Scotland to help catalyse the necessary efforts to increase climate ambition around the world.

As COP26 host and incoming G7 president, the UK can have an important role in shaping efforts to align responses with global climate objectives. There will be several important aspects to this, and Scotland's role is central in each of them:

- To help coordinate and convene a climate-resilient global response to COVID-19 the UK will need to demonstrate that climate change remains a key domestic and international priority in its own coronavirus recovery plan. The Scottish Government can set the standard for the UK Government in this area by continuing to develop 'green recovery' plans for Scotland using the available devolved powers, as well as calling on Westminster to support a resilient recovery in areas where key powers are reserved.
- The UK has been widely recognised as a climate leader, due to its legally-binding Net Zero target and compatible carbon budgets framework, alongside strong progress made in reducing emissions to date. Scotland has been – and must continue to be – a major contributor to emissions reductions in the UK. In order maintain its status as a climate leader, the UK needs to produce a comprehensive and detailed economy-wide policy programme well in advance of COP26, fully aligned with achieving Net Zero domestically by 2050. Scotland's forthcoming update to the Climate Change Plan has the potential to be the first net-zero-compatible programme set out by any nation of the UK.
- The UK will be submitting its own NDC (for UK emissions reductions by 2030) to the UNFCCC, as it will no longer be covered by the EU NDC. This represents a key opportunity to signal a commitment to the ambitious near-term action required by a credible Net Zero transition plan. This new UK NDC should be submitted well in advance of COP26 and be based on the pathway required to reach the Sixth Carbon Budget and net-zero GHG emissions by 2050 that the Committee will advise on in December 2020. The UK NDC should also be broader than just a focus on emissions reductions and include credible and significant commitments to addressing the climate adaptation gaps highlighted by our *Progress in preparing for climate change – 2019 Progress Report to Parliament*.

These actions can together help the UK to maximise the opportunity of its forthcoming G7 and COP presidencies in 2021 to support the higher levels of global ambition needed to achieve the long-term temperature goal of the Paris Agreement and create a climate-resilient world.

The UK's exit from the European Union will put the delivery of more environmental goals directly in the UK's hands. This process will also affect how swiftly the nations of the UK can make progress towards their climate objectives.

2. Scotland's Climate Change Plan – a new pathway for Scotland

a) The Climate Change Plan

In the wake of the COVID-19 pandemic, the Committee agreed with Scottish Ministers' decision to delay the update to the Scottish Climate Change Plan. We have welcomed the intention to reframe that Plan in the context of a 'green pathway' to aid an economic recovery in line with Scotland's statutory net-zero targets.

That Plan update must:

- Be **consistent with achieving Net Zero** by 2045.
- Put Scotland on the path to deliver meaningful **reductions outside of the power sector.**
- Help Scotland to build a **resilient recovery** from the pandemic.
- Reaffirm Scotland's status as an **international leader.**

In our 2019 Scottish Progress Report, we gave detailed advice on the original update to the Climate Change Plan. That report gave sector-by-sector advice on the transition to Net Zero and the actions that need to be taken now to put Scotland on that pathway.

In that report, we stated that the Plan update was:

"…an opportunity to set a clear and credible path to net-zero emissions in 2045. The foremost challenge is not to produce a quantified, optimised pathway for emissions reductions in each sector; the greatest need is for improved Scottish Government policies and stronger governance to drive a rapid, sustained transformation to a net-zero Scotland:

- Net-zero policy must be embedded across all levels and parts of government, with strong leadership and coordination at the centre.
- The public must be engaged in the challenge and policy should be designed to put people at the heart of it.
- Policy should provide a clear and stable direction and a simple investable set of rules and incentives that leave room for businesses to innovate and find the most effective means of switching to low-carbon solutions."

An updated Plan, in conjunction with Scotland's second Climate Change Adaptation Programme, can help to build back from the COVID-19 pandemic in Scotland, with a stronger economy and increased resilience. We provide recommendations for the Plan, as well as identifying policy actions for the coming year for both the UK and Scottish Governments, in Chapter 5.

b) Meeting Scotland's interim emissions targets

The Climate Change Plan does not only have to be consistent with Net Zero in 2045, it must also set a pathway to Scotland's legally-binding 'interim' emissions targets for 2030 and 2040. These targets have equivalent legal status to the Net Zero target.

The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 amended the 2009 Act to set a net-zero target for 2045. The 2019 Act introduced new emissions reductions targets for 2020, 2030 and 2040 of 56%, 75% and 90% respectively against 1990 levels.

Our recommendation at the time of the 2019 Net Zero advice was to set interim targets on the basis of a straight line to net-zero emissions in 2045, and update those targets based on the more detailed pathway analysis for Scotland as part of our 2020 advice on the UK Sixth Carbon Budget.

The targets for 2020 and 2040 were set in line with the Committee's recommendations, but the Scottish Parliament has set a more stretching 75% reduction target for 2030 than our recommended 70%.

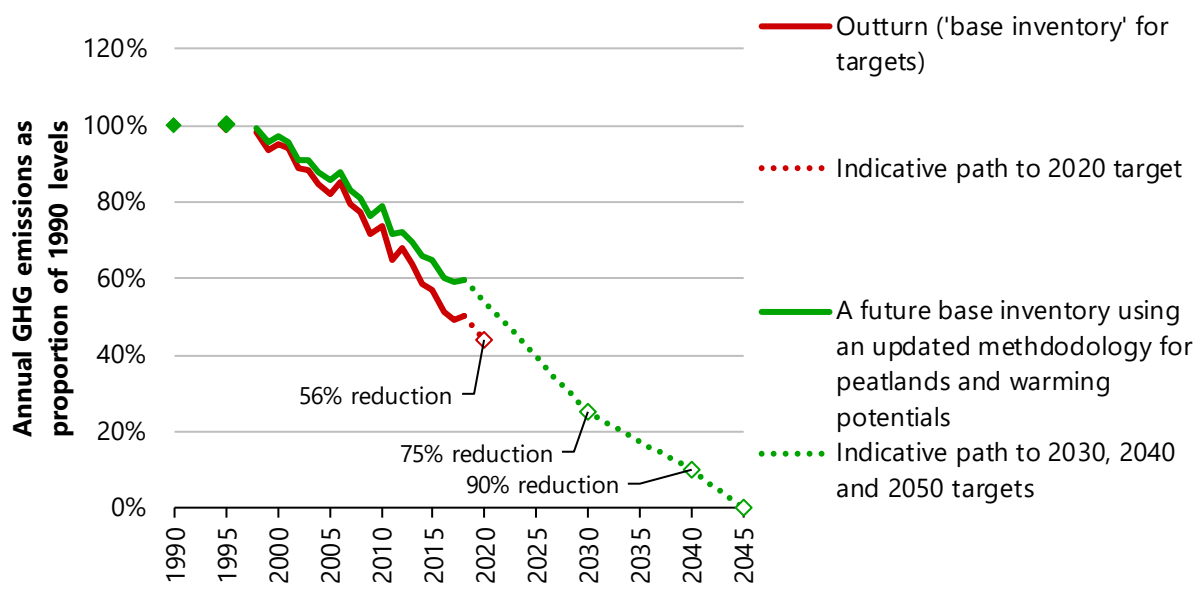
The Committee's recommendations for targets beyond 2020 were based on anticipated future changes in the methodology for estimating emissions under the emissions inventory[9]. These inventory changes make a given percentage reduction more difficult to achieve (Figure 1.1). The 2030 target for a 75% emissions reduction against 1990 levels – depending on which future inventory basis is assumed – equates to a reduction of around 80-85% based on the current emissions inventory methodology.

Given that Scotland has all but exhausted the potential for reductions in fossil-fired electricity generation that drove progress in reducing emissions in the 2010s, the 2030 target will be extremely challenging to meet, even if Scottish Ministers take action to get on track for Net Zero by 2045. The rapid emissions reductions required for a 75% reduction by 2030 may not be feasible without extreme implications for cost and/or required changes in behaviour.

The Committee will return to the appropriate path for Scottish emissions over the period between now and 2045 as part of our advice in December this year on the UK's sixth carbon budget.

[9] There are two known changes to future emissions inventories that could add over 12 $MtCO_2e$ per year to the Scottish inventory before 2025; there is uncertainty in which methodology will be used by the UK Government to calculate the impact of peatlands and global warming potentials (see Box 2.1).

Figure 1.1. Pathways to the Net Zero target in 2045



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019*; Evans et al. (2019) *Implementation of an Emissions Inventory for UK Peatlands*; CCC analysis.
Notes: The base inventory is the inventory against which Scotland's emissions reduction targets are currently measured. This is currently the inventory published in June 2018 (Figure 1.5) but this base inventory will be updated well in advance of the 2030 target. The base inventory does not reflect forthcoming revisions to peatland emissions or global warming potentials (Box 2.1). We show the high range of the estimated impact of these changes in this chart.

3. This report

This is the Committee's ninth annual report on Scotland's progress towards meeting emission reduction targets, as requested by Scottish Ministers under the Climate Change (Scotland) Act. This is the second report since the legislation was updated in 2019.

Chapters 2 and 3 reflect on performance in reducing emissions to 2018 across the economy and in specific sectors with discussion of the key underlying drivers of changes in emissions. Chapter 4 discusses recent climate policy in Scotland and provides an early assessment of the extent to which the Scottish and UK Governments are delivering the 'green recovery' on which we gave advice in May and June 2020.

The final Chapter gives further advice on Scotland's update to the Climate Change Plan one year on from our previous report.

The remainder of this report is set out in the following chapters:

- Chapter 2: Economy-wide progress in reducing emissions since 2008
- Chapter 3: Sectoral progress on emissions and key indicators
- Chapter 4: Policy progress in the last year
- Chapter 5: A Climate Change Plan for Net Zero and a resilient recovery
- Chapter 6: Policy priorities for the next year

Chapter 2: Economy-wide progress in reducing emissions

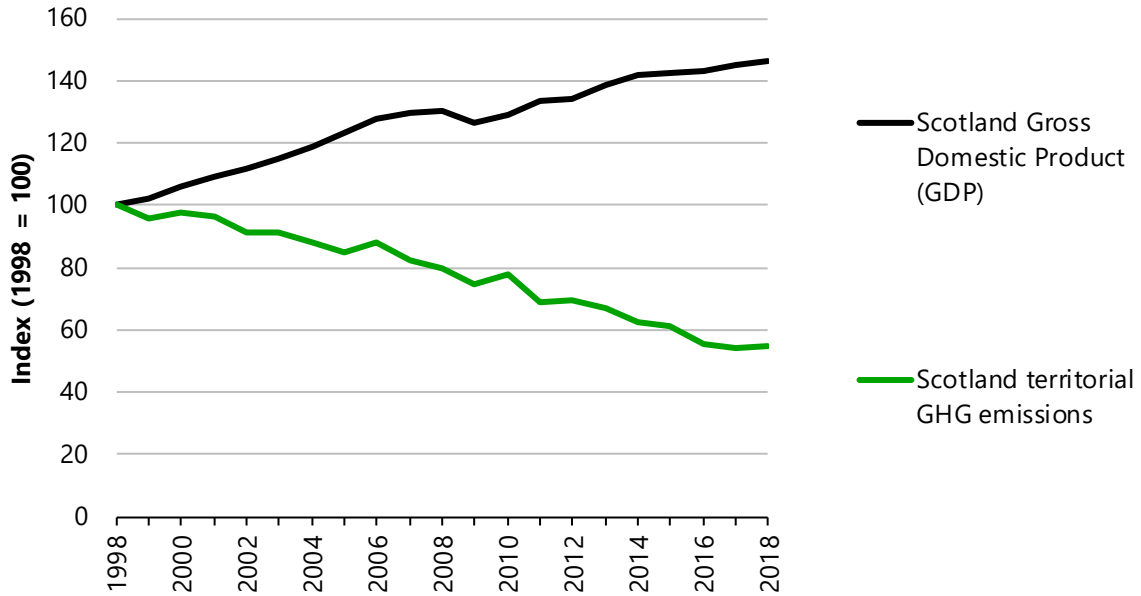
1. Progress in reducing Scotland's territorial emissions

On the basis of the latest published GHG emissions inventory, total Scottish emissions increased by 2% in 2018 to 41.6 $MtCO_2e$[10] and were 45% below 1990s levels. This was the first annual increase in emissions since 2010.

Greenhouse gas emissions in Scotland have fallen by 45% since 1998, while the economy has grown by 46% in the same period (Figure 2.1).

Emissions have fallen by 31% since 2008, more than any other nation of the UK and faster than any G20 economy over the period 2008-2018 (Figure 2.2).[11]

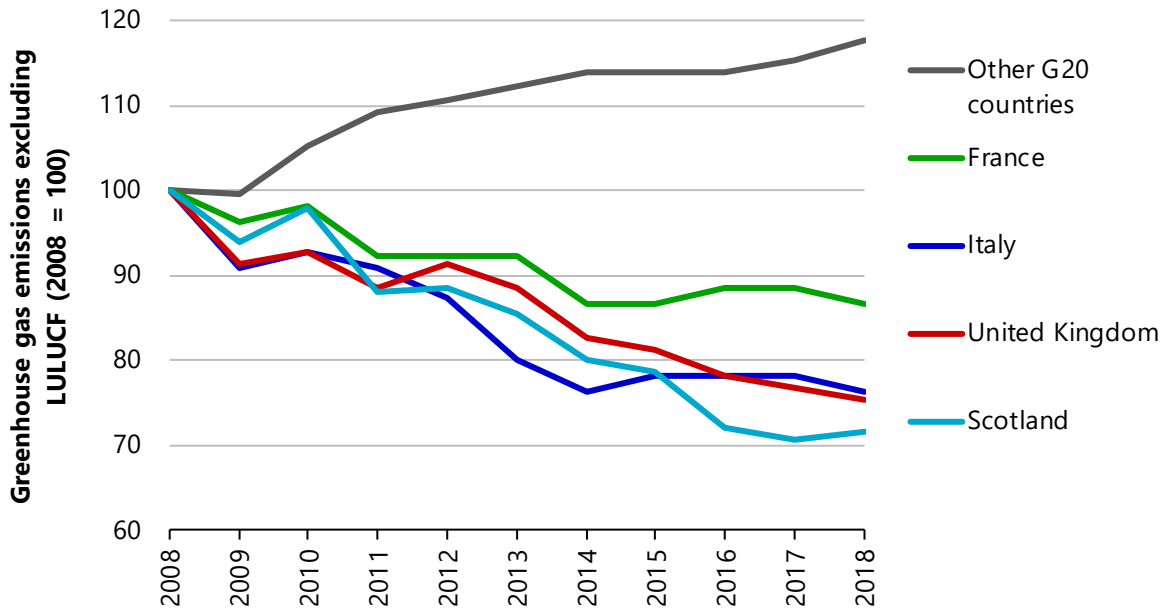
Figure 2.1. Greenhouse gas emissions have fallen in Scotland as the economy has grown



Source: ONS (2019) *Regional gross domestic product all NUTS level regions;* NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019*; CCC analysis.
Notes: GDP in real terms, chained volume measure.

[10] Including Scotland's share of international aviation and shipping emissions. The latest published inventory does not reflect forthcoming revisions to peatland emissions or global warming potentials (Box 2.1).
[11] Percentage reduction from 2008-2018.

Figure 2.2. Scotland has reduced emissions faster than the rest of the UK and all G20 economies



Source: PBL (2019) *Trends in Global CO_2 and Total Greenhouse Gas emissions: 2019 report;* NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019; CCC analysis.*
Note: GHG emissions from land-use, land-use change and forestry are not included in the national totals used here so the trend for Scotland is different to other charts of economy-wide emissions in this report.

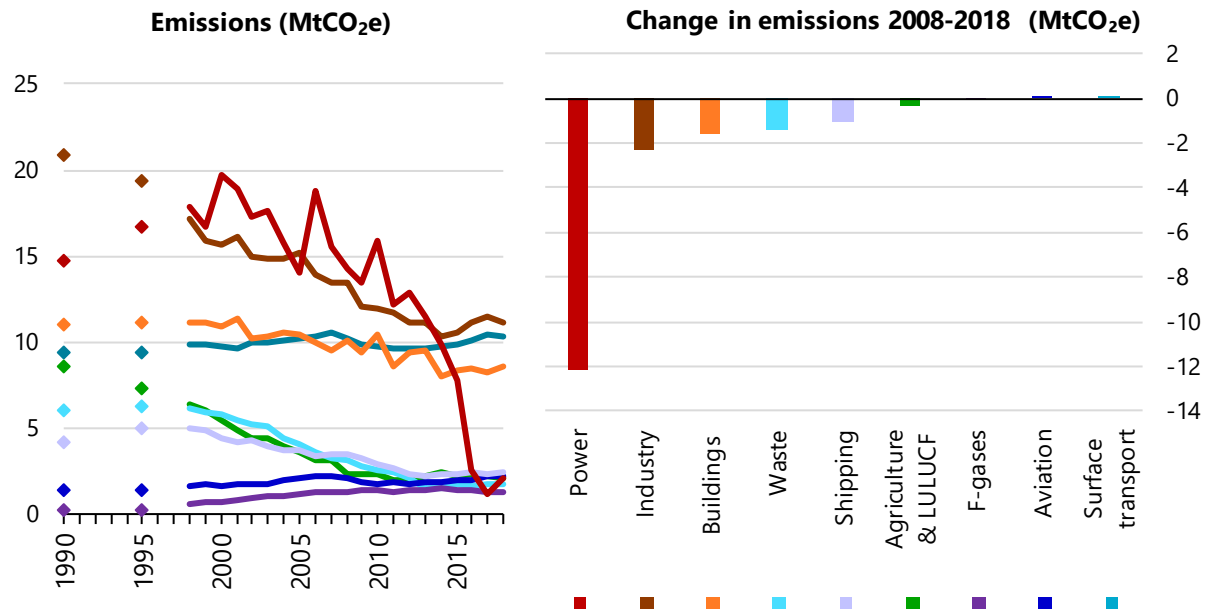
The fall in total emissions in the past decade has not been evenly distributed across all sectors (Figure 2.3). Strong progress in the power sector has dominated, with smaller reductions in some sectors and increases in others (Figure 2.4). The increase in emissions in 2018 was largely caused by an increase in power sector emissions compared to the previous year,[12] though power sector emissions were still the second-lowest on record. Colder winter temperatures, including the 'Beast from the East' in March 2018 (Figure 2.7) likely also led to increased emissions from heat generation:

- Emissions increased by 1.0 $MtCO_2e$ in the power sector in from 2017 to 2018. Despite this increase, emissions have fallen by 85% since 2008 and the power sector accounted for just 5% of Scottish emissions.
- Even after this increase, the power sector has contributed to 65% of the total fall in emissions in Scotland from 2008 to 2018. Emissions across all other sectors outside of the power sector have fallen by 14% over the same period.

To meet the net-zero emissions target, the overall rate of emissions reduction must be maintained while progress must be extended beyond the power sector: emissions fell an average of 1.9 $MtCO_2e$ each year from 2008 to 2018, and must fall by an average of at least 1.5 $MtCO_2e$ in each year from 2018 to 2045[13] – and by up to 2.0 $MtCO_2e$ each year once future methodology changes to the inventory are accounted for (Box 2.1).

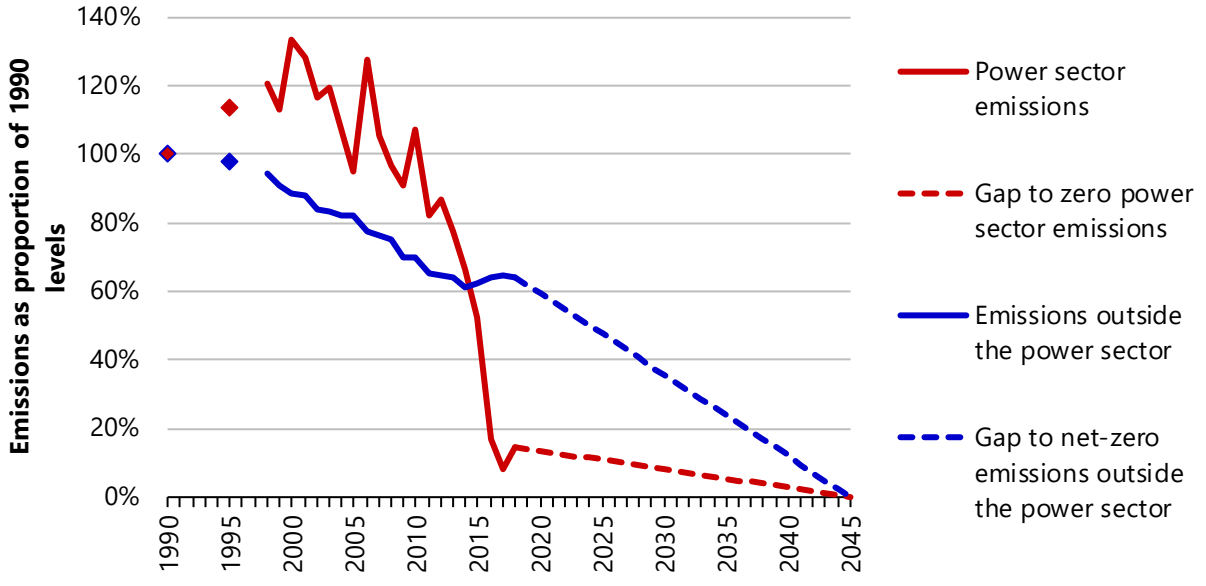
[12] Attributable to increased gas-fired generation at Peterhead.
[13] If the net-zero target in 2045 were measured against the current NAEI inventory for Scotland.

Figure 2.3. Greenhouse gas emissions by sector in Scotland (1990-2018)



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.*
Notes: No emissions data are available for Scotland for 1991-1994 or 1996-1997. Does not reflect forthcoming revisions to peatland emissions or global warming potentials (see Box 2.1).

Figure 2.4. There is limited room to reduce direct emissions from power sector further



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019*; CCC analysis.
Notes: No emissions data are available for Scotland for 1991-1994 or 1996-1997. Does not reflect forthcoming revisions to peatland emissions or global warming potentials (see Box 2.1).

2. Progress towards Scotland's targets against the base inventory

The emissions targets under Scotland's new climate legislation are measured against a 'base inventory' as recommended by the Committee in December 2017.[14] Comparing targets to this base inventory allows the calculation of a reference 'GHG account' that is used to assess target compliance. This measures progress against targets comparable to the inventory on which the targets were set. The use of the base inventory makes Scotland's targets less sensitive to year-to-year changes to the inventory methodology for estimating emissions, and must be updated at least every five years.

The 2019 Act defined the reference 'base inventory' as the most recent UK GHG 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:

- The 1990 baseline against which emissions reductions are measured was 75.7 $MtCO_2e$.
- For the year 2018, the 'base inventory' GHG account was 37.8 $MtCO_2e$.
- Against the 'base inventory', emissions have fallen by 50% from 1990 to 2018 (Figure 2.5).

In last year's Progress Report, the Committee stated that unless emissions fall in sectors other than electricity generation, Scotland was at risk of missing its next 'interim' target of a 56% reduction in emissions by 2020, as set out in the 2019 Act (Table 2.1). The impact of the COVID-19 pandemic means that the 2020 target will almost certainly be met;[15] this will not necessarily mean that the underlying structural changes to drive emissions reductions in key sectors have been achieved.

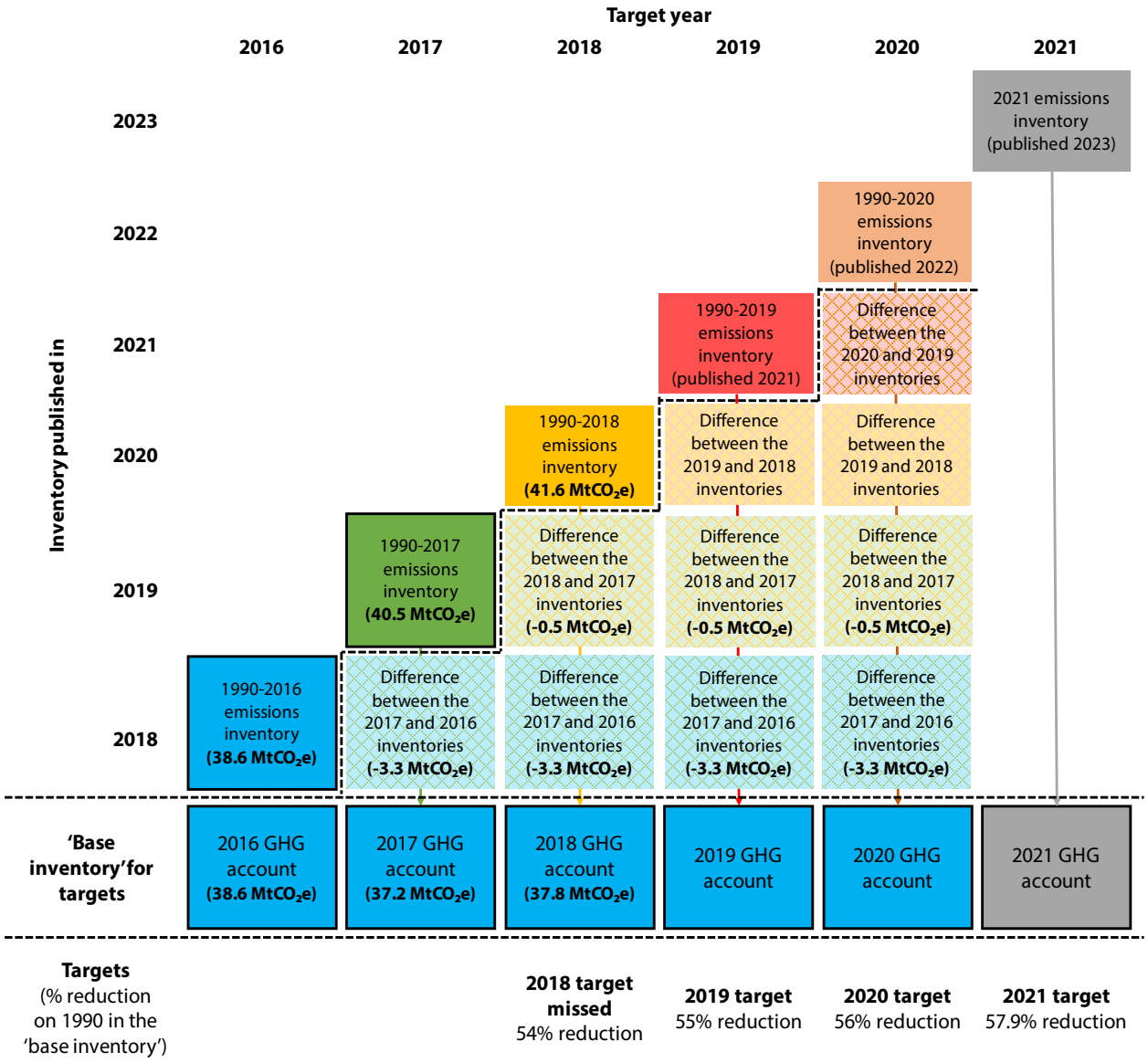
[14] CCC (2017) *Letter from Lord Deben to Roseanna Cunningham MSP advising on Scottish climate target framework.*
[15] This will be confirmed when emissions data for Scotland in 2020 are published – due in 2022.

Table 2.1. Scotland's targets and progress to date

Target	Progress to date
2045 net-zero target The 2019 Act set a target to reduce emissions of greenhouse gases to net-zero by 2045. This target accounts for all emissions including Scotland's share of emissions from international aviation and shipping (IAS).	Actual emissions in 2018 were **41.6 $MtCO_2e$, a 45% reduction on 1990 levels.** Scotland must reduce its emissions by an average of 1.5 $MtCO_2e$ per year between now and 2045.[16] Emissions increased by 0.6 $MtCO_2e$ in 2018.
2020 interim target and annual targets The 2019 Act established an interim target of a 56% reduction in emissions by 2020, based on the reference 'base inventory' published on 30 June 2018 (Figure 1.5). The 2019 Act set emissions reduction targets for 2018 (54%) and 2019 (55%) for reporting purposes only. The 2019 Act established 75% and 90% reduction targets for 2030 and 2040. These will be assessed against a future inventory which contains emissions from peatland (Figure 1.1).	After adjusting Scottish emissions to the 'base inventory' against which targets are measured **Scotland's emissions were 37.8 $MtCO_2e$ in 2018, 50% below 1990 levels**. • The 2018 target for reporting purposes was therefore missed. • The 2019 target is likely to be missed, unless Scottish emissions fall by 5 percentage points of the 1990 baseline (-3.8 $MtCO_2e$) in 2019. • The 2020 target (56%) will likely be met due to the impacts of COVID-19, but this will not necessarily mean that the necessary structural changes in key sectors beyond power generation are on track.

[16] Once revisions to peatland and are fully accounted for the required rate is 2.0 $MtCO_2e$ per year.

Figure 2.5. Calculation of the Scottish GHG Account 'base inventory' for 2018



Source: Scottish Government (2020) *Scottish Greenhouse Gas Emissions 2018*; 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.

3. Effects of past and future methodology changes to the Scottish greenhouse gas inventory

Methodology changes to the emissions inventory are designed to increase the transparency, accuracy, consistency, comparability, and completeness of emissions estimates. There are three primary sources of uncertainty in the inventory:

- **Uncertainty in the current GHG inventory.** This comprises the statistical 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.[17]
- **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 CO_2-equivalent, or tCO_2e). 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 CH_4, N_2O and F-gases since the inception of the inventory. Future changes to GWPs will significantly affect emissions as measured in $MtCO_2e$.
- **Scope of the inventory**. Some sources of emissions and activities (e.g. most peatland emissions) are not currently included in the inventory but will be included in the future, thus adding to overall GHG estimates.

Unlike previous years, which saw large changes in the estimate of emissions from the land use, land-use change and forestry (LULUCF) sector in Scotland (Figure 2.6), changes between the two inventories published in 2019 and 2020 were relatively small:

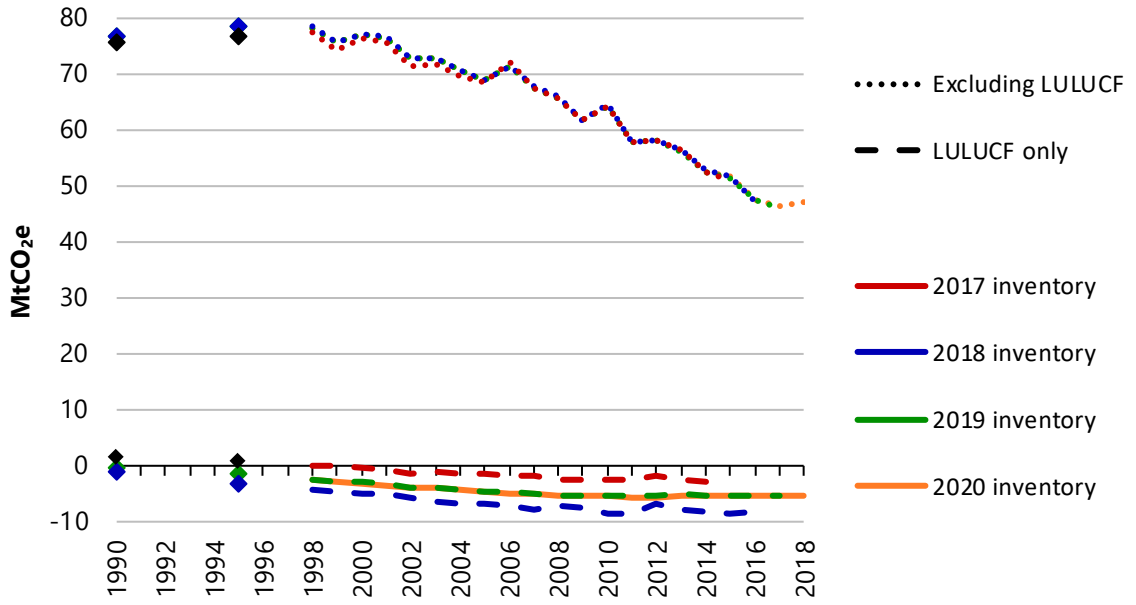
- The estimate of emissions in 2017 – the most recent comparable year – increased by 0.5 $MtCO_2e$.[18]
- The previous inventory estimated that emissions in 2017 were 47% below 1990 levels; this has now changed to a 46% reduction on the most recent inventory basis.

The stability in the estimated size of the LULUCF sink in the past two inventories suggests that work to update the Scottish inventory may have helped to reduce the uncertainty associated with the inventory.

There are two known changes to future emissions inventories that could add over 12 $MtCO_2e$ per year to the Scottish inventory before 2025 (Box 2.1). Our recommended net-zero greenhouse gas target in 2045, as well as the interim targets in 2030 and 2040, takes these two methodological changes into account, while Scotland's new 'base inventory' method for assessing targets is designed to be robust to these types of methodological changes in the near term.[19]

[17] CCC (2017) *Quantifying Greenhouse Gas Emissions.*
[18] The most notable revision was to the Industry sector, where emission in 2017 were reported as 0.4 $MtCO_2e$ higher in the newer inventory when compared to the older version. This increase can be traced to a revision to BEIS statistics of fossil gas use across the chemicals sector.
[19] CCC (2017) *Letter from Lord Deben to Roseanna Cunningham MSP advising on Scottish climate target framework.*

Figure 2.6. Estimates of LULUCF and non-LULUCF emissions in inventories published from 2017-2019



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2018*; NAEI (2019); NAEI (2018); NAEI (2017); CCC analysis.
Notes: No emissions data are available for Scotland for 1991-1994 or 1996-1997. Does not reflect forthcoming revisions to peatland emissions or global warming potentials (see Box 2.1).

Box 2.1. Effect of future methodology changes to the Scottish inventory

UK and Scottish emissions targets are based on estimates of greenhouse gas (GHG) emissions produced by the National Atmospheric Emissions Inventory (NAEI).

There are two major changes that will be made to the emissions inventory in the near future: the addition of emissions from peatland and revision of the Global Warming Potentials (GWPs) used to calculate aggregate greenhouse gas emissions.

These inventory changes will increase the headline estimate of Scottish emissions, both for the present day and back to 1990:

- **Peatland.** The current inventory captures less than 0.1 $MtCO_2e$ of emissions associated with wetlands in Scotland, but all sources of peatland emissions will be included in the inventory by 2024 at the latest. Work by the Centre for Ecology & Hydrology (CEH) for the BEIS Wetland Supplement project, which will be used as the basis for the emissions inventory, estimates net annual emissions from all peatland sources of 6.1-9.6 $MtCO_2e$ for Scotland in 2013 and a similar amount in 1990.[20] The main driver of this uncertainty is the methodology chosen for afforested peatland.

[20] Chris Evans et al. (2019) *Implementation of an Emissions Inventory for UK Peatlands.*

Box 2.1. Effect of future methodology changes to the Scottish inventory

- **Global Warming Potentials (GWPs).** These are used to aggregate different greenhouse gases together into a common metric, showing their equivalence to carbon dioxide. At COP24 in December 2018 the international community decided to standardise reporting under the Paris Agreement transparency framework using the GWP100 metric (the GWP evaluated over a 100-year time frame). The values to be used are those from the IPCC 5th Assessment Report (AR5). There are two methodologies presented in AR5, with different GWPs, and it is not yet clear which will be used. Both are different from the AR4 values used in the current emissions inventory. The decision requires national inventories to use updated GWP values by the end of 2024. The impact of this change will be to increase the headline figure for Scottish emissions (excluding peatland) by around 2-5 $MtCO_2e$ in 1990 and 1-2 $MtCO_2e$ for 2018, largely from sectors which have significant methane emissions (i.e. agriculture and waste).

For the longer term, the IPCC has recently published the *2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories* providing updated guidance and methodologies for compiling GHG inventories. If these are adopted by a future meeting of Parties to the Paris Agreement they will in due course have to be reflected in Scotland's emissions inventory. The effect of these refinements on the emissions inventory is not yet known but will likely bring marginal improvements in the accuracy of the inventory in a number of sectors.

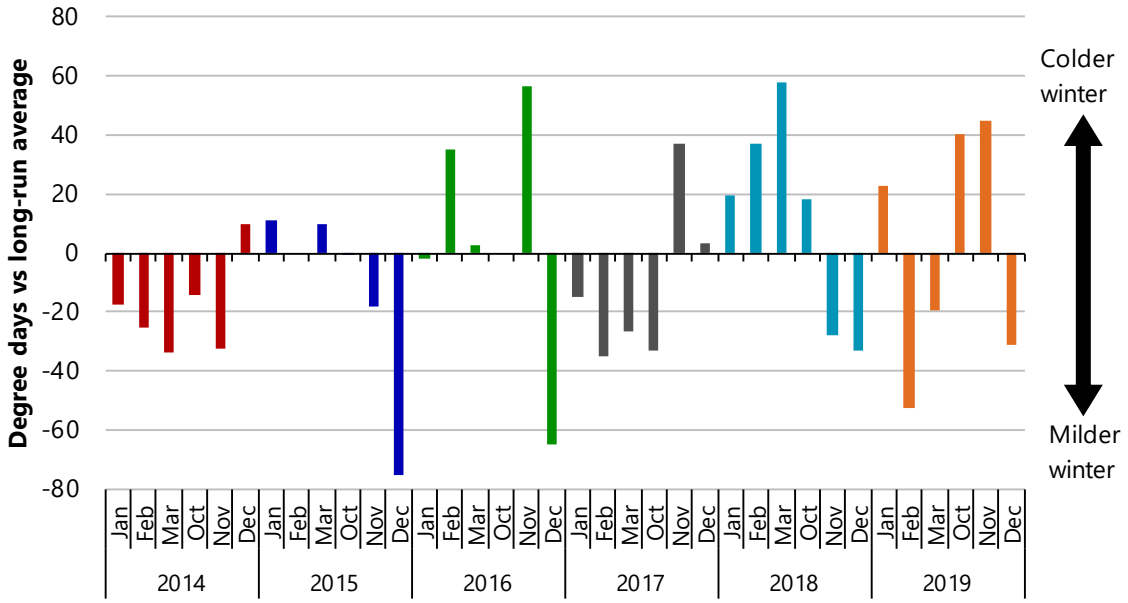
4. Outlook for Scottish emissions in 2019 and 2020

Data on Scottish emissions in 2019 will be published in June 2021. We will report on 2019 Scottish emissions in our UK progress report at the end of June 2021. In this section, we draw on other data that can provide an indication of what is likely to have happened to emissions data in Scotland in 2019 and 2020:

- **Temperatures in 2019.** There were fewer heating-degree-days[21] in the winter (January to March and October to December) months of 2019 in Scotland than compared to the same period in 2018 (Figure 2.7), and the total number of degree-days in 2019 were close to the long-run average. Notably, the first three months of 2018 were much colder than usual due to the cold weather events Storm Emma and Anticyclone Hartmut (the 'Beast from the East'). Lower heating demands may therefore lead to lower emissions from buildings in 2019 compared to 2018.
- **The impacts of COVID-19 on emissions in 2020.** Reduced energy demands during the lockdown are expected to cause a record fall in global emissions in 2020. These impacts are likely to be transient, reversing as the global economy reopens and with only a negligible impact on global warming. The full impact on Scottish greenhouse gas emissions is also unclear at this stage – and will depend on the rate at which the economy is able to reopen safely. It is already clear, however, that the lockdown will cause a substantial fall in emissions in 2020. In a mid-case estimate, daily CO_2 emissions for the whole of the UK were around 30% lower than mean 2019 levels during the peak of the lockdown in April and May 2020.

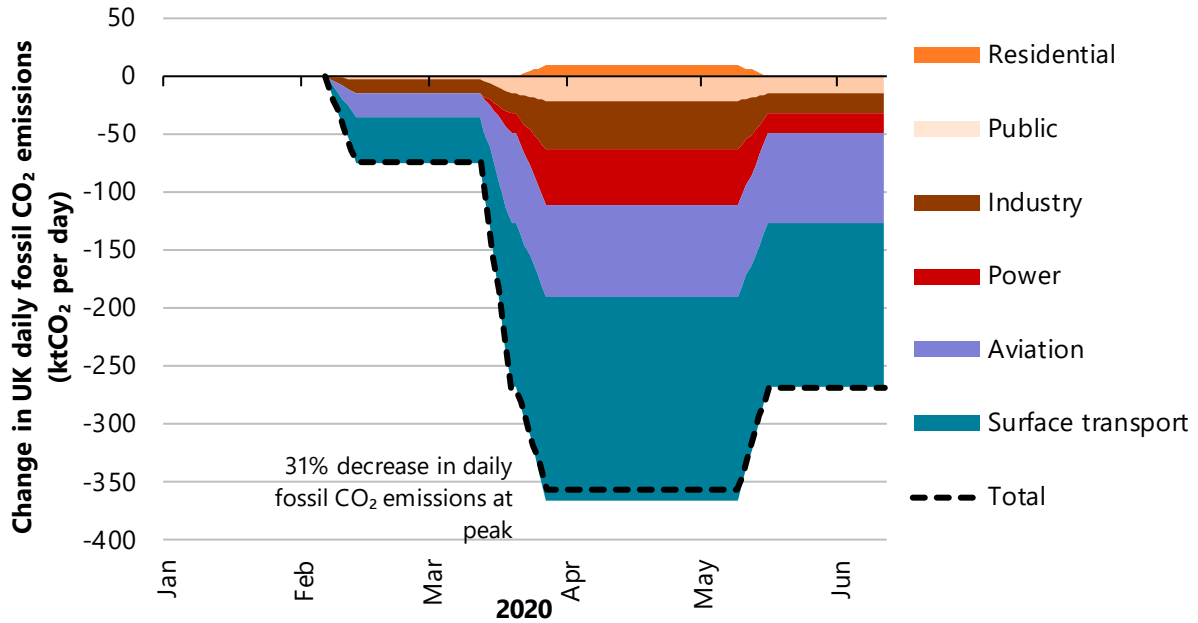
[21] Heating-degree-days (HDDs) are calculated relative to a baseline temperature, typically 15.5°C, which is the outside temperature above which a building needs no heating. One HDD is the number of degrees Celsius deviation from the base temperature of the actual temperature on a given day.

Figure 2.7. Heating degree days variation from the long-run average in Scotland (2014-2019)



Source: Energy Management Register (2020) *Degree day data*. http://www.enmanreg.org/freedd/
Notes: Heating-degree-days (HDDs) are calculated relative to a 15.5ºC baseline temperature. One HDD is the number of degrees deviation from the base temperature of the actual temperature on a given day. This figure compares HDD in winter months to the twenty-year average for that month. Points above the horizontal axis reflect colder than average temperatures and points below indicate higher than average temperatures.

Figure 2.8. UK emissions fell by almost one third during the peak of the COVID-19 lockdown



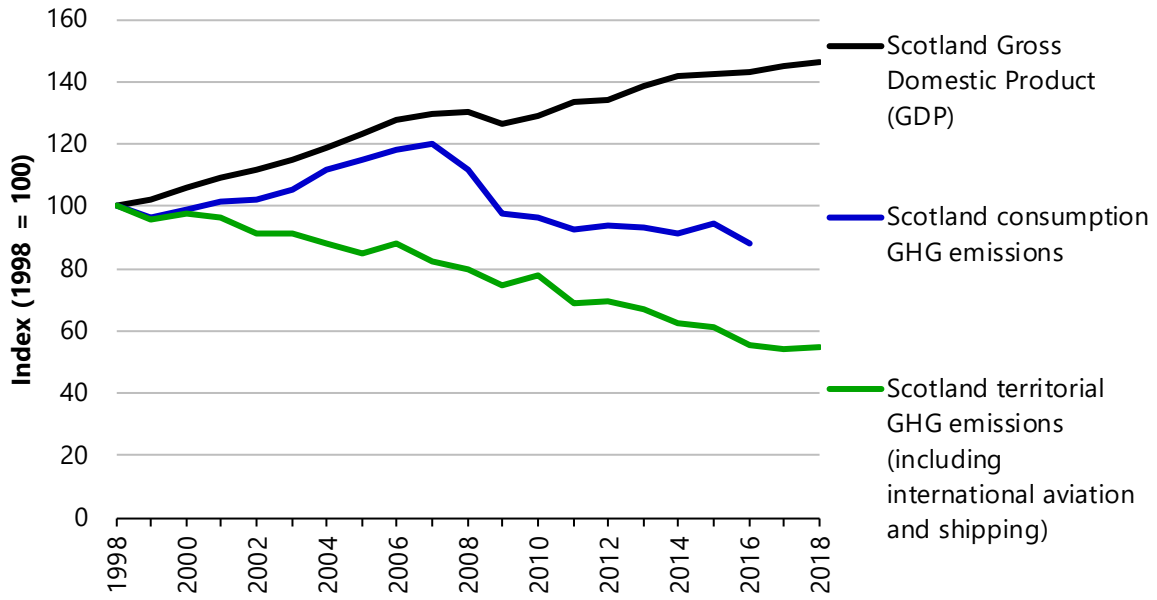
Source: Supplementary data to Le Quéré et al (2020) Temporary reduction in daily global CO_2 emissions during the COVID-19 forced confinement.
Notes: Mean baseline emissions for the UK are 1.16 $MtCO_2$/day, taken from the Global Carbon Project using sector allocation from IEA (2019) World Energy Balances 2019.

5. Progress in reducing Scotland's consumption emissions

Accounting for greenhouse gas (GHG) emissions under the Climate Change (Scotland) Act is done on a 'territorial' basis, meaning that a country has responsibility for all emissions produced within its borders. This is consistent with the internationally-agreed approach to GHG emissions accounting under the Paris Agreement. An alternative emissions accounting basis is 'consumption' emissions accounting, that associates emissions caused during the production of goods and services with the country that is the final consumer of those goods and services independent of where in the world those emissions occurred.

The Scottish Government publishes regular updates on Scotland's 'consumption emissions footprint'. Scotland's consumption emissions footprint has fallen over the last decade, but more slowly than territorial emissions (Figure 2.9). Scotland's consumption emissions for 2016, the most recent year of available data, can be broken down in a number of ways (Box 2.2).

Figure 2.9. Consumption and territorial emissions vs. GDP over time



Source: ONS (2019) *Regional gross domestic product all NUTS level regions;* NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019*; CCC analysis.
Notes: GDP in real terms, chained volume measure.

Box 2.2. Changes in Scottish consumption emissions

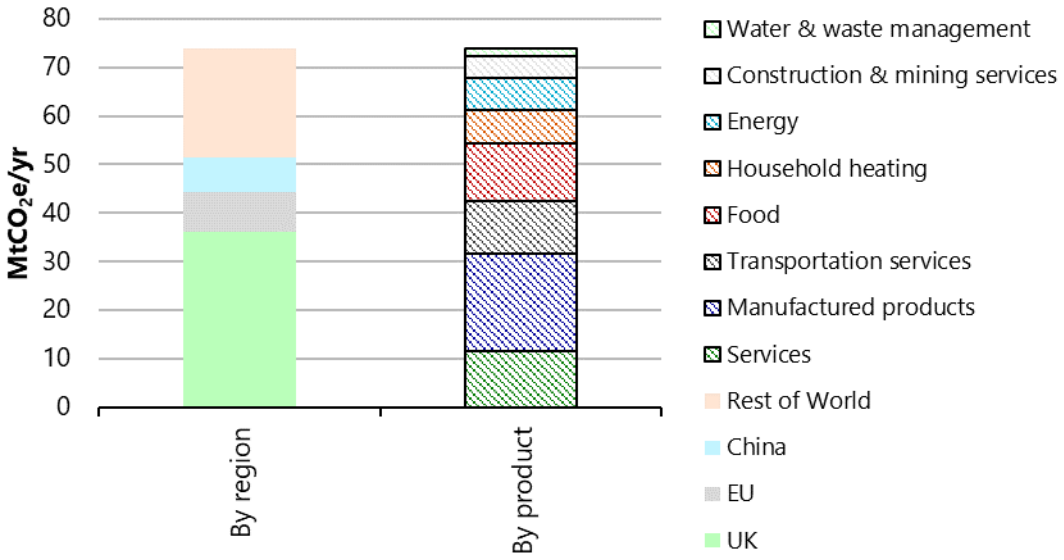
Scotland's consumption emissions footprint for 2016, the most recent year of available data, can be broken down in a number of ways (Figure B2.2):

- **By-region:** 49% of Scotland's consumption footprint emissions was produced in the UK. An additional 12% are produced in EU countries, meaning around 61% of Scotland's consumption footprint falls within countries that have legislated or have currently proposed Net Zero targets for 2050 or before. Emissions produced in China contribute 11% of Scotland's consumption footprint.
- **By-product:** Scotland's consumption of manufactured products makes up the largest fraction of the consumption emissions footprint (27%) when indirect emissions (such as from electricity used in production processes) are allocated along supply chains to the final product. Food, services and transportation are other areas that contribute significant shares (~15% each). 90% of the emissions associated with Scotland's demand for manufactured products occur outside of the UK, but only 53% do so for services. The consumption of food is the other areas of consumption for which the majority of emissions occur abroad (62%).

The drivers of changes in Scotland's consumption emissions footprint since 2009 have been similar to the rest of the UK. Increased population and consumption have acted to increase the consumption emissions footprint (by ~10%), but these have been more than offset by decreases in the energy intensity of economic activity and carbon intensity of energy in the UK and elsewhere in the world (contributing about a 27% reduction). The effects of changed consumption patterns and globalisation of supply chains only make a very small contribution to the overall change in Scotland's consumption footprint over this period, indicating that 'offshoring' of emissions is not responsible for a significant fraction of the changes in either Scotland's' territorial or consumption emissions since 2009.

Consumption-based accounting does offer a valuable complementary perspective to territorial-based accounting and should continue to be assessed by the Scottish Government. It can be helpful in identifying actions that might reduce the Scotland's territorial emissions but increase emissions elsewhere, as well as highlighting the additional emissions reductions from reduced consumption of GHG-intensive goods that fall outside of Scotland's territorial account.

Figure B2.2. Scotland's consumption emissions footprint for 2016



Source: Scottish Government (2019) *Scotland's carbon footprint: 1998-2016*; CCC analysis.

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Chapter 3: Sectoral progress on emissions and key indicators

In this chapter, we review progress in reducing emissions in each sector of the economy in Scotland and identify the key underlying factors which have driven those changes in emissions (Table 3.1).

We also provide an overview of Scotland's 2019 climate change monitoring report, which tracks progress towards the existing Climate Change Plan in Scotland.

Our UK Progress Report uses an indicator framework to track progress towards UK climate targets. Those indicators will be revised in next year's UK Progress Report to align to the UK's net-zero target for 2050 and our assessment of the sixth carbon budget pathway. This is likely to entail both reassessment of the level of indicators, to reflect the need for more rapid deployment (e.g. of electric vehicles), and a broadening of the indicator set (e.g. on the demand side).

In parallel, we will develop a set of equivalent indicators for Scotland which will enable us to monitor progress towards the 2045 target in a much more specific, quantitative and trackable level of detail in future.

Table 3.1. Medium-term milestones for Scotland to be on track to Net Zero emissions by 2045

Sector	Emissions in 1990 ($MtCO_2e$)	Emissions in 2018 ($MtCO_2e$)	Change in emissions 2017 to 2018 ($MtCO_2e$)	Balance of devolved powers
Transport, of which:	14.9	14.8	-0.2	Mixed
Surface transport	*9.4*	*10.3*	*-0.2*	
Aviation	*1.4*	*2.1*	*-0.0*	
Shipping	*4.2*	*2.4*	*+0.1*	
Industry	20.8	11.2	-0.3	Largely reserved
Buildings, of which:	11.0	8.5	+0.3	Mixed
Residential	*8.0*	*6.1*	*+0.2*	
Non-residential	*3.0*	*2.4*	*+0.1*	
Agriculture and LULUCF of which:	8.5	2.0	-0.1	Largely devolved
Agriculture	*8.9*	*7.5*	*-0.1*	
LULUCF	*-0.4*	*-5.4*	*-0.0*	
Waste	6.0	1.7	-0.0	Largely devolved
F-gases	0.3	1.2	-0.1	Mixed
Power	14.7	2.1	+1.0	Largely reserved
Total	**76.3**	**41.6**	**+0.6**	**Mixed**

Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019*.
Notes: F-gas emissions in the 1990 column are shown for 1995, which is the base year against which F-gas emissions reductions are measured in the Climate Change (Scotland) Act 2009. Changes from 2017 to 2018 that are less than 0.05 $MtCO_2e$ are shown as zero change. Values may not sum due to rounding. LULUCF = land use, land-use change and forestry.

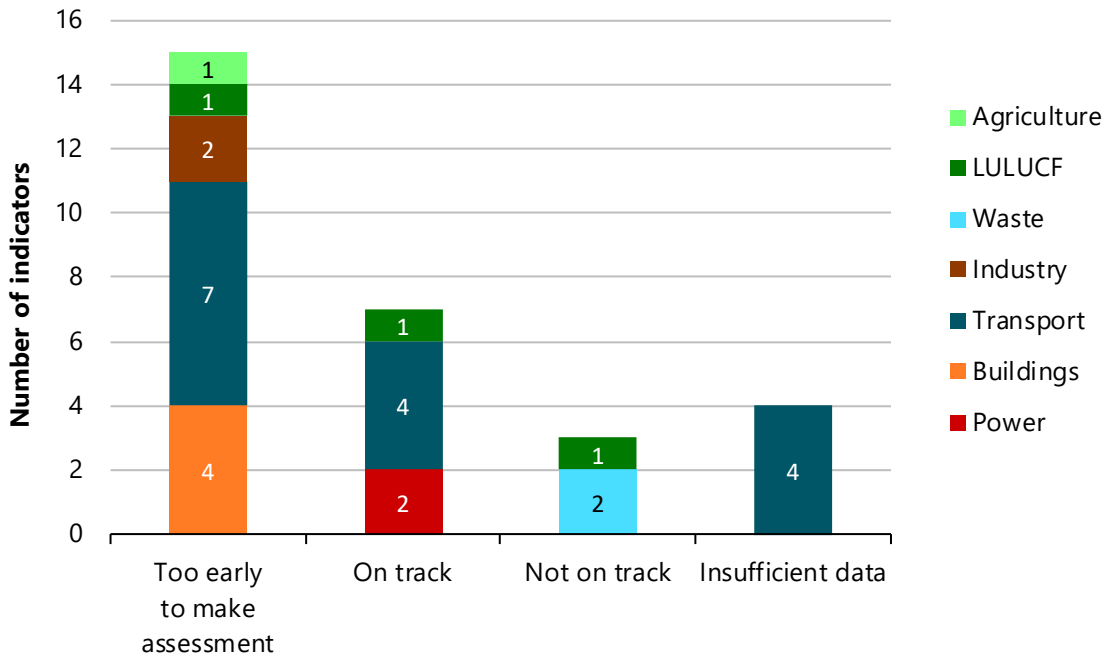
1. Scottish Government Climate Change Plan monitoring report 2019

The Climate Change (Scotland) Act has now been amended to require a sector-by-sector monitoring report to be laid before the Scottish Parliament each year. The most recent Climate Change Plan Monitoring Report sets out and tracks progress against 85 policy output and implementation indicators established in the most recent version of the Climate Change Plan.

The Scottish Government has stated it is too early to assess the majority of the indicators, and a comprehensive assessment of whether the Plan is fully on track has not yet been possible. Of the policy indicators where assessments have been possible, seven are assessed as 'on track' (across the electricity, transport and forestry sectors) and three are assessed as 'off track' (across waste and peat) (Figure 3.1).

The Committee welcomes the publication of the monitoring report, and as it develops the Committee expects to use this framework to complement and compare to our own set of indicators that will track progress in Scotland.

Figure 3.1. Climate Change Plan monitoring report 2019



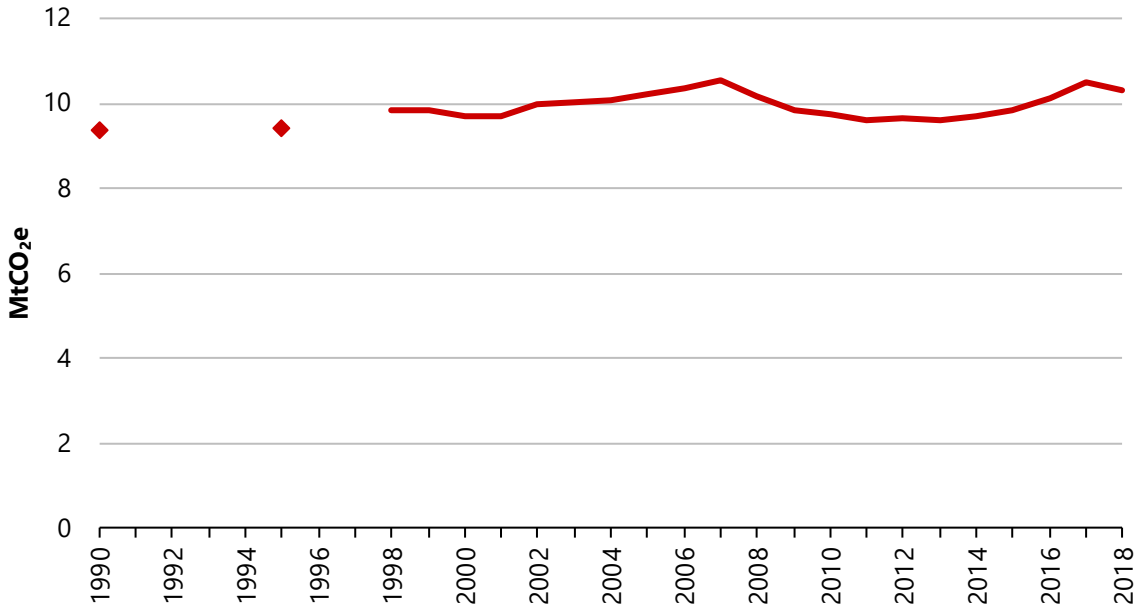
Source: Scottish Government (2020) *Climate Change Plan Monitoring Report December 2019.*
Notes: The seven indicators on track were electricity grid intensity; peak electricity demand compared to Scotland's maximum supply capacity from non-intermittent sources; reporting on rail freight strategy; low-emission ferries in govt ownership; percentage of rail electrified; active travel budget; and area of new woodland created. The indicators not on track were the volume of waste landfilled; number of landfill sites fitted with methane capture; and area of restored peatland.

2. Surface transport

Transport – when including international aviation and shipping – accounted for more than one-third (36%) of Scotland's greenhouse gas emissions in 2018. Surface transport emissions were 70% of total transport emissions in 2018.

Surface transport emissions fell by 2% in 2018 compared to 2017 (Figure 3.2) and accounted for 25% of total Scottish emissions. Unlike most other sectors, surface transport did not see a fall in emissions in the decade between 2008 and 2018. Emissions in 2018 were 1% higher than 2008 and were 10% higher than 1990.

Figure 3.2. Surface transport emissions in Scotland (1990-2018)



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.*
Notes: No emissions data are available for Scotland for 1991-1994 or 1996-1997. Does not reflect forthcoming revisions to global warming potentials (see Box 2.1).

The current trend on transport emissions is off-track for meeting Scotland's interim emissions reduction targets and net zero:

- There have been some improvements in car efficiency for given car classes over the past decade, despite difficulties with the New European Drive Cycle (NEDC) testing process.[22] These improvements have been driven by EU standards and implemented by the UK Government. Overall, the test-cycle emissions per km of new registered cars in Scotland have reduced from 156 gCO_2/km in 2008 to 124 gCO_2/km in 2018[23] although the average CO_2 intensity increased by 3% between 2017 and 2018.

[22] The test cycle used to measure new car emissions changed in 2018 from the New European Drive Cycle (NEDC) to the Worldwide Harmonised Light Vehicle Test Procedure (WLTP), with the majority of cars tested under the latter procedure in 2019. These produce different results, therefore comparisons before and after 2019 are not possible.
[23] Transport Scotland (2019) *Scottish Transport Statistics No. 38 2019 Edition, Chapter 13: Environment and Emissions.*

- The total distance driven has increased overall during the past decade, despite a steady decrease in distances driven between 2007 and 2011. Total vehicle road traffic was 48 billion vehicle-kms in 2019,[24] an increase of 8% since 2008.

Despite policies such as Smarter Choices Smarter Places and the Cycling Action Plan, there has been no significant behavioural shift away from cars towards public transport, walking and cycling in Scotland in the last decade.[25]

- In 2018, 68% of Scottish commuters' usual method of travelling to work was by car or van, slightly up from 2008 (66%). The number of pupils whose main method of travel to school is by car or van has remained the same between 2008 and 2018 (24%).
- The proportion of people who usually walk to work was unchanged at 12% in 2018 compared to 2008, though the rate of cycling has increased from 2.3% to 2.8%. The proportion of schoolchildren walking to school has increased by 3 percentage points to 52% in the same period and the rate of cycling was largely unchanged.
- From 2008 to 2018, the proportion of people using the bus for their main method of transport has fallen for travellers to work (-2.0 percentage points) and to school (-4.9 percentage points), while rail use has increased amongst commuters (+1.2 percentage points) and remained stable amongst school pupils (no change).

While the use of cars and vans to commute to work is lower for urban households (64%) than the Scottish average, the ambition in the 2019-20 Programme for Government to aim for zero-emission or ultra-low-emission city centres by 2030 will require the provision of ultra-low-carbon public transport options, cycling routes, and extensive deployment of electric vehicle recharging infrastructure to support a shift away from the use of conventional vehicles. The Scottish Government response to the COVID-19 pandemic is an opportunity to reduce the influence of rising demand (e.g. by facilitating and encouraging a move towards home working, and making it easy for people to walk and cycle).

Electric vehicle (EV) uptake has been slow in the 2010s, but has accelerated in recent years as battery costs have fallen and vehicle ranges have improved. Our 2020 Progress Report stated that electric vehicle sales in the UK are not currently on track; Scotland's rate of uptake of electric vehicles has generally been lower than the rest of the UK through the 2010s, although the gap has started to close. Fewer than 500 plug-in cars and vans were on the road in Scotland in 2010, including plug-in hybrids and battery electric vehicles (BEVs).[26] There are now over 14,000 plug-in cars and vans on the road (~1% of total cars) in Scotland, and sales of ultra-low emission vehicles in the first half of 2020 were 15% higher than in 2019 despite the impact of the pandemic.[27]

[24] Transport Scotland (2019) *Scottish Transport Statistics No. 38 2019 Edition, Chapter 5: Road Traffic.*
[25] Transport Scotland (2019) *Scottish Transport Statistics No. 38 2019 Edition, Chapter 11: Personal and Cross-Modal Travel.*
[26] Transport Scotland (2019) *Scottish Transport Statistics No. 38 2019 Edition, Chapter 13: Environment and Emissions.*
[27] DfT (2020) *Vehicle Licensing Statistics Ultra low emission vehicles (ULEVs) registered for the first time by region, United Kingdom from 2010 Q1.*

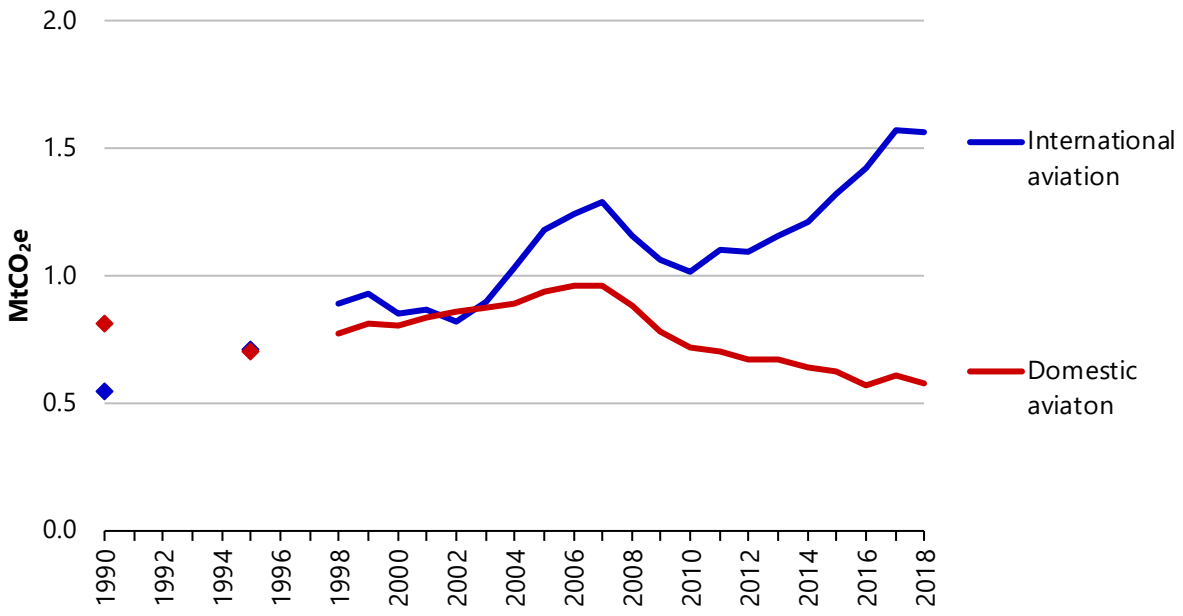
3. Domestic and international aviation

Aviation emissions in 2018 were 2.1 $MtCO_2e$, 2% lower than in 2017. Aviation emissions have grown significantly in Scotland, and were 57% higher than 1990 levels and 5% higher than 2008 levels (Figure 3.3) in 2018:

- Emissions from domestic flights decreased steadily from 2008 to 2018 (by a total of 35%) to 0.6 $MtCO_2e$, and were 29% below 1990 levels.
- In contrast, emissions from international flights continued to rise and are now 86% greater than in 1990 at 1.6 $MtCO_2e$ and were 36% higher than 2008. Emissions from international aviation decreased slightly by 0.5% between 2017 and 2018.

The increase in emissions has therefore been due to an increase in demand for international flights. International aviation emissions in Scotland fell in 2009 and 2010 after the financial crisis, but have since risen steadily in recent years. Over the same 2008-2018 period, the total number of terminal passengers in Scotland rose by 54% to reach 16 million in 2018.[28] The increase in emissions 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.

Figure 3.3. Aviation emissions in Scotland (1990-2018)



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.*
Notes: No emissions data are available for Scotland for 1991-1994 or 1996-1997. Does not reflect forthcoming revisions to global warming potentials (see Box 2.1).

[28] Transport Scotland (2019) *Scottish Transport Statistics No. 38 2019 Edition, Chapter 8: Air Transport.*

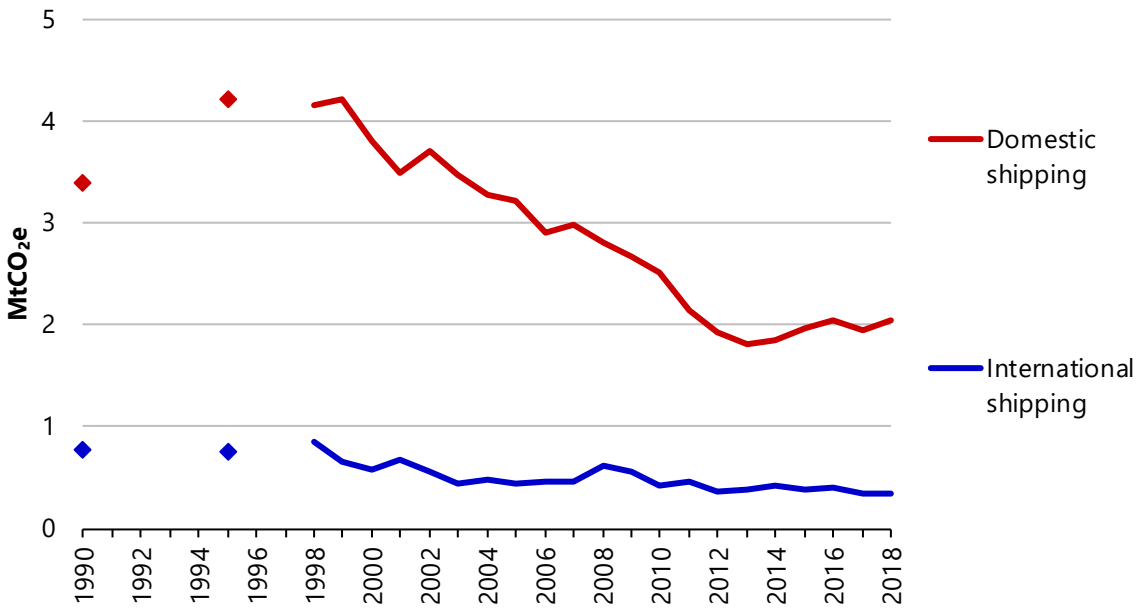
4. Domestic and international shipping

Shipping emissions rose by 3% between 2017 and 2018 to 2.4 $MtCO_2e$, and were 43% below 1990 levels. Shipping has seen an overall decrease in emissions of 31% over the period 2008-2018, despite an increase in domestic shipping emissions between 2015 and 2018 (Figure 3.4):

- The largest sources of UK domestic shipping emissions were coastal shipping (1.6 $MtCO_2e$) and fishing vessels (0.4 $MtCO_2e$). In 2018, domestic shipping emissions were 2.0 $MtCO_2e$, 4% higher than the previous year and 40% lower than 1990 levels. This increase drove up total emissions from shipping in Scotland.
- International shipping emissions fell slightly (by 5%) to 0.3 $MtCO_2e$, and are now 66% below 1990 levels.

Unlike the UK shipping sector – where over half of UK shipping emissions are associated with maritime fuel bunker sales for international shipping – domestic shipping in Scotland is responsible for more than five times the greenhouse gas emissions than from international shipping.[29]

Figure 3.4. Shipping emissions in Scotland (1990-2018)



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.*
Notes: No emissions data are available for Scotland for 1991-1994 or 1996-1997. Does not reflect forthcoming revisions to global warming potentials (see Box 2.1).

[29] Scotland's consumption emissions account for international shipping emissions associated with goods imported to UK ports outside of Scotland that are then transported domestically within the UK to Scotland (Box 2.2).

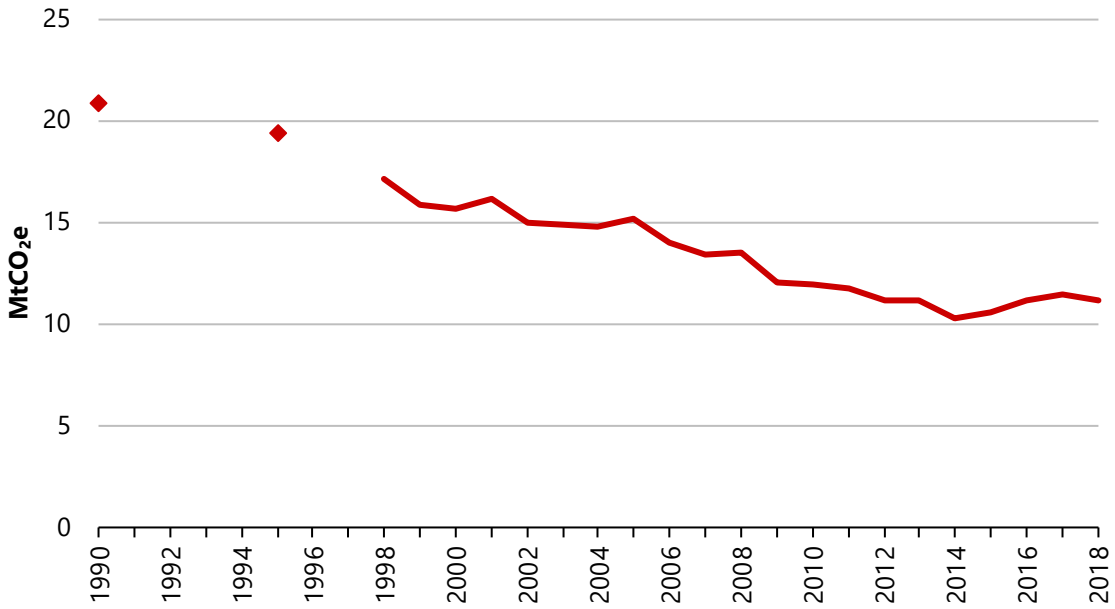
5. Industry

Industry is the second largest (27%) source of all greenhouse gas emissions in Scotland. Emissions in 2018 decreased by 2% to 11.2 $MtCO_2e$. Industry has seen significant reductions in emissions over the past decade, falling by 27% over the period 2008-2018, and emissions have nearly halved since 1990. Emissions from industry fell steadily from 1990 to 2014, but the sector has seen an increase in emissions since 2014 (Figure 3.5).

Chemicals manufacture, refineries, oil and gas extraction and production, and other industrial combustion are the main sources of emissions in the industry sector in Scotland, and make up almost 60% of total emissions in this sector. Emissions in industry have fallen due to reductions across all parts of industry – particularly in manufacturing and fossil fuel supply (Figure 3.6):

- More than half (1.3 $MtCO_2e$) of the emission reductions in industry in Scotland came from the paper, chemicals, refining, and food and drink sectors.[30]
- Fossil fuel production emissions have also fallen by 0.5 $MtCO_2e$ (-20%) since 2008, while a further 0.4 $MtCO_2e$ reduction (-35%) came from a fall in fugitive emissions from fuels.

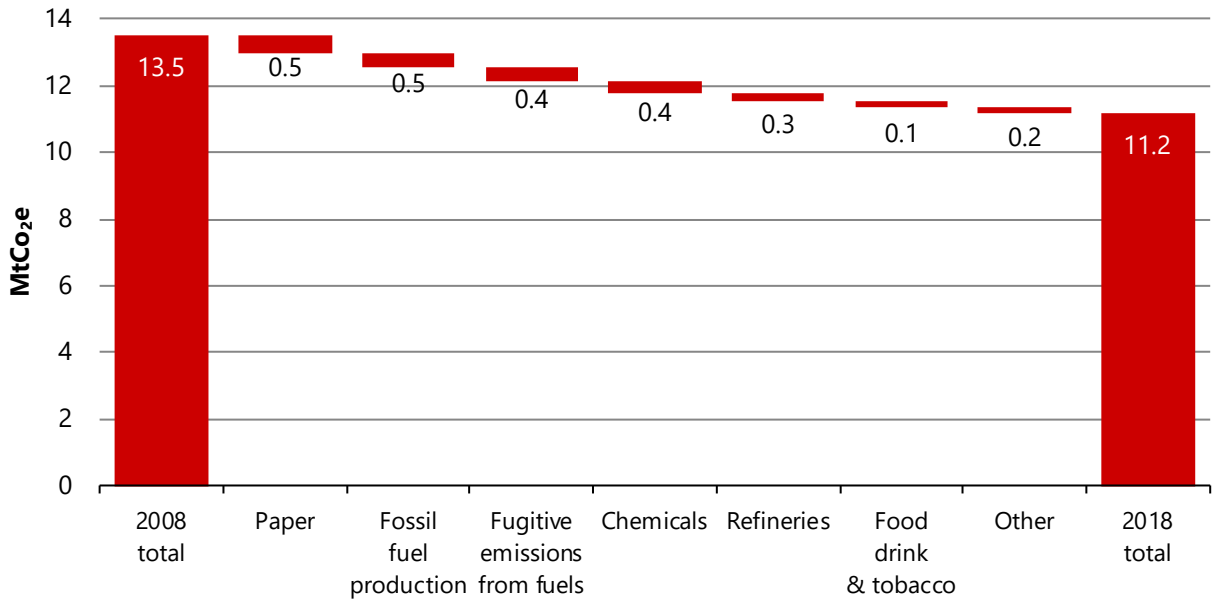
Figure 3.5. Emissions from industry in Scotland (1990-2018)



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.*
Notes: No emissions data are available for Scotland for 1991-1994 or 1996-1997. Does not reflect forthcoming revisions to global warming potentials (see Box 2.1).

[30] CCC (2019) *Net Zero: Technical Report*.

Figure 3.6. Change in emissions by industry sub-sector in Scotland between 2008 and 2018



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019;* CCC analysis.
Notes: Does not reflect forthcoming revisions to global warming potentials (see Box 2.1).

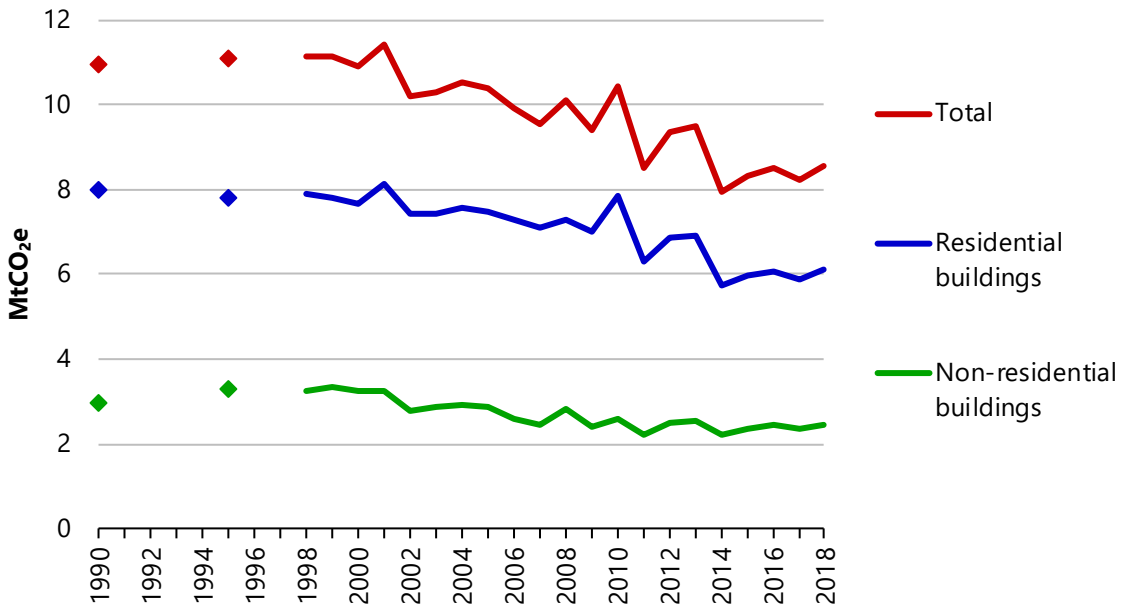
6. Buildings

Direct emissions from buildings[31] increased by 4% from 2017 to 8.5 $MtCO_2e$ in 2018, and were 21% of total Scottish emissions in 2018. Emissions from non-residential buildings accounted for 29% (2.4$MtCO_2e$) of total emissions from buildings, with residential buildings accounting for the other 71% (6.1 $MtCO_2e$).

Emissions from buildings have seen some progress in the past decade, with total emissions falling 16% in from 2008 to 2018, with progress mainly seen in the residential buildings sector (Figure 3.7).

The extreme cold weather event the 'Beast from the East' in March 2018 resulted in colder weather for 2018 compared to 2017 and 2019 (Figure 2.7). This is likely to be a significant driver of the increase in emissions seen in 2018. The Scottish Government does not publish an estimate of 'temperature-adjusted' emissions that would show the underlying trend in buildings emissions more clearly. However, improvements to the energy efficiency ratings of homes (Figure 3.9) suggests that a proportion of the emissions reductions made in the last decade reflects genuine improvements.

Figure 3.7. Emissions from buildings in Scotland (1990-2018)



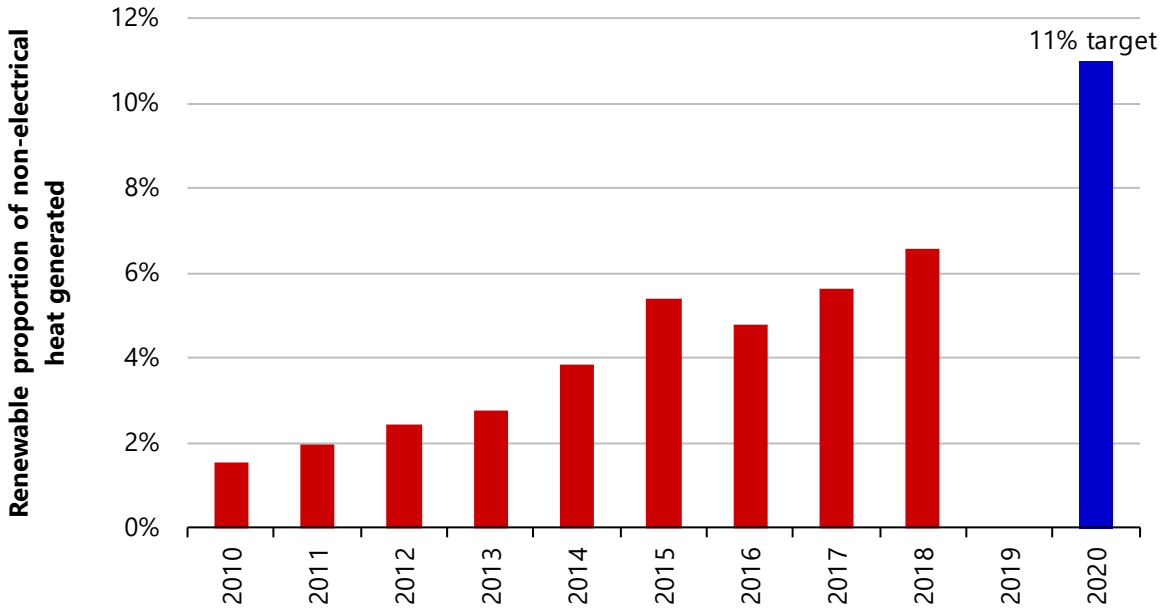
Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.*
Notes: No emissions data are available for Scotland for 1991-1994 or 1996-1997. Does not reflect forthcoming revisions to global warming potentials (see Box 2.1).

[31] Direct emissions from buildings do not include emissions associated with generating electricity for use in buildings.

The bulk of the challenge to decarbonise buildings in Scotland remains, with the greatest challenge on decarbonising heating and hot water:

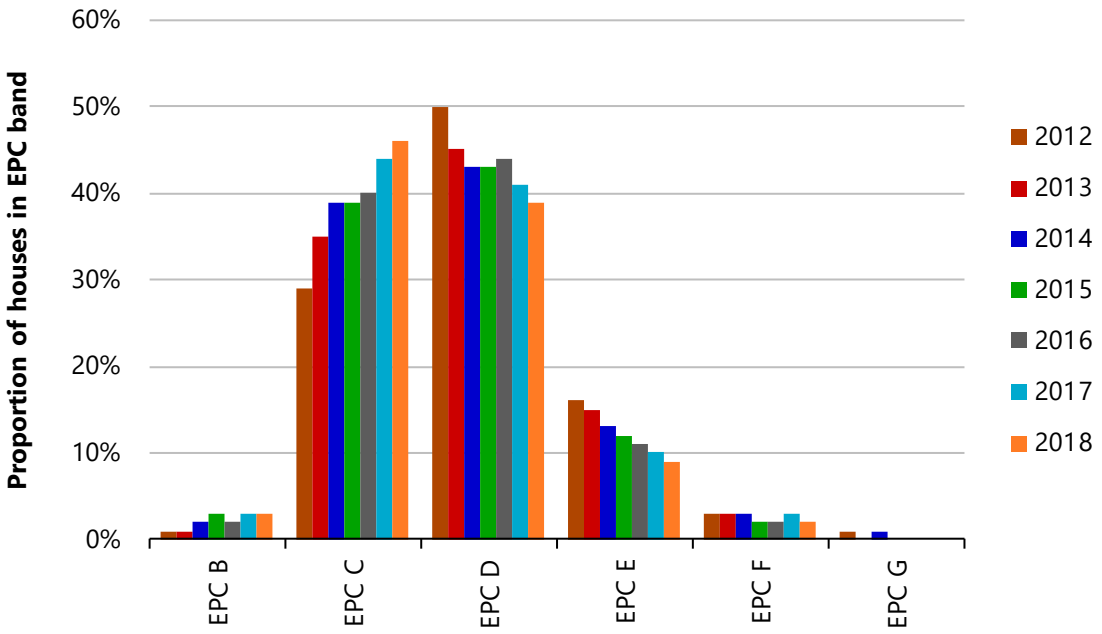
- **Low-carbon heat in existing homes.** The major challenge for the buildings sector remains the need to shift homes away from fossil gas to low-carbon heat solutions. The last decade has seen limited progress in this area under the Renewable Heat Incentive (RHI), although Scotland has a proportionately higher number of accreditations on the GB-wide RHI scheme relative to its population. There were fewer than 13,500 heat pumps in Scotland in 2018. Scotland is not currently on track to meet its 2020 target of 11% of non-electric heat from renewable sources (Figure 3.8), let alone a level of low-carbon heat that is consistent with Net Zero.
- **Energy efficiency in existing homes.** The major challenge of widespread building renovation and retrofit to increase building heat efficiency is yet to be addressed, although some progress in improving EPC of homes has been made (Figure 3.9), particularly in houses moving out of EPC bands D and E and into band C.
- **New homes.** Scotland's new build standards – due to be legislated in 2021 – must ensure that all new homes use low-carbon heat, are ultra energy efficient and are designed for a changing climate.

Figure 3.8. Share of renewable heat in non-electrical heat demand (2010-2017, 2020 target)



Source: Scottish Government (2020) *Scottish Energy Statistics Hub*. Share of renewable heat of non-electrical heat demand.

Figure 3.9. Distribution of Scottish housing stock by EPC Band (SAP 2009)

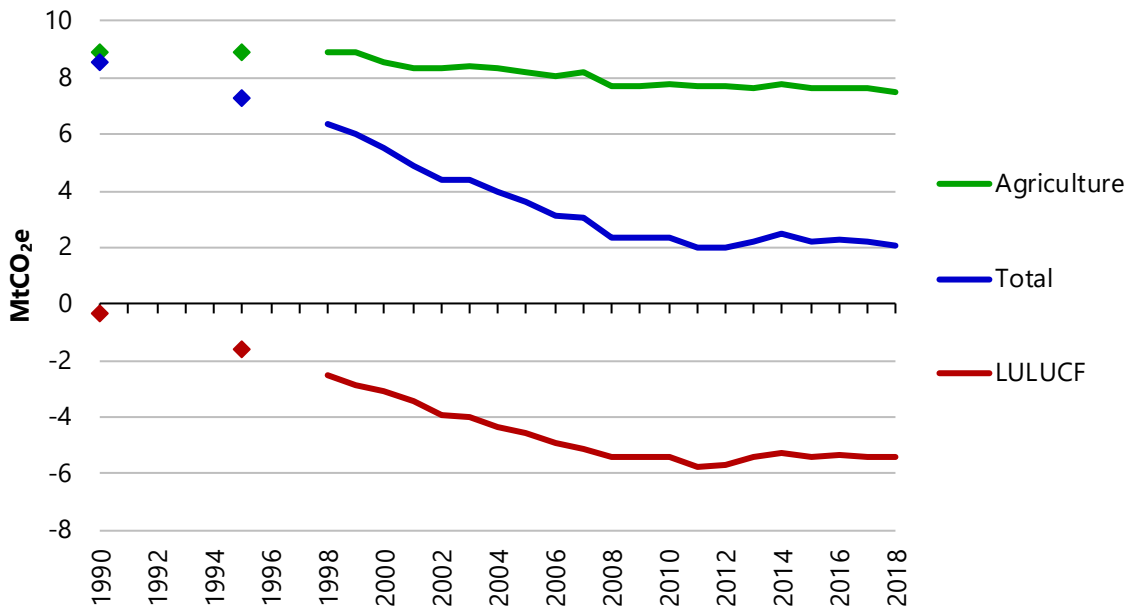


Source: Scottish Government (2019) *Scottish House Condition Survey: 2018 Key Findings.*
Notes: The older version of the Standard Assessment Procedure (SAP) to compare changes over time. SAP is periodically reviewed by the UK Government. The more recent (SAP 2012) was first used in reporting data from the SHCS in the 2014 Key Findings report and therefore only four years of data are available.

7. Agriculture and land use, land-use change and forestry LULUCF

In 2018, net emissions across the agriculture and land use, land use change and forestry (LULUCF) sectors totalled 2.0 $MtCO_2e$, down 0.1 $MtCO_2e$ (-6%) from 2017 and 13% lower than 2008 levels (Figure 3.10). The last ten years have seen a modest but steady decline in emissions from agriculture-related land use[32] while direct emissions from agriculture have remained stable and the size of the forestry carbon sink has fallen since 2008.

Figure 3.10. Emissions from agriculture and LULUCF in Scotland (1990-2018)



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.*
Notes: No emissions data are available for Scotland for 1991-1994 or 1996-1997. Does not reflect forthcoming revisions to peatland or global warming potentials (Box 2.1). LULUCF = land use, land-use change and forestry.

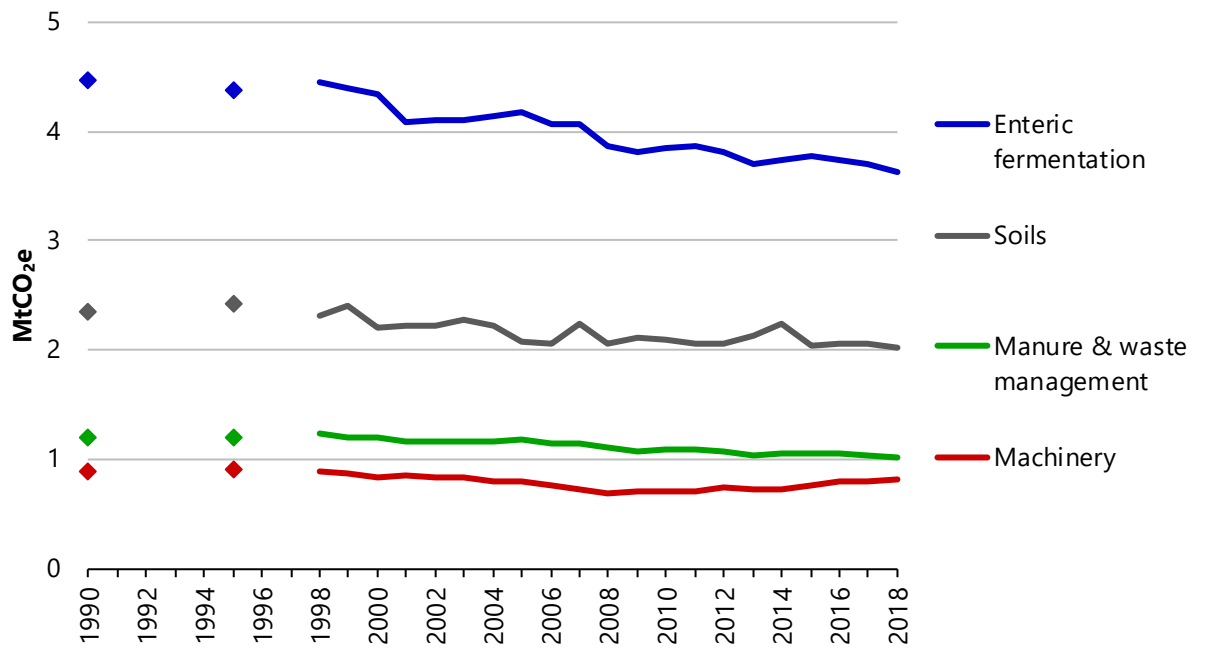
a) Agriculture

Emissions from agriculture were relatively unchanged in Scotland in the ten years from 2008 to 2018, falling by 3% between 2008 and 2018 to 7.5 $MtCO_2e$ (Figure 3.11):

- Emissions from the digestive processes of livestock (enteric fermentation) continued to account for about half (48%) of all agricultural emissions, and have fallen by 6% since 2008. A further 14% of emissions are from manure and waste management, which fell by 8% from 2008 to 2018.
- Soil emissions account for a further 27% of emissions from agriculture, and have been unchanged since 2008.
- The remaining emissions (11%) were from machinery, which have increased by 17% since 2008.

[32] Agriculture-related land use covers emissions from existing cropland and grassland and land-use changes to cropland and grassland.

Figure 3.11. Emissions from agricultural sources in Scotland (1990-2018)



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.*
Notes: No emissions data are available for Scotland for 1991-1994 or 1996-1997. Does not reflect forthcoming revisions to peatland or global warming potentials (see Box 2.1).

b) Land use, land-use change and forestry (LULUCF)

Under the current inventory, the LULUCF sector in Scotland is a net carbon sink due to forestry. In the ten years from 2008 to 2018 the size of the net land-use sink was largely unchanged, increasing by 1% to 5.4 $MtCO_2e$ (Figure 3.12):

- The amount of CO_2 Scotland's forests removed from the atmosphere each year fell from 10.7 $MtCO_2e$ in 2008 to 9.6 $MtCO_2$ in 2018.
- Emissions from agriculture-related land use[33] fell by 0.6 $MtCO_2e$ over the same period (-41%).

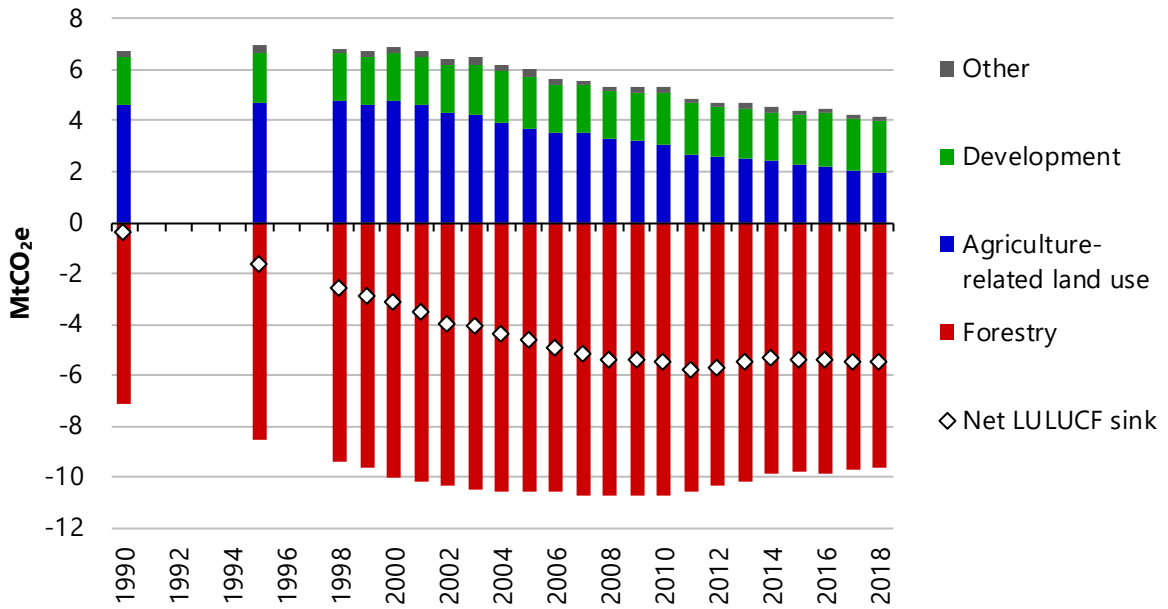
In the year ending March 2019, the Scottish Government, met its own tree-planting targets for the first time by planting 11,200 ha of new trees, though it missed its target for 12,000 hectares in the year ending March 2020. Over 97% of new planting was private,[34] with 270 ha planted on Scotland's national forest estate (Figure 3.13). In 2019/20, Scotland accounted for 80% of all new planting in the UK.

[33] Emissions and sequestration of greenhouse gases directly from and as a result of land-use changes to cropland and grassland, rather than direct emissions from agricultural activities (see Figure 3.12).

[34] Trees planted on public land that is not part of Scotland's national forest estate is considered 'private' planting.

Emissions from peatlands are not currently fully accounted for in Scotland's greenhouse gas inventory, but Scotland's wetlands currently emit greenhouse gases at a rate of between 6-10 $MtCO_2e$ per year, and will continue to emit until restoration actions are taken.[35] Analysis for our 2019 Net Zero report suggested that a minimum of 18,000 hectares of peatland restoration should be carried out in Scotland annually from the mid-2020s to 2045. The Scottish Government has recently committed to restoring an average of 20,000 hectares per year in the next decade.

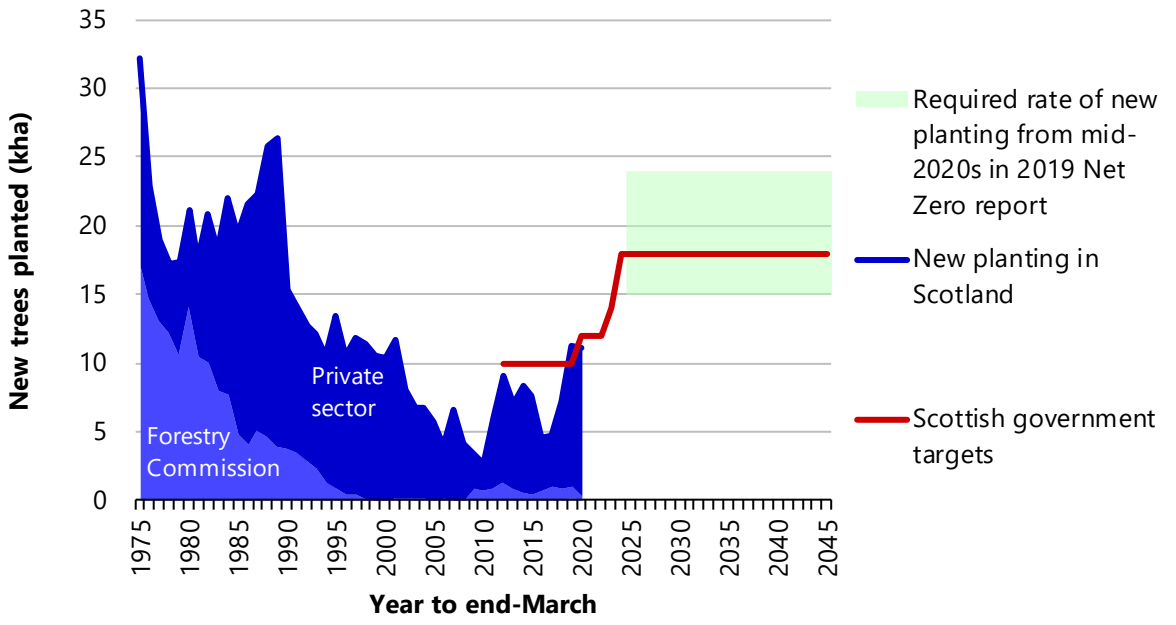
Figure 3.12. Emissions from land use, land-use change and forestry sources in Scotland (1990-2018)



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.*
Notes: No emissions data are available for Scotland for 1991-1994 or 1996-1997. Does not reflect forthcoming revisions to peatland or global warming potentials (see Box 2.1).

[35] This uncertainty is due to the different possible methodologies used to calculate greenhouse gas emissions from wetlands, particularly forested peatland.

Figure 3.13. New tree planting in Scotland (1975-2019)



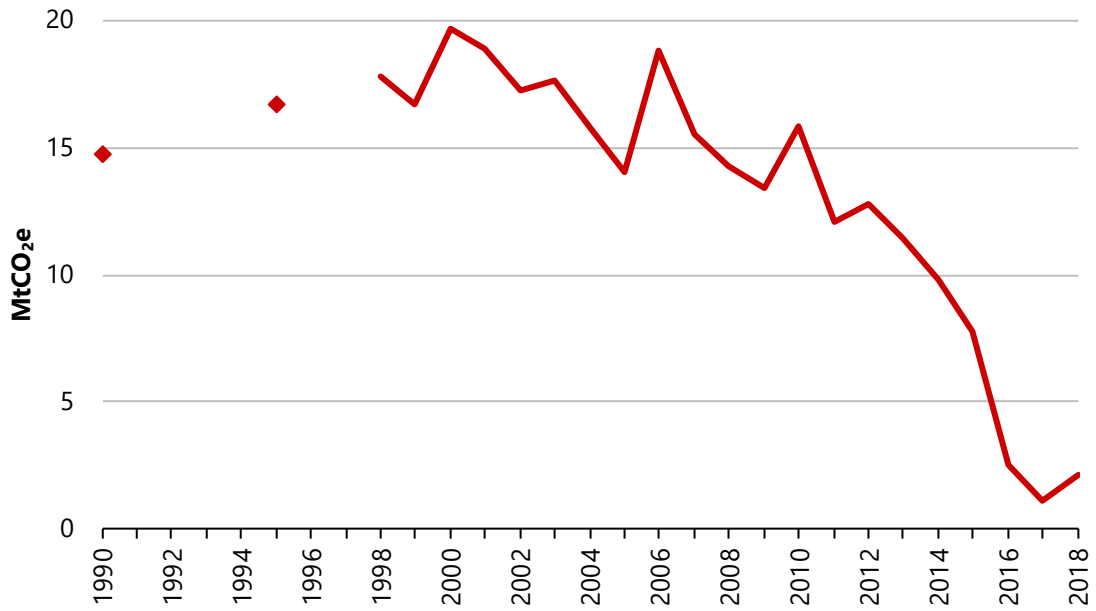
Source: Forest Research (2020) *Forestry Statistics 2020. New planting and restocking: time series*; CCC analysis.
Notes: The range of tree planting shown are the 'Further Ambition' and 'Speculative' rates for Scotland from the 2019 Net Zero report.

8. Power

The power sector has been a major success story in Scotland in the past decade. Emissions have decreased by 85% over the period 2008 to 2018 (Figure 3.14), reflecting real decarbonisation of energy produced in Scotland. In 2018, direct emissions from the power sector accounted were 2.1 $MtCO_2e$, 5% of total Scottish emissions.

Emissions increased by 1.0 Mt in 2018 (+86% compared to a low base in the previous year) almost entirely driven by an increase in gas-fired generation at Peterhead power station. It is likely that emissions from Peterhead will fluctuate from year to year as a result of wider changes in the GB power system.

Figure 3.14. Power sector emissions in Scotland (1990-2018)



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.*
Notes: No emissions data are available for Scotland for 1991-1994 or 1996-1997. Does not reflect forthcoming revisions to global warming potentials (see Box 2.1).

Electricity generated from renewables was 9 TWh in 2008 (18% of all electricity generation in Scotland), and rose to 26 TWh in 2018 (55% of total generation), with a further increase to 31 TWh in 2019 (Figure 3.15).

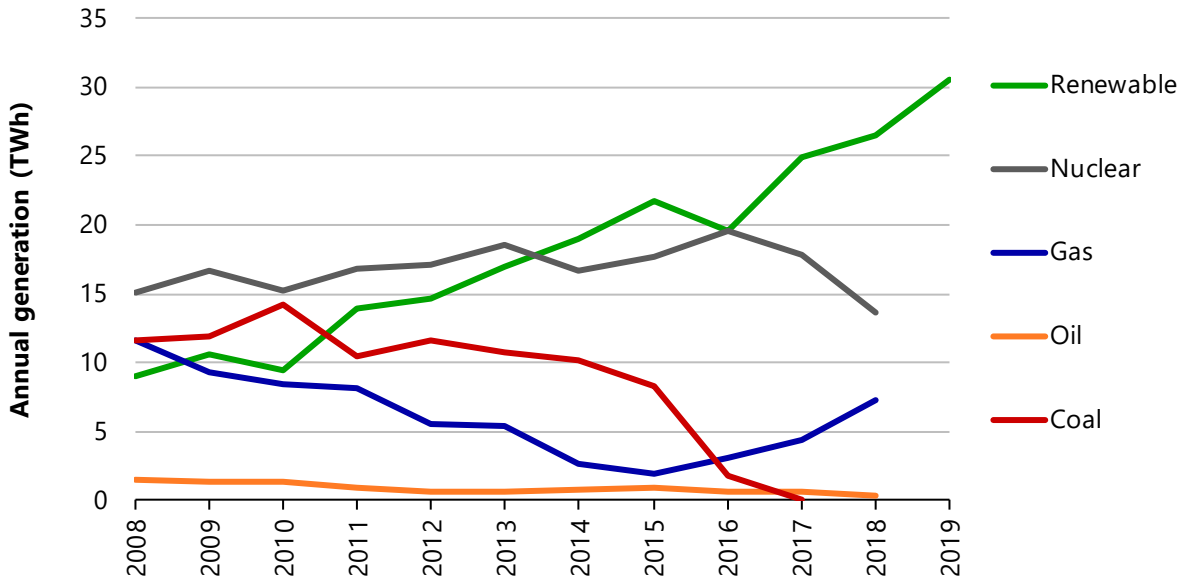
As of March 2020, Scotland has 11.9 GW of installed renewable generation capacity operational with a further 13.5 GW in the pipeline.[36] Scotland produced 90.1% of its gross electricity consumption from renewable sources in 2019, putting the 2020 target of 100% within reach.[37]

[36] Scottish Government (2020) *Scottish Energy Statistics Hub.*
[37] Gross electricity consumption refers to total electricity generation minus net exports.

Scotland's last coal-fired power station closed in 2016 and the share of fossil-fuelled generation has fallen from 50% of all generation in Scotland in 2008 to 16% in 2018. This has been driven by effective policy:

- The Government introduced Electricity Market Reform in 2012. This included a host of policies that led to the decarbonisation of the UK's power sector and complemented the existing Renewable Obligation Certificates (introduced in 2002) and Feed-in Tariffs (introduced in 2010).
- Contracts-for-Difference (CfD) de-risk future returns for low-carbon investors. This gives investors greater confidence to invest in these projects which have high up-front capital costs. This investment, initially catalysed by the Green Investment Bank, has helped drive an increase in renewable generation and reduce the costs of the technology.
- Carbon pricing contributed to the decommissioning of coal by making it uncompetitive against gas-fired generation.
- European efficiency standards for lights and household appliances drove down electricity use as products were replaced over time with more efficient models.
- A favourable planning and consenting regime in Scotland and other enabling measures such as targets for community and locally owned energy projects have allowed Scotland to capitalise on its natural advantages for producing low-cost renewable energy.

Figure 3.15. Energy generation by fuel in Scotland (2008-2018)



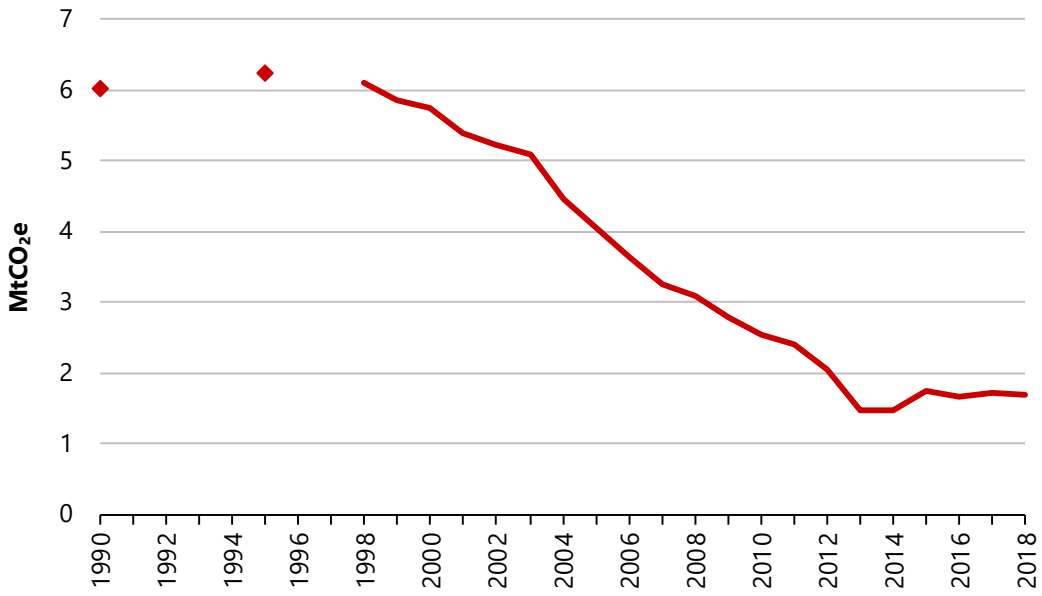
Source: Scottish Government (2020) *Scottish Energy Statistics Hub: Proportion of electricity generation by fuel, Electricity generated from renewable sources 2000-2019.*

9. Waste

In 2018, emissions from waste in Scotland remained relatively flat, recording a fall by 2% to 1.7 $MtCO_2e$, 72% below 1990 levels (Figure 3.16). Almost all (1.6 $MtCO_2e$) emissions from the waste sector[38] were methane.

Waste emissions continued to account for only 4% of total emissions of Scotland in 2018, reflecting significant progress from 1990 when waste accounted for 8% of all Scottish emissions. Over the last 10 years, the sector has seen the second largest long-term fall in emissions across the economy – 2018 emissions were 46% lower than 2008 – although progress has stalled since 2013. The fall over the last decade is mainly due to a reduction in total waste generated, increased recycling rates and a significant reduction in the amount of biodegradable waste landfilled.

Figure 3.16. Waste sector emissions in Scotland (2008-2018)



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.*
Notes: No emissions data are available for Scotland for 1991-1994 or 1996-1997. Does not reflect forthcoming revisions to global warming potentials (see Box 2.1).

Across the UK, there were 6.8 $MtCO_2e$/yr of fossil-related GHG emissions resulting from the conversion of municipal solid waste and other industrial wastes into power and/or heat, an increase of 14% from 2017. These emissions are currently counted within the Power and Industry sectors above, rather than the Waste sector.[39]

[38] The definition of the waste sector here excludes combustion of waste for energy (e.g. incineration), which are counted in the power and industry sectors.
[39] Defra (2019) *Statistics on waste managed by local authorities in England in 2018/19*.

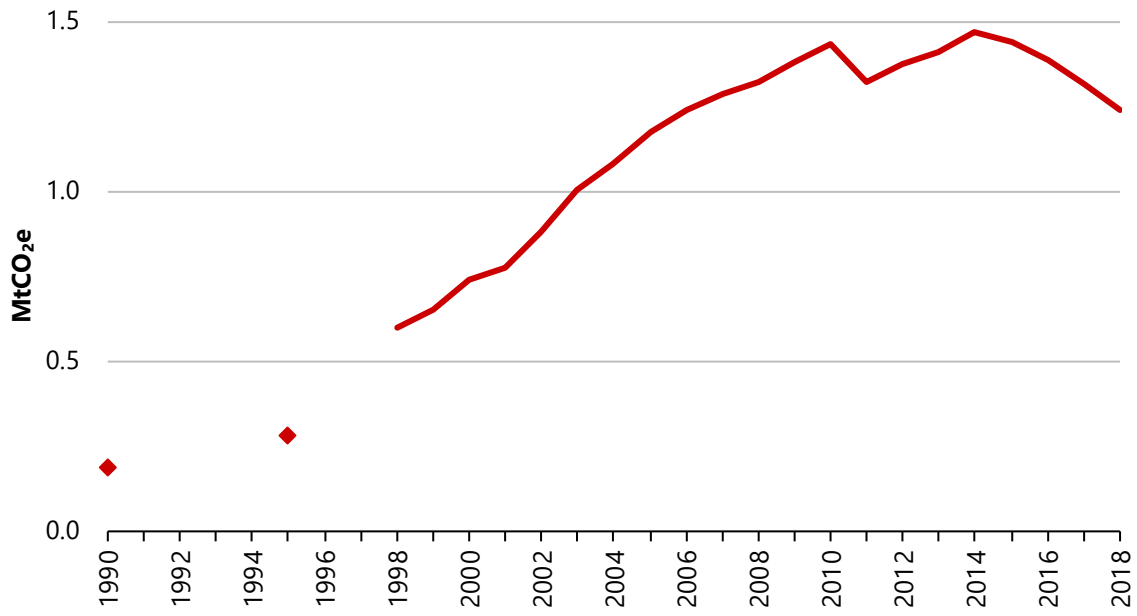
The Scottish inventory does account for emissions associated with energy from waste, but these are not published as a separable source of emissions. However, Scottish energy from waste (EfW) emissions are likely to be increasing rapidly, due to a number of new EfW plants having been recently built and under construction.[40]

10. F-gases

In contrast to F-gas emissions in the UK as whole, F-gas emissions in Scotland did not peak in 1997. The rapid fall in emissions seen for the UK from 1997 to 2000 was driven by regulations to virtually eliminate leakage from the production of halocarbons, which were not manufactured at scale in Scotland at the time. The largest source of F-gas emissions – in Scotland and for the whole of the UK – is now the refrigeration air-conditioning and heat pump (RACHP) sector.

F-gas emissions have fallen in every year since 2015, resulting in a total decrease of 6% from 2008-2018. These reductions are a result of industry pressure as well as strong EU regulation on their use (requiring a 79% reduction in the use of most F-gases by 2030), driving innovation and product shifts.

Figure 3.17. F-gas emissions in Scotland (2008-2018)



Source: NAEI (2020) *Greenhouse Gas Inventories for England, Scotland, Wales & Northern Ireland: 1990-2019.*
Notes: No emissions data are available for Scotland for 1991-1994 or 1996-1997. Does not reflect forthcoming revisions to global warming potentials (see Box 2.1).

[40] SEPA (2019) *Waste incinerated in Scotland – 2018.*

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Chapter 4: Policy progress in the last year

In this chapter, we outline policy developments since our previous Progress Report.

Policy progress is discussed sector by sector, based on the priority policy actions for 2019 and 2020 we recommended to the Scottish Government last year. The Scottish Government has made progress against the milestones, with six milestones being fully achieved and a further six partially achieved (Tables 4.1 to 4.7) in the policy areas which are either fully devolved or require a balance of UK and Scottish Government action.

The coming year is crucial. The delay of COP26 to November 2021 provides a window to address this policy deficit and establish a credible internationally-leading position. The key remaining elements of the net-zero policy package must be put in place in the coming months, early enough to demonstrate Scotland's credentials ahead of COP26.

In 2020, we wrote to the Scottish Government advising on a 'green recovery' for Scotland, and we expanded our advice for a resilient recovery in our 2020 Progress Report to UK Parliament. As Scotland takes steps to recover from the most immediate impacts of the pandemic, we can now also begin to assess the extent to which our advice on a resilient recovery has been taken into account. The first signs coming out of the 2020-21 Programme for Government are positive, with emphasis given to energy efficiency and green jobs, but there is further scope for Scotland to demonstrate further ambition in its forthcoming update of the Climate Change Plan, due later this year.

When the Committee recommended the Net Zero target, we emphasised that "clear, stable and well-designed policies to reduce emissions further" must be introduced across the economy without delay. That process has begun, but is far from yet complete.

One year on from legislating a Net Zero target, in a twelve-month period that included a UK general election, departure from the European Union and the COVID-19 pandemic, the Scottish Government has made some important steps towards the policy changes that are required to prepare for the Net Zero.

In last year's Scottish Progress Report, we set out recommended milestone actions for 2019 and 2020, focusing on enabling those that lie on the ‘critical path’ to achieving the Net Zero target. These actions were split by sector and further categorised by whether responsibility for the most relevant policy levers lies primarily with the Scottish Government, with the UK Government, or is split across devolved and reserved powers.

We now present an assessment of performance against those milestones in Tables 4.1 to 4.7. The Committee's assessment is based on whether there is evidence that a policy milestone is **on track** to be achieved by the intended date, whether **partial progress** has been made (e.g. if work was due to be published but was delayed due to the pandemic), or there is **no evidence of progress**.

We have not included an assessment where the policy milestone was set for later than 2020. A summary of our assessments indicates that:

- Overall the Scottish Government fully achieved five milestones of the 11 set out in the 2019 Progress Report, and has made partial progress on a further three milestones:
  - **Milestones met.** The Scottish Government has – in line with our recommendations – set out substantive new policies for buses and active travel; is on track to legislate new standards for new build homes; has set new targets and funding for tree planting and peatland restoration in the next decade; and launched the first round of seabed leasing for offshore wind in Scottish waters in over a decade.
  - **Partial progress** has been made in three policy milestones. The Scottish Government has made some progress on both assessment and skills in the buildings sector, and Scotland's waste reduction targets have been set out but not yet legislated.
  - **Remaining gaps.** Areas of concern where three recommendations were not met, include agriculture – where Scotland's future plans for rural support to replace the Common Agricultural Policy have not yet been set out (although the 2020-21 Programme for Government did commit to making new recommendations on mechanisms for agricultural support) – and the waste sector where the landfill ban on biodegradable waste was pushed back from 2021 to 2025.
- One of the five policy milestones which required the closest balance of devolved and reserved policies has been fully delivered:
  - **Milestone met.** The UK and Scottish Government have legislated for a UK-wide scheme to replace the EU F-gas Regulation with a scheme of equivalent strength once the UK leaves the European Union.
  - **Partial progress** has been made in three policy milestones in transport and buildings. The UK Government is expected to make an announcement on the target date to phase out petrol and diesel cars, and the Scottish Government should ensure its target is at least as ambitious as this date. Partial progress has also been made in improving HGV efficiency. The Scottish and UK governments have not yet set out a long-term future for heat decarbonisation in Scotland, but the Scottish Government is now due to publish a draft Heat Policy Statement at the end of this year. The HM Treasury review on Net Zero is underway.
  - **Remaining gaps.** There is still a risk of a policy hiatus following the closure of the Renewable Heat Incentive – despite a one-year extension – and no progress has been made in publishing detailed plans to phase out the installation of fossil fuel heating in off-gas properties in the 2020s from either the UK or Scottish Government. Much rests on Scottish Government's draft Heat Policy Statement and next phase of the Energy Efficient Scotland Programme, and the UK Heat and Buildings strategy.
- The UK Government has delivered on one of the 16 policy milestones that we flagged in the 2019 Scotland Progress Report as having direct impacts on Scotland.

More broadly, our UK Progress Report found that **the UK Government only fully achieved one milestone out of the 30 set out in the 2019 UK Progress Report**,[41] with partial progress made in 15 policy milestones which lie predominantly in the transport and industry sectors:

- **Milestone met.** In industry, the UK Government published an evaluation of its Climate Change Agreements.
- **Partial progress** was made in ten policy milestones. The UK Government is consulting on bringing forward the phase-out date for petrol and diesel cars and vans buildings; funds have been committed for the first zero-carbon industrial cluster; 6 GW of offshore wind has been procured at record low prices – of which 740 MW is in Scottish waters – and onshore wind and solar are to be given the chance to bid for new Contract for Differences.
- **Remaining gaps.** A lot rests on the UK Heat and Buildings Strategy later this year, which must be ambitious, well-funded and well-designed, alongside the UK National Infrastructure Strategy. Policy is needed to deliver the cars and vans commitment, and other vehicles such as HGVs must also be addressed. Near-term and longer-term investable mechanisms must be developed for industrial decarbonisation, especially for carbon capture and storage (CCS) and fuel switching.

Some challenges were not highlighted in the 2019 Scotland Progress Report, such as aviation & shipping. While these sectors both require progress at the global level, UK Government policy will become increasingly important, as well as Scottish Government powers over air passenger duty (APD) and efforts to decarbonise short flights within the Highlands and Islands.

The key remaining elements of the net-zero policy package must be put in place in the coming months, early enough to demonstrate Scotland's credentials ahead of COP26.

1. Cross-economy

The past year has seen a number of important developments in Scottish climate change policy. In particular, major announcements in the Scottish Budget announced before the COVID-19 crisis and the Programme for Government (PfG) announced in September 2020 have demonstrated the Scottish Government's willingness to take meaningful action on climate change (Box 4.1):

- **The 2020-21 Programme for Government** included policy and funding announcements that aim at contributing to a 'green recovery' of the economy following the COVID-19 pandemic (Box 4.1). The **2020-21 Scottish Budget** also prioritised tackling climate change by allocating £1.8 billion to funding low emissions infrastructure and proposing a package of cross-government measures focusing on the trajectory to achieving Scotland's 2045 Net Zero target.
- The Scottish government established the independent **Citizens' Assembly of Scotland**, which aims at answering three broad questions: what kind of country Scotland is trying to build, how can it overcome the challenges it faces, and how can people best access the details they need in order to make informed decisions about the future of Scotland.

[41] The Welsh Government published a Waste Strategy which we also counted as a policy milestone achieved in that report.

The Assembly will be discussing how to build an environmentally sustainable Scotland, and a report with the recommendation of the Assembly will be laid in the Scottish Parliament. This can build on the insights gained through the Big Climate Conversation in 2019.

- The **Just Transition Commission** published its first report. The Commission advises the Scottish government on how to achieve an "inclusive, net-zero economy" while applying the International Labour Organisation's Just Transition principles to Scotland. The Commission's Interim Report in February 2020 highlighted the scale of the challenge and recommended a number of actions to the government, including placing equity at the centre of the Climate Change Plan, developing a Climate Emergency Skills Action Plan, and ensuring ongoing support to the just transition of the agricultural sector. The Commission provided further advice on a 'green recovery' in July 2020.
- The **Infrastructure Commission for Scotland** was appointed with the mandate to look at Scotland's infrastructure needs and strategy for the next 30 years. In January 2020, the Commission published its Phase 1 report with 23 recommendations to the Scottish government on heat, transport, digitalisation, demonstrating leadership and regulation. The Phase 2 report followed this up with recommendations for delivery. The Scottish Government's Infrastructure Investment Plan is due to follow later this year around the same time as this report.
- Carbon trading is a devolved matter[42] and the Scottish Government has jointly consulted[43] on a **UK-wide Emissions Trading Scheme** that is collectively agreed with the rest of the UK. The UK Government and devolved administrations have agreed plans to legislate for a standalone UK Emissions Trading Scheme that will be set up by 2021. It is yet to be determined whether this scheme will be connected with the EU ETS, pending EU negotiations. The UK Government has outlined its ambition for the scheme to be made consistent with the UK's Net Zero target, following the Committee's forthcoming advice on the Sixth Carbon Budget.

The Scottish Government is already taking action in each of our recommended areas for investment to stimulate a recovery from COVID-19. In particular, the Programme for Government was framed as a package for 'green recovery' and contained a range of measures suited to a low-carbon recovery, particularly around housing retrofits and skills and training.

The Scottish Government has committed to a substantial package of infrastructure investment; the forthcoming Infrastructure Investment Plan should ensure that this investment is compatible with and drives progress towards Net Zero. The Committee welcomes this clear signal that the Scottish Government's ambition of getting to Net Zero is unchanged by the pandemic. We discuss these issues further in section 4 of Chapter 5.

[42] The UK Government has stated that other carbon pricing mechanisms – such as a carbon tax – would fall under reserved powers.
[43] Scottish Government (2020) *The future of UK carbon pricing – UK Government and Devolved Administrations' response*.

Box 4.1. The 2020-21 Scottish Budget and Programme for Government

The 2020-21 Scottish Budget and the 2020-21 Programme for Government saw a number of substantial funding and policy announcements aiming at delivering on Scotland's emissions targets.

The **2020-21 Programme for Government**, delivered in the context of COVID-19, set out a 'national mission to help create new jobs, good jobs and green jobs' setting Scotland on the pathway to a green recovery:

- The first tranche of a £2 billion Low Carbon Fund was set out, including £1.6 billion over the next Parliament in heat and energy efficiency in homes and buildings.
- Established a £100 million Green Jobs Fund and a £25 million National Transition Training Fund with a focus on the 'provision of green skills to support Scotland's transition to net zero'.
- Committed £500 million for active travel infrastructure.

The **2020-21 Scottish Budget** pledged:

- A £1.8 billion programme of investment in low emissions infrastructure – an increase of £5oo million compared to 2019-20. This included a £120 million Heat Transition Deal, an £83 million Future Transport Fund, and an initial £40 million investment into the Agricultural Transformation Programme.
- £250 million dedicated to peatland restoration over the next 10 years.
- An additional £270 million to support sustainable public transport.

Source: Scottish Government (2020) *Scottish Budget 2020-2021*; Scottish Government (2020) *The Government's Programme for Scotland 2020-2021*.

There have been several positive examples of cross-cutting policy development and announcements from the UK Government which will directly affect policy in Scotland:

- The Government has instigated a **Cabinet Committee on Climate Change**, chaired by the Prime Minister. Our UK Progress Report recommended that this committee should meet monthly and report transparently against its goals to "to hold departments to account for their actions to combat climate change" (which should include adaptation actions) and to "coordinate" the Net Zero strategy.
- The **HM Treasury Net Zero Review** will report on how the transition to Net Zero will be funded and how the costs and savings associated with decarbonisation will be distributed fairly.
- In **bioenergy**, a new green levy will be established on bills to fund biomethane injection into the gas grid, with up to £150 million available annually via the Green Gas Support Scheme.[44] Proposals have also been set out by the Department for Transport (DfT) to double the amount of bioethanol blended in petrol from 5% to 10% (E10) across the UK during 2021.[45]

[44] BEIS (2020) *Future support for low carbon heat.*
[45] DfT (2020) *Introducing E10 Petrol.*

- **Greenhouse gas removals** (GGRs) are at an early stage of policy development in the UK. A September 2019 scoping study for BEIS by Vivid Economics set out potential GGR policy options.[46] UKRI have launched a £31.5 million GGR programme under the Strategic Priorities Fund. This includes a £22.5 million call to support up to 5 pilot projects during 2021-2026, and develop a £6.1 million central coordination hub.[47] BEIS have also announced a new £70m 'Direct Air Capture and GGR Innovation Competition', expected to open to prospective demonstration projects in late 2020.[48] There will also be Call for Evidence launched later in 2020 on negative emissions technologies and carbon pricing, to build on HM Treasury's carbon tax consultation.[49]
- In 2019, the Government announced a doubling of its **International Climate Finance (ICF)** support for addressing climate change in developing countries to at least £11.6 billion over the period 2021/22 to 2025/26. It has also subsequently committed to end financial support to coal mining and coal-fired power plants overseas through the UK's export credit agency (UK Export Finance), although the vast majority of UKEF support for fossil fuels in recent years has been for oil and gas, not for coal. UKEF support for oil and gas is now under review.
- Although not led by the UK Government, the **Citizen's Assembly** convened by Parliament has been a welcome step towards understanding public attitudes to achieving Net Zero. The Climate Assembly UK report published in September 2020 (Box 6.2) provides more crucial evidence through a representative sample of the whole UK. This work can complement Scottish Government programmes to engage with the public and better understand public attitudes.
- The Government's **Green Finance Strategy**, published in July 2019, outlines important steps to align the financial sector to the UK's (and the world's) climate and environmental objectives.
- £800 million was committed to the **CCS Infrastructure Fund** to establish CCS in at least two hubs, the first by the mid-2020s and a second by 2030. The Government Response to BEIS' 2019 consultation on potential business models for Carbon Capture, Usage and Storage was published in August 2020.[50]

[46] BEIS (2019) *Greenhouse gas removal policy options.*
[47] Engineering and Physical Sciences Research Council (2019) *Greenhouse Gas Removal Demonstrators Programme calls and workshop.*
[48] BEIS (2020) *Direct air capture and other greenhouse gas removal technologies competition.*
[49] BEIS (2020) *A Government Response on potential business models for Carbon Capture, Usage and Storage.*
[50] BEIS (2020) *A Government Response on potential business models for Carbon Capture, Usage and Storage.*

2. Surface transport

The transport sector has seen only partial progress against most of the policy milestones outlined in Table 4.1. In February 2020, the Scottish Government published a new version of its National Transport Strategy; it followed the Infrastructure Commission for Scotland's Key Findings Report, which focused on low and zero emissions infrastructure.

A number of announcements have been made by the Scottish Government in respect of surface transport in 2019 and up to mid-September 2020:

- Strengthening bus and active travel infrastructure. In 2019, the Scottish Government announced a £500m investment to improve infrastructure for buses and high-occupancy vehicles in and around cities and across the country. The Scottish Government also allocated £51m to walking and cycling infrastructure and have since committed to a further £500m funding for active travel infrastructure, access to bikes and behaviour change schemes over the course of the next Parliament in the 2020-21 Programme for Government.[51]
- Supporting the transition to low emissions vehicles through increasing funding to the Low Carbon Transport loan fund to £35m, subsidising those who need to drive to buy new electric vehicles. There is also £5m of electric vehicle funding available for the police fleet.[52]
- Setting an £83m Future Transport fund that prioritises low-carbon and "transformational" initiatives, such as low emission and electric buses, and electric vehicle charging infrastructure.
- Decarbonising railway travel, through the publication of the Rail Services Decarbonisation Action Plan by 2035. The document provides a pathway towards the electrification of the railway network, but does not include cost calculations.

UK Government policies have also been put in place that will have a direct impact on emissions from transport in Scotland, particularly vehicle standards and incentives:

- There has been a strengthening of Electric Vehicle (EV) incentives. Benefit-in-kind taxes have been reduced to 0% for the 2020/21 financial year, rising to 1% then 2% over the next two years. The plug-in car grant has been reduced to a maximum of £3,000 but has been secured to 2022/23. A consultation on Vehicle Excise Duty for EVs has been launched.
- While grants for home-charging reduced to £350 per charge point, the UK Budget 2020 doubled the UK-wide financial support for on-street charging to £10 million.
- The Department for Transport (DfT) published its Decarbonising Transport report 'Setting the Challenge' for the sector, with a policy document due later this year.

[51] Scottish Government (2020) *The Government's Programme for Scotland 2020-2021*.
[52] Scottish Government (2020) *Scottish Budget 2020-2021*.

Table 4.1. Delivery of policy action in surface transport in 2019 and 2020

Action	Timing	Primary responsibility	On track?
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 a strengthening of the UK Government's target date. Encourage the UK Government to bring forward its target in line with Scotland's targets.	2020	Joint	Partly Contingent on UK Government decision on petrol and diesel phase-out date.
Bring forward the ban on new conventional vehicle sales in the UK to 2035 (or ideally earlier) and clarify that only battery electric (or other zero-carbon) vehicles will be permitted to be sold after this point.[53] *Note: the Committee's most recent recommendation to the UK Government has been updated to 2032 at the latest.*	2020	UK Government	Partly
Clarify the UK regulatory approach to the EU 2020/21 new car and van CO_2 targets and set stretching CO_2 targets for new cars and vans beyond 2020, requiring a high electric vehicle market share. A real-world testing regime for vehicle emissions must be used alongside standardised tests.	2019	UK Government	Partly
Implement policies, including fiscal instruments, to strengthen incentives to purchase cleaner vehicles. If current purchasing trends are not reversed, new car and van emissions targets will be missed.	2019	UK Government	Partly
Set stretching targets for CO_2 emissions reductions from new HGVs to address the rise in emissions and exploit opportunities to improve logistics and increase uptake of eco-driving.	2019	Joint	Partly
Set out policies to address the decline in bus usage and develop new schemes to increase levels of walking and cycling.	2019	Scottish Government	✓ Significant spending increases for active travel and bus use

Source: Milestones from CCC (2019) *Progress Report to Scottish Parliament.*

[53] Scotland does not have the power to set legal bans on the sales of certain vehicles.

3. Aviation

There are currently no policy indicators established for aviation, and last year no policy milestones were set by the Committee for 2019-20. However, there have been a number of Scottish and UK developments:

- The 'Future of Flight Challenge' was announced by the UK Government in August 2019. Funding of £125 million will be provided via the Industrial Strategy Challenge Fund with £175 million from industry, to develop new aircraft technology including electrification.[54]
- The Jet Zero Council has been established by No10, DfT and BEIS, bringing together aviation & aerospace industries and NGOs to work on long-haul zero emissions flight. This initially is focusing on plans for electric or hydrogen aircraft, and sustainable aviation fuels.[55]
- DfT's Aviation & Climate Change Consultation was due out in early 2020, but is currently delayed due to COVID-19. A final Aviation Strategy is due to follow.
- The 2020-21 Programme for Government has stated a continued commitment to introducing the Air Departure Tax and to decarbonising scheduled flights within Scotland by 2040.
- A new £33m aerospace Centre for Excellence is being set up adjacent to RAF Lossiemouth in Moray.[56]

The Committee will develop indicators for aviation following our advice on the Sixth Carbon Budget later this year.

4. Shipping

There are currently no policy indicators established for shipping, and last year no policy milestones were set by the Committee for 2019-20. However, there have been some important Scottish and UK developments:

- The UK's Clean Maritime Plan[57] was launched in July 2019, setting up early advisory and research functions. This commits to exploring supporting the transition to zero emissions shipping, beginning with a consultation on the Renewable Transport Fuel Obligation (RTFO) in 2020, and a Call for Evidence on non-tax incentives in shipping. The MarRI-UK collaborative innovation vehicle, based at the University of Strathclyde, has awarded £1.5m of funding to 11 successful innovative shipping projects across the UK.
- The 2020-21 Programme for Government mentions reduced emissions being considered in new ferry and port investment plans, although it does not set any quantified targets.

The Committee will develop indicators for shipping following our advice on the Sixth Carbon Budget later this year.

[54] Innovate UK and UK Research and Innovation (2019) *Developing the future of flight: take part in the challenge.*
[55] HM Government (2020) *Press Release: PM commits £350 million to fuel green recovery.*
[56] MOD (2020) *UK Government announces multi million pound funding for Moray College Hub at RAF Lossiemouth.*
[57] DfT (2019) *Clean Maritime Plan.*

5. Industry

As industry is a reserved area, responsibility for policy design and implementation falls mainly under the UK government. The Scottish Government has taken steps towards supporting decarbonisation in industry, but they are unlikely to be effective in isolation of wider developments taking place on a UK level:

- The 2020-21 Programme for Government announced £60m of funding to support the decarbonisation of industrial and manufacturing sectors. This includes £34m for the Scottish Industrial Energy Transformation Fund and £26m for the Low Carbon Manufacturing Challenge Fund.
- The development of a Carbon Capture and Utilisation Challenge Fund was also announced, along with the continued support of and investment in a suite of CCUS projects in Scotland.
- A new £100m Green jobs fund, distributed across sectors, will support the creation of green jobs in Scotland.
- The Scottish Government has established a Grangemouth Future Industry Board that will include the Scottish Government, Falkirk Council and other government agencies. This board is focused on "sustaining economic activity at the Grangemouth industrial cluster, whilst supporting its transition to our low-carbon future".
- The Scottish Government to delivering a Hydrogen Policy Statement and Hydrogen Action Plan as a companion to the Climate Change Plan update.

At UK level, and following a significant increase in industrial decarbonisation policy in 2018/19, progress from the UK Government in 2019/20 has been slow relative to the actions required that we outlined last year (Table 4.2).

- BEIS consulted on mechanisms to support the operational costs of industrial CCUS in July 2019, partly meeting our recommendation. In its response to the results of the consultation, the Government restated its commitment to deploying CCUS this decade and spending at least £800m on CCS transport and storage infrastructure in at least two clusters. They are exploring the development of an industrial CfD to cover ongoing operational costs and allow the recovery of capex investment. However, there has been no consultation on mechanisms to support the operational costs of fuel switching, including electrification, hydrogen and BECCS. This is urgently required to enable development of fuel switching technologies, as well as CCS, and to complement capital funding on offer through the Industrial Energy Transformation Fund (IETF) and IDC.
- On energy efficiency, the Government published its evaluation of the Climate Change Agreements (CCA) scheme and extended the scheme by two years. However, there is still little evidence that policy, including CCAs and the IETF, will provide sufficient support to enable overall business energy efficiency to improve by 20% as set out in the Clean Growth Strategy and detailed in the UK Government's response to our Progress Report last year.
- Other areas still lack firm policy. There has been no new policy on reducing methane leakage and venting. The Oil and Gas Authority published its Energy Integration Project report, which considers electrification of offshore platforms, but without policy to enable this. For non-road mobile machinery (NRMM), the Budget suggested that the Energy Innovation Programme will support the development of near-zero GHG emission technologies, but this requires further detail. The Budget's removal of red diesel tax relief for industrial NRMM will also encourage deployment.

Table 4.2. Delivery of policy action in industry in 2019 and 2020

Action	Timing	Primary responsibility	On track?
Following the BEIS consultation on CCS business models in July 2019, consult on mechanisms to incentivise widespread industrial fuel switching. Identify when those industrial sites that will require CCS and/or fuel switching would need to install them in order to fit with their refurbishment cycles.	2019	UK Government	Partly
Secure (e.g. taxpayer or consumer) funding for mechanism to incentivise widespread industrial fuel switching and CCS.	2020	UK Government	×
Deliver near-term capital support for industrial decarbonisation, through the Industrial Energy Transformation Fund (IETF) and Industrial Strategy Challenge Fund (ISCF). Where necessary this should be accompanied by bespoke support for operational expenditure for these projects.	2019	UK Government	Partly
Publish the results of the evaluation of Climate Change Agreements to inform any successor scheme for 2023.	2019	UK Government	✓
Strengthen policies to reduce methane leakage and venting to near-zero.	2020	UK Government	×
Establish policies to develop near-zero GHG emission technologies for off-road mobile machinery.	2020	UK Government	Partly
Set out preferred mechanism for CO_2 transport and storage infrastructure.	2019	UK Government	Partly
Set out plan to enable multiple UK CCS facilities to be operational by the mid-2020s.	2019	UK Government	×

Source: Milestones from CCC (2019) *Progress Report to Scottish Parliament.*

6. Buildings

The Scottish Government is on track to legislate net-zero standards for new-build homes that come into force from 2024, and a number of policy milestones outlined in our last report have made partial progress (Table 4.3):

- Over the next Parliament, the Scottish Government has committed nearly £1.6bn towards eliminating emissions from heating by 2040. This includes existing capital commitments in heat and energy efficiency of £900 million, together with a further £425m of capital spend and £225 million of investment in wider heat and energy efficiency, low-carbon, and renewable programmes. This will include the decarbonisation of the public sector estate, a £50m Green Recovery Low Carbon Infrastructure Transition Programme, and £25m for zero-carbon energy infrastructure and heat networks for residential and commercial premises.
- The Scottish government has launched the Heat Transition Deal, allocating £20m to decarbonising heating in social housing, along with £2m of capital investment for remote and off-grid communities. It has also increased the funding for domestic energy efficiency, bringing total spending in 2020-21 to £162m.
- The Heat Networks Bill will introduce regulation and a licensing system for district and communal heating to accelerate use of the networks across Scotland. If passed, Scotland would be the first country in the UK to legislate on the development of heat networks to help meet climate change targets and tackle fuel poverty.
- A new Fuel Poverty Strategy is in development and due to be published in 2021.
- Scotland will be publishing a draft Heat Policy Statement in December 2020, which must set the route map for the heat transformation.
- The Energy Efficient Scotland Route Map is also due to be updated alongside the Climate Change Plan update. As part of this, the Scottish Government consulted on proposals to require a minimum standard of EPC band C for all properties being sold.
- Under the Climate Change Act, public bodies in Scotland are required to contribute to the delivery of our emissions reduction targets, and many are already going well beyond their legislative duty. New draft regulations were laid in Parliament in September 2020 that would strengthen the requirements on public bodies to set a target date for achieving zero direct emissions of greenhouse gases (or such other targets that demonstrate how the body is contributing to Scotland achieving its emissions reduction targets). Public bodies will be required to include this in their report on emissions from 2021/22.

Further announcements have been made in UK policy over the past year:

- A small extension of the Domestic Renewable Heat Incentive to 2021/22 was announced in the budget, with a further £100m of funding released, which will be spread over 2022/23 and 2023/24. This provides £4,000 grants for households and small non-domestic buildings to install heat pumps (or biomass boilers in limited circumstances). However, this funding is only forecast to support 12,500 residential heat pumps a year for the whole of Great Britain – well below what will be required for the phase out of oil boilers later this decade and new gas boilers soon after.
- A £270m Green Heat Network Fund was also committed to support the deployment of low-carbon heat networks, along with the proposed green levy to support biomethane.

The UK Government is consulting on regulatory frameworks for heat networks, including: a new regulator, rights and powers for heat network developers (to align with other utilities) and consumer protection measures. The UK Government is considering local zoning and concessions amongst other options.

Table 4.3. Delivery of policy action in buildings in 2019 and 2020

Action	Timing	Primary responsibility	On track?
Develop a fully-fledged strategy for decarbonised heat. This must be designed to fully decarbonise buildings across the Scotland in line with the net-zero goal. HM Treasury must commit to working with BEIS and the Scottish Government, undertake a review of where the costs of the transition should fall, and allocate sufficient funding to deliver over the full period from now to 2050.	2020	Joint	Partly Success rests on both Scottish Government commitments and forthcoming Heat and Buildings Strategy from UK Government
Publish detailed plans to phase out the installation of fossil fuel heating in off-gas properties in the 2020s, ensuring there is no policy hiatus in 2021 following the closure of the RHI.	2019	Joint	× RHI extended by one year.
Legislate new-build standards to ensure that all new homes built from 2025 at the latest are designed for a changing climate, are ultra energy efficient and use low-carbon heat. Ambitious standards for non-residential buildings must also be decided and set.	Regulations set by 2021	Scottish Government	✓ Consultation to launch autumn 2020, steering group in place.
Tackle performance and compliance issues to ensure that new buildings and measures retrofitted in existing buildings perform as they should. This includes consulting on strengthened compliance and enforcement measures which extend beyond fire safety to regulations more widely and funding building control adequately.	2019	Scottish Government	Partly Scottish Government has appointed a working group on assessment for the Energy Efficient Scotland Programme

Table 4.3. Delivery of policy action in buildings in 2019 and 2020

Action	Timing	Primary responsibility	On track?
Review professional standards and skills across the building, heat and ventilation supply trades with a nationwide training programme to upskill the existing workforce.	2019-2022	Scottish Government	Partly No review. National Transition Training Fund is 'focused on heat and energy efficiency' and Climate Emergency Skills Action Plan announced.

Source: Milestones from CCC (2019) *Progress Report to Scottish Parliament.*

7. Agriculture and land use, land-use change and forestry (LULUCF)

There is still an absence of policy to deliver emissions reduction in agriculture in Scotland (Table 4.4). Unlike legislation planned for England and Wales, the Scottish Government has not yet included climate mitigation and adaptation as key 'public goods' to be paid for as part of Scotland's overhaul of agriculture and land policy.

The Scottish Government introduced a Rural Support Bill in 2019, which is designed to maintain and simplify the existing Common Agricultural Policy (CAP) scheme in the three to five years after leaving the EU. It does not set out the future direction of Scottish rural support policy, nor does it make provisions for Ministers to create new policy or reform existing policy.

The 2020-21 Programme for Government contained a commitment to now bring forward recommendations for new mechanisms of agricultural support, with a focus on productivity and delivering Scotland's climate change policy outcomes – though it is not yet clear whether these recommendations will meet our recommendations on agriculture and land use set out in our 2020 report *Land use: Policies for a Net Zero UK*.

New funding has been released for both agriculture and land use in Scotland, but this is not enough to drive a structural realignment of rural funding in Scotland that properly incentivises carbon reduction and sequestration, nor climate adaptation:

- The Agricultural Transformation Programme received £40 million of initial funding in February 2020. Support for the Programme will be continued through the Agricultural Transformation Fund, which will include a capital grant scheme.
- The 2020-21 Scottish Budget set the aim of significantly increasing the rate of peatland restoration in Scotland, with a commitment to invest £250 million over 10 years that would deliver an average of 20,000 hectares a year of restoration. This level of restoration would be consistent with our recommendations from the 2019 Net Zero Report; we will assess the potential for Scotland to be even more ambitious than this in our upcoming advice on the UK Sixth Carbon Budget.
- Investment in forestry expanded in 2020/21 by £6 million. The 2020-21 PfG announced an additional £100 million to Scottish Forestry to increase new planting, as well as £30 million to Forestry and Land Scotland to expand Scotland's national forests by 18,000 hectares per year until 2024.

This level of tree planting would be consistent with our recommendations from the 2019 Net Zero Report; we will assess the potential for Scotland to be even more ambitious than this in our upcoming advice on the UK Sixth Carbon Budget.

- The Biodiversity Challenge Fund received an additional £3 million in the 2020-21 PfG, following the £5 million it received last year.

Table 4.4. Delivery of policy action in agriculture and LULUCF in 2019 and 2020

Action	Timing	Primary responsibility	On track?
Ensure the ongoing design of the post-CAP framework in Scotland, including the testing and trialling of options, will incentivise the take-up of low-carbon farming measures and changes in land use to increase carbon removals.	2021	Scottish Government	× Agricultural Transformation Fund does not fully address action, but commitments were made to outline a post-CAP rural support policy in the coming year
Ensure a long-term policy framework and funding is in place to support a minimum of 18,200 hectares of peatland restoration per year between now and 2045.	2020	Scottish Government	✓ Funding secured for the next decade and long-term restoration target set
Follow through on commitments in Scotland's 2019-2029 Forestry Strategy to increase overall annual afforestation rates to at least 15,000 hectares in the early 2020s.	Early 2020s	Scottish Government	✓ Ambition raised to 18,000 hectares by 2024/25
Increase the take-up of low-carbon farming practices and develop a strong regulatory baseline that includes low-regret options, with incentives and a wider policy framework for further measures.	Early 2020s	Scottish Government	× Not yet demonstrated
The Industrial Strategy's Transforming Food Production Challenge Fund: ensure future calls are allocated to projects that deliver supporting emissions reduction and clean growth in the food and agriculture sectors.	2020	UK Government	Partly

Source: Milestones from CCC (2019) *Progress Report to Scottish Parliament.*

8. Power

The Scottish Government delivered on one of its two policy milestones in the power sector (Table 4.5), and the Programme for Government announced plans for a new energy strategy and hydrogen strategy in 2020-21:

- Following the conclusion of the consultation on and publication of the draft Sectoral Marine Plan in December 2019, Crown Estate Scotland has launched the first round of ScotWind Leasing, giving seabed leasing rights for offshore wind farms for a decade. The application portal opened in June 2020 and provides supporting documentation to registered applicants.
- The Scottish Government's annual Energy Statement 2020 is yet to be published. The 2020-21 PfG announced that the Scottish Government will set out a new Energy Strategy, a Hydrogen Policy Statement and a Hydrogen Action Plan in the next year.

The UK Government has also made policy progress in 2019 and 2020, particularly in announcing future auctions for low-cost renewable energy:

- The UK held a third allocation round of the Contracts for-Difference (CfD) auction and, as announced in September 2019, cleared a record low energy price of £39.65/MWh for delivery year 2023/24 and £41.61/MWh in 2024/25 (in 2012 prices).
- A consultation has been launched for amendments to the CfD scheme, with floating offshore wind proposed to be included in Pot 2, alongside other design changes.[58]
- In March 2020, the Government announced that onshore wind and solar PV would be included in the next round of CfD auctions, reversing the previous exclusion of these technologies.
- Ofgem announced that networks will have to demonstrate how their business models are compatible with Net Zero. Ofgem also consulted on the RIIO-2 Draft Determinations for Transmission, Gas Distribution and Electricity System Operator in July 2020, with final determinations expected to be published in December.[59]

[58] BEIS (2020) *Contracts for Difference (CfD): proposed amendments to the scheme 2020.*
[59] Ofgem (2020) *RIIO-2 Draft Determinations for Transmission, Gas Distribution and Electricity System Operator.*

Table 4.5. Delivery of policy action in the power sector in 2019 and 2020

Action	Timing	Primary responsibility	On track?
Develop contingency plans that allow for additional low-carbon generation to be brought forward in the event of delay or cancellation of planned projects, or imports of electricity below projected levels.	2019	UK Government	×
Develop and deliver a plan, in coordination with Ofgem, to upgrade networks in the 2020s to accommodate new electricity demands (e.g. from electric vehicles), and future-proof them in order to limit costs.	2019	UK Government	Partly Finalised plans for electricity transmission with flexibility to accommodate new announcements related to Net Zero, but business plans for distribution not due until 2023.
Outline in the forthcoming Energy White Paper a level of ambition compatible with achieving net-zero emissions. This should include the outline of a subsidy-free route to market for the cheapest low-carbon generation from 2020.	2019	UK Government	Partly
Develop clear plans to ensure adequate resilience of energy supplies as heat and transport become more electrified.	2020	UK Government	×
Use the 2020 Energy Statement to set out an updated assessment of how much renewable and low-carbon energy generation will be required to meet net-zero in Scotland, with a clear trajectory to 2045.	2020	Scottish Government	Partly Statement not yet published, but plans for a new Energy Strategy announced in 2020-21.
Crown Estate Scotland to set out its plans for ScotWind Leasing following the publication of the draft Sectoral Marine Plan. This leasing process should provide certainty and clarity to investors seeking to lease seabeds for new offshore wind farms in Scottish waters.	2020	Scottish Government	✓

Source: Milestones from CCC (2019) *Progress Report to Scottish Parliament.*

9. Waste

The Scottish Government proposed several 2025 targets in 'Developing Scotland's circular economy' but this is not being taken forward in this legislative session due to COVID-19, although may be reintroduced in 2021. These 2025 targets include a 70% recycling rate for all wastes (with households achieving a 60% recycling rate by 2020), a 15% reduction in total waste (against 2011 levels), a 33% reduction in food waste (per capita against 2013 levels), and no more than 5% of all waste being sent to landfill.[60]

- Scotland is on track for some of these targets, but not others – for example, household recycling was 44.7% in 2018,[61] making the 2020 target unlikely to be met.
- In 2019, the Scottish government published its *Food waste reduction: action plan*, setting out its plans for reducing unnecessary demand for food, improving methods of production and recycling rates and making better use of food waste as an organic resource, all aimed at delivering the 33% reduction in food waste target.
- In conjunction with the Convention of Scottish Local Authorities, the Scottish government has also committed to evaluating the Household Recycling Charter and its Code of Practice and to form a steering group to change the way Scotland tackles waste and recycling. Zero Waste Scotland has since 2015 provided a total of £7.5m to eight Councils in support for transition to Charter-compliant waste and recyclate collection services.[62]
- Scotland's previous commitment to ban the landfill of biodegradable municipal waste by 2021 has been delayed to January 2025 (Table 4.6), as many local authorities lacked sufficient processing infrastructure and would have been forced to export their waste.[63] 1.02 million tonnes of biodegradable municipal waste were landfilled in 2018.[64] Although some local authorities had made significant progress towards the 2021 target, this delay will lead to fewer avoided landfill methane emissions. The Scottish Government is proposing centrally supported procurement and use of the Scottish Landfill Tax to ensure the transition occurs by 2025. The 2020-21 Programme for Government also allocates a £70 million fund to the improvement of local authority refuse collection infrastructure.

Table 4.6. Delivery of policy action in waste in 2019 and 2020

Action	Timing	Primary responsibility	On track?
Support local authorities and businesses in Scotland to prepare for the 2021 ban on biodegradable waste to landfill, minimising the amount of biodegradable waste that is diverted to landfill in England.	End of 2020	Scottish Government	× Landfill ban legislated for but pushed back to 2025 to ensure sufficient waste treatment facilities available

[60] Scottish Government (2019) *Developing Scotland's circular economy: consultation on proposals for legislation.*
[61] SEPA (2020) *Household waste data.*
[62] Scottish Government (2019) *Climate Change Plan: monitoring report 2019.*
[63] Scottish Government (2019) *Climate Change Plan: monitoring report 2019.*
[64] SEPA (2020) *Waste from all sources: summary document and commentary text.*

Table 4.6. Delivery of policy action in waste in 2019 and 2020			
Action	**Timing**	**Primary responsibility**	**On track?**
Deliver Scotland's net-zero-consistent targets from the 2018 Climate Change Plan to reduce food waste by 33% and recycle 70% of all waste generated by 2025.	2020s	Scottish Government	Partly Targets proposed but yet to be legislated
Source: Milestones from CCC (2019) *Progress Report to Scottish Parliament.*			

10. F-gases

The use of F-gases and ozone-depleting substances (ODS) had, until now, been regulated by EU law, which, in Scotland, was enforced by SEPA, local authorities and port-health authorities. The Scottish Government has devolved control of F-gas regulations but has agreed to participating in a UK-wide quota system. The Scottish Government has not yet taken action on replacing high GHG metered dose inhalers within the health service, nor taken actions to go beyond replacing the EU F-gas regulation (Table 4.7).

Table 4.7. Delivery of policy action in F-gases in 2019 and 2020			
Action	**Timing**	**Primary responsibility**	**On track?**
Develop and enforce legislation for F-gases that is at least as strong as the existing 2014 EU F-gas Regulation and consistent with the Kigali Amendment. This must restrict the use of F-gases to the very limited situations where there are currently no viable alternatives.	2020s	Joint (enforcement is devolved but a UK-wide scheme is being developed)	✓
Source: Milestones from CCC (2019) *Progress Report to Scottish Parliament.*			

Chapter 5: A Climate Change Plan for Net Zero and a resilient recovery

In the 2019 Progress Report, we gave advice on the planned update to the Climate Change Plan. That report gave sector-by-sector advice on the transition to Net Zero and the policy actions that need to be taken to put Scotland on that pathway.

The core messages from that advice and from our Net Zero report remain unchanged by the COVID-19 pandemic:

- As long as human activity continues to add to concentrations of greenhouse gases in the atmosphere, the scale of climate change and the impacts from the risks attached to climate change will continue to increase. The scientific and economic basis for Scotland to transition to a net-zero economy, in line with the goals of the Paris Agreement, remains.
- Reaching Net Zero emissions in Scotland will require all energy to be produced from low-carbon sources (e.g. renewables and nuclear, plus bioenergy and any fossil fuels being combined with CCS) and delivered to consumers in carbon-free forms that can make use of those sources (e.g. electricity, hydrogen, hot water in heat networks). The transition will also involve choices around how people travel, what people eat and the best use of the UK's land.
- Even if these emissions reductions goals are met, there will be further climate change compared to today, so actions to prepare for the impacts of climate change are required.

Historically, climate action has been led by the parts of government which deal with energy and the environment. Increasingly, action on reducing emissions to net-zero and ensuring policies are resilient to climate change will need to be led by all directorates and driven from the centre of government.

The Scottish Government has already taken important steps to embed this as core policy, by establishing important advisory and delivery bodies with goals aligned with Net Zero and framing major fiscal and Parliamentary events around climate change. The directorate-based structure of the Scottish Government may also prove more suited for tackling the cross-economy nature of the climate challenge.

Across the Scottish Government, multiple directorates are developing policy and delivery capability in key areas such as land use, transport decarbonisation, heat in buildings and energy efficiency, manufacturing policy and low-carbon energy. An integrated and ambitious Plan is required to ensure co-ordinated progress across all areas, and by all parties, to set up Scotland for the next decade of delivery of climate ambition.

The following sections summarise the Committee's recommendations for Scotland:

1. Set the foundation for a whole-economy transition to Net Zero in 2045

2. The full range of devolved and reserved policy levers must be used together

3. Net Zero and adaptation are the responsibility of all Cabinet Secretaries, directorates and public bodies

4. Support a resilient recovery from COVID-19

5. Apply the lessons learned since 2008

6. Scotland's interim targets

1. Set the foundation for a whole-economy transition to Net Zero in 2045

Reaching Net Zero emissions in Scotland will require all energy to be produced from low-carbon sources (e.g. renewables and nuclear, plus bioenergy and any fossil fuels being combined with CCS) and delivered to consumers in carbon-free forms that can make use of those sources (e.g. electricity, hydrogen, hot water in heat networks).

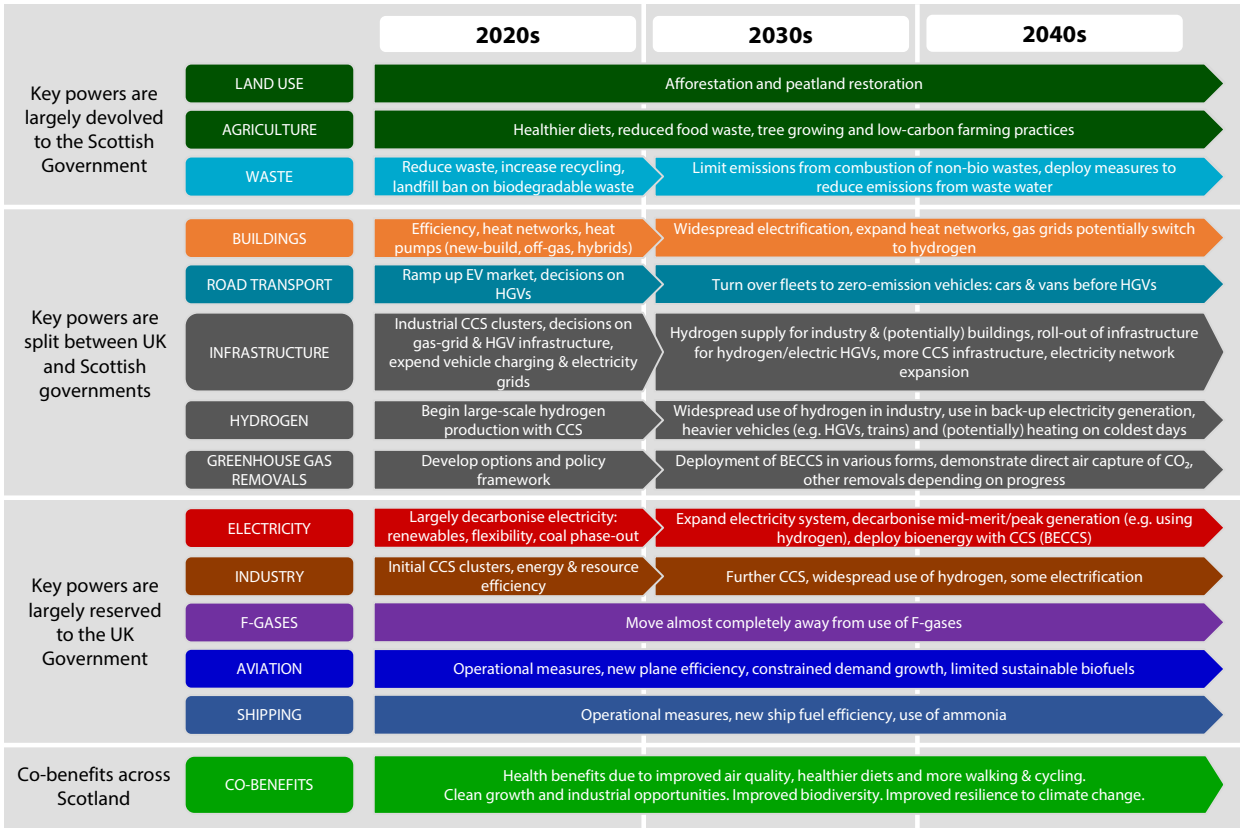
The transition will also involve choices around how people travel, what people eat and the best use of Scotland's extensive land area. Although it is impossible to predict the exact mix of technologies and behaviours that will best meet the challenge of reaching net-zero GHG emissions, our 2019 Net-Zero report presented a vision of this transition for Scotland, in our *Further Ambition* scenario (Figure 5.1).[65] This included:

- **Resource and energy efficiency** that reduce demand for energy across the economy. Without these measures, the required amounts of low-carbon power, hydrogen and carbon capture and storage (CCS) would be much higher. In many, though not all, cases they reduce overall costs.
- **Some societal choices** that lead to a lower demand for carbon-intensive activities, for example an acceleration in the shift towards healthier diets with reduced consumption of meat and dairy products, and an increase in journeys being made by walking and cycling. Societal changes occurring as a result of the COVID-19 pandemic, such as reduced travel and electricity consumption, could, if permanent, reduce demand in these sectors, potentially to a greater extent than that included in our *Further Ambition* scenario. We are considering the implications of this as part of our work on the UK Sixth Carbon Budget advice.
- **Extensive electrification**, particularly of transport and heating, supported by a major expansion of renewable and other low-carbon power generation. Our Further Ambition scenario for the Net Zero report involves around a doubling of today's annual electricity demand, with all power in the UK produced from low-carbon sources (compared to around 55% for the whole of the UK today, but over 90% in Scotland).
  - *A transition to electric vehicles.* The 2.7 million cars and vans and 30,000 HGVs on Scotland's roads today will need to switch to low-carbon electricity, or, for HGVs, potentially hydrogen.
  - *A switch to low-carbon heating.* From 2025, all new-build homes will need to be built with low-carbon heating. Scotland's 2.4 million existing residential dwellings, and all commercial and public buildings, will need to switch away from fossil fuelled boilers towards low-carbon heating sources.
- **Development of a hydrogen economy** to service demands for some industrial processes, for energy-dense applications in long-distance HGVs and ships, and for electricity in peak periods and in periods of low wind and solar production, and potentially also for some portion of heating in buildings. By 2050, a new low-carbon industry is needed, with UK hydrogen production capacity of comparable size to the UK's current fleet of gas-fired power stations.

[65] The actions in our Further Ambition scenario achieved a 96% reduction in UK GHG emissions by 2050, based on 1990 levels. We identified a range of possible options to reduce the last 4% of emissions, but did not specify precisely how this would be achieved. Our Sixth Carbon Budget scenarios will set out detailed pathways to reducing emissions by 100% by 2050.

- **Carbon capture and storage (CCS)** in industry, used with bioenergy (for GHG removal from the atmosphere), and very likely for hydrogen and electricity production. CCS is a necessity, not an option. The scenarios involve aggregate annual capture and storage of 75-175 $MtCO_2$ in the UK 2050, which would require a major CO_2 transport and storage infrastructure servicing at least five clusters across the UK, and with some CO_2 transported by ships or heavy goods vehicles. A significant proportion of this carbon storage could be located in Scotland; our Further Ambition scenario for Scotland identified potential for up to 12 $MtCO_2e$ of CCS applied to bioenergy combustion in Scotland, with a significant role for CCS deployed in industry.
- **Changes in the way we farm and use our land** by adopting low-carbon farming practices and putting much more emphasis on carbon sequestration and biomass production alongside improving the condition of natural assets to enhance resilience and halt biodiversity loss. Enabled by healthier diets and reductions in food waste, our Further Ambition scenario for Net Zero in Scotland involves at least one-fifth of Scottish agricultural land shifting to tree planting, energy crops and peatland restoration.
- **Emissions removed from the atmosphere** by trees, soils or engineered carbon removal to offset residual emissions in sectors where low-carbon alternatives are limited (predominantly aviation and agriculture).

Figure 5.1. Actions to achieve Net Zero by 2050



Source: CCC (2019) *Progress Report to Scottish Parliament.*
Notes: CCS = carbon capture and storage. EV = electric vehicle. HGV = heavy goods vehicle. BECCS = bioenergy with CCS.

In many areas the transition is already underway (e.g. electricity generation and efficiency of appliances, falling battery costs in electric vehicles, waste), though progress will need to be sustained. In others, decisions will need to be made in the 2020s to allow for a sustained roll-out of low-carbon technologies and infrastructure to meet the 2050 target (Figure 5.1). Table 5.1 provides an overview of the near-term milestones required to meet the Scotland's 2045 target.

Our 2019 Net Zero report (and the *Further Ambition* scenario) presented a snapshot view of emissions in 2050. Our advice in December 2020 on the UK's sixth carbon budget (2033-37) will explore multiple pathways to achieving Net Zero, including scenarios with higher levels of behaviour change and technological innovation. Alongside this advice, we will pull out the implications for Scotland's path to Net Zero.

Next year, the Adaptation Committee's UK Climate Change Risk Assessment Evidence Report will highlight the climate risks to net-zero measures, such as water availability for CCS and hydrogen production, and synergies and trade-offs between Net Zero and adaptation across the UK.

Table 5.1. Medium-term milestones for Scotland to be on track to Net Zero emissions by 2045

Sector	Action	Primary responsibility	Timing
Transport	Development of infrastructure and policy to enable sales phase-out of petrol and diesel cars, vans and motorbikes by 2032 at the latest.	Joint	Early 2020s
	Decisions about how to switch to zero-emissions (e.g. hydrogen or electric) HGVs will be required in the second half of the 2020s. This will necessitate trial deployments of hydrogen, battery electric, catenary and hybrid HGVs in a variety of fleets prior to this – in the UK or elsewhere.	Largely reserved	Second half of the 2020s
Industry	CO_2 transport and storage infrastructure operational, and hydrogen available, at multiple industrial clusters.	Largely reserved	Mid-2020s
	Implement resource efficiency measures in industry.	Largely devolved	Early 2020s
	Demonstration of a range of industrial fuel-switching technologies including electrification and hydrogen.	Joint	Early 2020s
	Award first support for industrial fuel-switching and CCS through an incentive mechanism designed to enable widespread industrial fuel switching and CCS.	Largely reserved	End 2021
	Enable delivery of substantial improvements in industrial energy efficiency in line with the upper end of ambition in the *Industrial Decarbonisation and Energy Efficiency Roadmaps to 2050*.	Joint	2020s

Table 5.1. Medium-term milestones for Scotland to be on track to Net Zero emissions by 2045			
Sector	**Action**	**Primary responsibility**	**Timing**
Buildings	Strategic decisions on the future of the gas grid and the future balance between hydrogen and electrification for heating, taking into account the views of the public and synergies with industrial demand for electricity and hydrogen. Transition to sustainable heat networks market. Targeted deployment of heat pumps must scale up to be able to replace the majority of current gas boiler demand by the early 2030s.	Joint (energy markets and networks are reserved but heat policy is devolved)	Mid-2020s
	Deliver against Scotland's clear trajectory of standards covering owner-occupied, social- and private-rented homes and expand these for non-residential buildings. Alongside trajectories for energy efficiency, all new heating systems to be low-carbon from 2030 in off-gas properties and 2035 across the building stock.	Largely devolved	2020-2035
	Review professional standards and skills across the building, heat and ventilation supply trades with a nationwide training programme to upskill the workforce.	Largely devolved	2020-2022
	Reform monitoring metrics and certification to reflect real world performance, rather than modelled data (e.g. Standard Assessment Procedure (SAP)). Accurate performance testing and reporting must be made widespread, committing developers to the standards they advertise.	Largely devolved	2020-2022
Power	Deliver plans to decarbonise the entire GB power system consistent with a level of ambition for an emissions intensity towards 50 gCO_2/kWh – and well below this in Scotland – in 2030, including 40 GW of offshore wind across the UK.	Largely reserved	2030
	Develop clear plans to ensure adequate resilience of energy supplies as heat and transport become more electrified.	Largely reserved	2020
	Continue to improve system flexibility through the implementation of all actions in the Smart Systems and Flexibility plan.	Largely reserved	2022

Table 5.1. Medium-term milestones for Scotland to be on track to Net Zero emissions by 2045

Sector	Action	Primary responsibility	Timing
Hydrogen	Low-carbon hydrogen production at scale, for use initially in applications that would not require major infrastructure changes (e.g. applications in industry, power generation, injection into the gas network and depot-based transport)	Largely reserved	Second half of the 2020s
	Trials and pilot projects to establish the practicality of switching to hydrogen across a range of sectors and applications.	Largely reserved	Early 2020s
	Demonstrate that hydrogen production from CCS can be sufficiently low-carbon to play a significant role.	Largely reserved	Mid 2020s
Agriculture	To increase the take-up of low-carbon farming practices, develop a strong regulatory baseline that includes low-regret options, with further measures incentivised by a post-CAP agricultural support system and a wider policy framework.	Largely devolved	Early 2020s
	Innovation and investment in R&D and testing and piloting of options to deliver sustainable agricultural productivity improvements in crops and livestock; use of low-carbon technologies and options for low-carbon agricultural machinery e.g. tractors and robotics.	Joint	Early 2020s
Land use, land-use change and forestry	Ensure the post-CAP framework in Scotland promotes transformational land-use change and measures for deep emissions reductions including afforestation of a minimum of 15,000 hectares per year, peat restoration of at least 18,000 hectares per year.	Largely devolved	Early 2020s
	Targeted investment in R&D and innovation to deliver productivity improvements in trees and energy crops.	Joint	Early 2020s
	Policies to encourage a shift to less carbon-intensive diets, starting with the public sector.	Largely devolved	Early 2020s
Aviation	Demand management policies in place to ensure emissions remain aligned with a net-zero emissions pathway.	Joint	Early 2020s
	Low-carbon transport fuel support realigned to promote the transition from road to aviation fuels.	Largely reserved	Mid 2020s

Table 5.1. Medium-term milestones for Scotland to be on track to Net Zero emissions by 2045			
Sector	**Action**	**Primary responsibility**	**Timing**
Shipping	First UK clean maritime cluster operational, roll-out plan in place for future clusters and shipping fleet engine retrofits.	Largely reserved	2030
Wastes	Local authority plans implemented to go beyond 70% recycling rates.	Largely devolved	Late 2020s
	Long-term plan announced for diversion of all wastes from landfill, phasing out of waste exports, and plans for methane capture, oxidation and remediation at (legacy) landfill sites.	Largely devolved	Mid-2020s
	Energy from Waste (EfW) plants (including incineration, gasification & pyrolysis facilities) begin retrofitting CCS where feasible, and new EfW plants are built with CCS or 'CCS ready' in regions where the CO_2 network is soon to expand.	Largely devolved	From mid-2020s onwards
Greenhouse gas removals	Initial deployment of engineered greenhouse gas removals (e.g. BECCS in power generation, hydrogen production, industry and/or aviation fuel production), driven by incentives and enabled by CO_2 infrastructure development.	Largely reserved	Second half of the 2020s

2. The full range of devolved and reserved policy levers must be used together

Delivering this transition in Scotland will require a strong policy framework that works across all levels of government. Some key relevant policy levers are devolved to the Scottish Government, while others are held by the UK Government (i.e. they are reserved) (Table 5.1).

The net-zero target is likely only to be feasible with action in parallel to devolved policy from the UK Government, particularly in reserved areas such as fiscal policy, vehicle standards, energy production, heavy industry, and international relations.

Similarly, the UK target will only be achieved if Scotland commits to reducing its emissions. Scotland's contribution is particularly important to the UK target due to its enhanced abilities to generate low-carbon electricity and to use its land and offshore resources to sequester carbon. The UK cannot achieve net-zero in 2050 without strong policy from the Scottish Government across key devolved areas including planning, agriculture and land use, public engagement, housing and local government.

The Scottish Government, together with local authorities, can make particular use of devolved policy levers on the demand side even where supply-side policies are reserved to the UK Government (e.g. introducing low emission zones, policies to encourage walking and cycling and reducing the need to travel long distances through appropriate planning and '20 minute neighbourhoods'), provide 'soft' support (e.g. advice on low-carbon heat) to support UK-wide or GB-wide policies, and use planning and procurement powers to drive decarbonisation:

- **Planning**. The National Planning Framework is a useful lever over infrastructure that needs to be well aligned to objectives for emissions reduction in Scotland (e.g. through encouraging walking, cycling and use of public transport, ensuring readiness for or installation of electric vehicle charging points in new developments, co-location of new housing with services and major centres of employment, and a favourable planning regime for low-cost onshore wind).
- **Procurement**. The public sector in Scotland can use procurement rules positively to help drive emissions reductions in a number of areas (e.g. uptake of ultra-low emission vehicles, energy efficiency and low-carbon heat in buildings, low-carbon products).
- **Convening role.** It is important the Scottish Government maximises its potential to bring stakeholders together, and facilitate dialogue and strengthen relationships, to enable the development of mutually-beneficial projects that contribute to decarbonisation.
- **Working with the UK Government** to ensure that UK-wide policies work for Scotland and that actions in Scotland to mitigate and adapt to climate change also contribute to the UK's climate goals.
- **Access to UK-wide funding.** Scotland should seek to ensure that households and businesses have good access to UK-wide funding opportunities where possible and appropriate.
- **Communication and public engagement** of climate risks, and the options and choices available to reduce emissions across the UK.

While all sectors will require a significant degree of interdependent policy from both the UK and Scottish governments, the nature of the devolution agreement means that the balance of policy action between Scottish and UK governments varies across different areas of the economy. This balance can be broadly classified in three ways (Table 5.2, Figure 5.1):

- Areas where powers are largely devolved, and the Scottish Government can make progress, supported by UK Government;
- areas where some key powers are reserved, but the Scottish Government can still make significant progress using devolved policy levers; and
- areas where decarbonisation is most contingent on UK Government policy, but Scottish Government policy is needed.

Table 5.2. Balance of devolved and reserved powers		
Areas where policy levers are largely devolved	**Areas where certain key powers are reserved**	**Areas where progress is most dependent on UK Government and/or international policy**
The Scottish Government can demonstrate leadership, contingent on appropriate support and funding: • Agriculture • Land use, land-use change and forestry (LULUCF) • Waste • Public engagement	The Scottish Government can still make substantial progress using devolved policy levers: • Buildings • Surface transport • Low-carbon infrastructure • F-gases • Emissions trading	Scottish Government policy will still be required to supplement and facilitate decarbonisation in these sectors: • Power • Industry • Aviation • Shipping

3. Net Zero and adaptation are the responsibility of all Cabinet Secretaries, directorates and public bodies

In our Net Zero report, the Committee noted the need for the Net Zero challenge to be embedded and integrated across all departments, at all levels of Government and in all major decisions that impact on emissions. The Governments of the UK and Scotland quickly enacted the Net Zero target as law, and Welsh Government and Northern Ireland Executive have expressed their intentions to align to the UK's net-zero objective.

Net Zero and adaptation will require cross-government action, led from the centre of government and integrated to economic strategy. As discussed in the previous section, success will be reliant on co-ordinated action across the UK and Scottish Governments.

As well as collaborating more closely with Westminster to ensure that UK policy works for Scotland and vice-versa, the Scottish Government can ensure its own internal structures, public agencies and delivery bodies are well-equipped to deliver the net zero transition and integrate climate ambition with broader economic objectives.

The current **structure of the Scottish Government** naturally lends itself to the type of co-ordinated, cross-government policy that is needed to address climate change:

- The system is based around 39 directorates and headed by six directors-general, who are collectively responsible for delivering the Scottish Government's objectives. Cabinet Secretaries do not lead a government department, and work across multiple portfolios that often span several directorates. This system is intended is to minimise departmental 'silos' and encourage cross-government working towards shared government objectives. This system is – in theory – suited to working towards the Net Zero goal, provided that objective is strongly endorsed and driven by the centre of the Scottish Government.
- The Scottish Government's **National Performance Framework (Box 5.1)** is an outcome-based framework to measure success in Scotland. The indicators in the framework give a measure of national wellbeing, and include a range of economic, social and environmental indicators.

The framework is already being used to shape climate policy in a way that is consistent with national wellbeing, but a future framework could also be an effective tool for ensuring all policies developed in Scotland are consistent with Scotland's climate goals.

– The National Performance Framework is already having an impact on developing climate policy in a way that aims to increase wellbeing in Scotland, including Climate Ready Scotland and Scotland's Forestry Strategy 2019–2029, which both build on the framework and make reference to the national outcomes in policy design.
– Climate change mitigation and adaptation metrics are already included to some degree within this framework (Box 5.1), but as efforts to tackle climate change ramp up and become more interlinked with economic policy, Net Zero and adaptation must become even more central to Scottish Government policy; potentially even explicitly referenced as one of the national outcomes in a future iteration of the National Performance Framework.

Box 5.1. National Outcomes in the National Performance Framework

These national outcomes are that people in Scotland:

- grow up loved, safe and respected so that they realise their full potential
- live in communities that are inclusive, empowered, resilient and safe
- are creative and their vibrant and diverse cultures are expressed and enjoyed widely
- have a globally competitive, entrepreneurial, inclusive and sustainable economy
- are well educated, skilled and able to contribute to society
- value, enjoy, protect and enhance their environment
- have thriving and innovative businesses, with quality jobs and fair work for everyone
- are healthy and active
- respect, protect and fulfil human rights and live free from discrimination
- are open, connected and make a positive contribution internationally
- tackle poverty by sharing opportunities, wealth and power more equally

Source: Scottish Government (2020) *National Performance Framework.*

4. Support a resilient recovery from COVID-19

a) The Committee's advice on a resilient recovery

In April 2020 the Scottish Government requested the Committee's advice on a 'green recovery for Scotland'. The Committee responded with a letter setting out six principles for a resilient recovery from COVID-19 (Box 5.2).

Scotland – and the whole of the UK – faces a 'resilience deficit'. Our most recent review of Scotland's first Climate Change Adaptation Programme showed it is not clear that Scotland is prepared for the range of expected impacts of climate change, including the minimum level of change expected,[66] and the current Climate Change Plan is not yet ambitious enough to reduce greenhouse gas emissions to net-zero across the economy.

Measures to reduce greenhouse gas emissions and adapt to climate change can support the recovery from COVID-19. Planning must be reset across the whole of government:

- In the short term, with the economy operating well below capacity, action by Government must protect workers and businesses, restore confidence, stimulate spending and rebuild a greener economy, particularly for the most affected regions and sectors. These objectives can be strongly complementary to Scotland's climate goals and must avoid locking into carbon-intensive activities in the long term.
- For 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, job creation in low-carbon and climate-resilient industries, training and reskilling of the workforce. It also requires investments in building knowledge, and natural, social and institutional capital. Public money should not support industries or infrastructure in a way that is not consistent with the future net-zero economy or that increase exposure to climate risks.

In Chapter 5 of our 2020 UK Progress Report, we set out further evidence demonstrating that a range of low-carbon and climate adaptation 'green stimulus' measures fulfil both the short-term and long-term requirements of policies to support an economic recovery. We highlighted the clear economic, social, and environmental benefits from immediate expansion of the following measures (Table 5.1):

- Investments in low-carbon and climate-resilient infrastructure.
- Support for reskilling, retraining and research for a net-zero, climate-resilient economy.
- Upgrades to our homes and other buildings ensuring they are fit for the future.
- Action to make it easy for people to walk, cycle, and work remotely.
- Tree planting, peatland restoration, green spaces and other green infrastructure.

Our recommendations also covered the increasing need for a just transition and avoiding 'lock-in' of greenhouse gas emissions or increased climate risk. Fiscal measures were also considered, particularly carbon taxes or trading scheme auctions which can support the public finances and strengthen incentives to reduce emissions. They are particularly attractive when global oil prices, and therefore consumers' energy costs, are low, as they are now. Particular attention is needed to where the costs and benefits of action fall, given the uneven effects of the COVID-19 crisis.

When considering a Climate Change Plan for the 2030s and beyond, the Scottish Government should focus on the more medium-to-long term measures. This means a focus on identifying and accelerating investments in low-carbon and adaptation technologies that build long-term productive capacity in the economy.

[66] CCC (2019) *Final assessment of Scotland's first Climate Change Adaptation Programme.*

Many of the actions that we have identified for a resilient recovery are – by definition – also necessary actions for getting to Net Zero. The Plan should recognise recent policy commitments for a green recovery and expand commitments for:

- Low-carbon retrofits and buildings that are fit for the future.
- Natural capital investments: tree planting, peatland restoration and green infrastructure.
- Strengthening Scotland's energy system – including electricity and hydrogen derived from low carbon sources, and CCS – to the extent possible using Scotland's devolved powers.
- Infrastructure to make it easy for people to walk, cycle, and work remotely.
- Moving towards a circular economy.
- Reskilling and retraining programmes.
- Leading a move towards positive behaviours.
- Targeted science and innovation funding.

Box 5.2. Six principles for a resilient recovery from COVID-19

In April 2020, we wrote to the Cabinet Secretary for Environment, Climate Change and Land Reform setting out six principles for a resilient recovery from COVID-19 in Scotland:

1. Use climate investments to support the economic recovery and jobs.
2. Lead a shift towards positive long-term behaviours.
3. Tackle the wider 'resilience deficit' on climate change.
4. Embed fairness as a core principle.
5. Ensure the recovery does not 'lock-in' greenhouse gas emissions or increased climate risk.
6. Strengthen incentives to reduce emissions when considering fiscal changes.

Our Costs and Benefits Advisory Group on Net Zero, which we reconvened for this report, endorsed these principles and concluded that "*the economic recovery from [COVID-19] gives the UK a chance to grow back in a way that is fit for the low-carbon future to which it aspires, and that can benefit from the industrial and economic developments that this future offers.*"

Source: CCC (2020) *Letter: Building a resilient recovery from the COVID-19 crisis to Roseanna Cunningham MSP.*

b) The Scottish Government is already taking action

The Scottish Government is already taking action in each of our recommended areas for investment to stimulate a recovery from COVID-19. In particular, the Programme for Government was framed as a package for 'green recovery' and contained a range of measures suited to a low-carbon recovery, particularly around housing retrofits and skills and training (Table 5.3).

The Scottish Government has committed to a substantial package of infrastructure investment; the forthcoming Infrastructure Investment Plan should ensure that this investment is compatible with and drives progress towards Net Zero.

The Committee welcomes this clear signal that the Scottish Government's ambition of getting to Net Zero is unchanged by the pandemic.

Table 5.3. Scottish Government actions towards a resilient recovery

Committee on Climate Change recommendations for a resilient recovery	Scottish Government actions to date
Investments in low-carbon and climate-resilient infrastructure.	• Has maintained the commitment to spend an additional £2 billion on low-carbon capital investment over the next Parliamentary session. • £70 million to improve refuse collection infrastructure. • £150 million for flood risk management.
Support for reskilling, retraining and research for a net-zero, climate-resilient economy. Supporting a just transition.	• £100 million Green Job Fund. • £25 million National Transition Training Fund aimed at bridging the skills gap between those facing unemployment and sectors with greatest potential for future growth. • Expanded existing apprenticeship and undergraduate schemes in public agencies – including Scottish Forestry and Forestry and Land Scotland. • Commitment to publish a Climate Emergency Skills Action Plan. • Committed to establish a Grangemouth Future Industry Board.
Upgrades to homes and other buildings ensuring they are fit for the future.	• Committed to an uplift in heat and energy efficiency spend from £112m in 2019/20 to £398m in 2025-26.
Action to make it easy for people to walk, cycle, and work remotely.	• New £500 million fund over five years for active travel infrastructure, access to bikes and behaviour change schemes • £40 million for local authorities to spend on 'pop-up' cycle lands and wider pavements • Updated Digital Action Plan and continued work on Reaching 100% (R100) programme
Tree planting, peatland restoration, green spaces and other green infrastructure.	• £150 million to help deliver a 50% increase in woodland creation by 2024

Source: CCC (2020) *Reducing UK emissions – Progress Report to Parliament*; CCC (2020) *Letter: Building a resilient recovery from the COVID-19 crisis to Roseanna Cunningham MSP*.

5. Apply the lessons learned since 2008

Our 2020 UK Progress Report reviewed the period since the UK's Climate Change Act was legislated in 2008, and highlighted policy lessons that are relevant to the period ahead. We drew out eight lessons that should be applied to future policy development in the UK.[67]

These lessons are generalisable and equally applicable to policy in Scotland (Box 5.3). Scotland's climate policy – starting with the Climate Change Plan update – should consider these lessons at design stage and continue to improve as our understanding of 'what works' evolves. Scotland's monitoring and reporting framework for the Plan will continue to be an important tool for policymakers to evaluate what is working in Scotland.

Box 5.3. Applying the lessons learned since 2008

1. Success is attainable and can be rapid, provided the foundations are in place. Although not sufficiently widespread, the UK has had notable successes where high ambition has been adopted and backed by a well-designed package of policies.

2. Direction must be clear, and policies must be investable. Policy needs to be robust, clear and long-term to achieve the best results from the market. Once a market has been given clear standards and goals to achieve, and an investable mechanism to deliver it, firms operating within that market can respond in good time.

3. Enabling measures are important, with new challenges approaching. Part of the success of the power sector in Scotland in the last decade reflects a systematic approach to tackle barriers that could otherwise impede progress and to enable actions to speed up progress.

4. Multiple Government departments must work together. Decarbonisation is a cross-cutting issue and there are complex interactions between different sectors. To make the necessary changes, there must be increased collaboration and coordination between different Government departments. Success will require that the different arms of Government increase their co-ordination significantly.

5. Fairness must be a key part of policy design. Over the past decade, fairness has emerged as a key theme in climate policy. The COVID-19 crisis has further highlighted differential impacts and reinforced the importance of equitable policy design. Climate policies that fail to consider the need for a just transition and the fair distribution of costs in their formulation, announcement and delivery, risk being derailed due to public concern over regressive impacts (real or perceived).

6. Contingency and flexibility are needed – not everything will work. It is inevitable that not every area of policy action can deliver its intended impact, and this means that planning for the coming decades needs to be comprehensive and realistic about the risks to success. In practical terms, this means building contingency into decarbonisation plans to allow for areas where progress falls short.

7. National, local and international policy are all needed and can provide good examples. Achieving Net Zero requires action to be taken on multiple levels of governance, ranging from the local level to international. Coordination between different levels of government will be vital to ensure that their policies are aligned and additive.

8. Scotland can – and must – influence international decarbonisation. Scotland currently represents much less than 1% of global GHG emissions.[68] Future increases in the climate change that Scotland experiences will largely depend on the evolution of global emissions. The past decade has

[67] See CCC (2020) *Reducing UK emissions – Progress Report to Parliament,* Chapter 3 for full detail.
[68] On a territorial basis.

Box 5.3. Applying the lessons learned since 2008

shown that UK efforts can have an international impact through several mechanisms.[69] Scotland has been, and must continue to be, a key contributor to each of these mechanisms by showcasing effective climate governance, demonstrating that economic growth and decarbonisation are compatible, and deploying low-carbon technologies to drive down costs for the world as a whole.

Source: Adapted from CCC (2020) *Reducing UK emissions – Progress Report to Parliament*, Chapter 3.

6. Scotland's interim targets

Alongside the Net Zero legislation, the Scottish Parliament legislated a target for a 75% reduction in emissions by 2030 and 90% reduction in 2040. These targets have equivalent legal status to the Net Zero target.

The 2030 target for a 75% emissions reduction against 1990 levels – depending on which future inventory basis is assumed – equates to a reduction of around 80-85% based on the current emissions inventory methodology.

This target will be extremely challenging to meet, confirmed by emerging results from our analysis for the UK-wide Sixth Carbon Budget – which will be finalised in December 2020. The Committee previously recommended that the target was set to a 70% reduction in 2030, on the basis of a straight line to the 2045 target, with the intention that the Committee provide a more rigorous recommendation in 2020, backed up by analysis of the transition to Net Zero.

As results from our Sixth Carbon Budget analysis emerge, it is clear that the 2030 target is a particularly difficult period in which to define a target for Scotland. The period around the 2030s is expected to be the period with the fastest change on the pathway to net zero. This is a natural function of the transition in our Net Zero scenarios:

- In the early 2020s, the transition to low-carbon technology should be well underway in many sectors and sub-sectors of the economy, but other technologies, markets and skills need time to develop fully before they can be deployed at scale and start to deliver significant reductions in emissions.
- By the start of the 2030s, low-carbon technologies should be much more readily available to firms and households. Through the 2030s, high-carbon capital stock is replaced at the fastest rate across the economy as people and business switch to low-carbon alternatives. At the same time, electrification, CCS, hydrogen and engineered removals begin to be deployed at scale in the power and industry sectors (driving changes at large point-sources of emissions) while Scotland's land-use sink continues to grow as markets for tree-planting and energy crops are scaled up, and people continue to make lower-carbon choices.
- By the 2040s, the rate of change in annual emissions is expected to slow, as the last remaining high-carbon capital stock is phased out, residual 'hard-to-treat' sources of emissions continue to be addressed, and measures that remove CO_2 from the atmosphere continue to expand up to the scale needed to achieve Net Zero.

[69] Betts, P. (2019) *Chair's Summary Report of the International Advisory Group to the Committee on Climate Change in relation to its work on the UK'S Long-Term Emissions Goal.*

The greatest uncertainty on timing is associated with the period where the transition is fastest because the slope of the pathway is steepest. This is when policy frameworks and business models should be fully established, investment across the economy will be its highest and supply chains will be operating at maximum output. The exact year in which all those things will be in place depends on progress through the 2020s.

Given that Scotland has all but exhausted the potential for direct reductions in fossil-fired electricity generation that drove progress in reducing emissions in the 2010s, the 2030 target will be extremely challenging to meet even if Scotland gets on track for Net Zero by 2045. This picture is made even more complex by the uncertainty associated with COVID-19. The lasting impacts of the pandemic on Scotland's emissions pathway in the next decade – either through permanent changes in behaviours or through reduced economic output – are still unclear. Future changes to the emissions inventory – particularly for emissions associated with forested peatland – add further uncertainty to the 2030 target.

The rapid emissions reductions required for a 75% reduction by 2030 may not be feasible without significant increases in costs, adoption of technologies which have not yet been deployed at scale, and/or changes in behaviour. Not all of the policy levers that could be deployed to drive more rapid progress through the 2020s are devolved to the Scottish Government.

We will offer advice on the implications of the 2030 target in more detail in our advice to the Scottish Government later this year.

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Chapter 6: Policy priorities for the next year

Getting on track for Scotland's climate targets means taking action now. In this section we set out actions that the Scottish government can take in 2020 and 2021 – either as part of the Climate Change Plan update or as separate legislation – to lay the foundations for achieving their longer-term goals. These are further developed in the recommendation tables in the Executive Summary.

1. Embedding Net Zero and adaptation as core Scottish Government objectives

Scotland has already taken steps to facilitate cross-government effort by establishing key institutions, including the Scottish National Investment Bank (SNIB), the Just Transition Commission and the Infrastructure Commission for Scotland, which are aligned to the Net Zero goal and are beginning to provide evidence to support the transition.

- A renewed vision from Government, delivered via **the update to the Climate Change Plan**, can take into account recent progress in reducing emissions and the new context dictated by the COVID-19 pandemic. It can be the first net-zero-compatible programme of policies produced in the UK.
- **Scotland's response to the COVID-19 pandemic** will continue to be a clear barometer of climate ambition. There are multiple synergies between climate ambition and the economic response to the COVID-19 pandemic. As set out in Chapter 4, the Scottish government is already taking steps to ensure that the response to COVID-19 also addresses the resilience deficit.
- Increasingly, **all policy and infrastructure decisions** will need to be checked against their consistency with the Net Zero target and the need to adapt to the impacts of climate change. Scottish Government planning documents should be reviewed (e.g. through the use of HM Treasury's Green Book,[70] Scotland's National Planning Framework) to ensure consistency against this objective. Some commentators also suggest a need for new institutions, such as a Net Zero delivery body to help the delivery of these objectives – the Committee will consider these in our Sixth Carbon Budget advice.[71]
- **Scotland's climate objectives should be more closely integrated into the National Performance Framework**, possibly as a 'national objective' to ensure that directorates across the Scottish Government sufficiently prioritise Net Zero emissions and adaptation when making decisions.
- As much as possible, **barriers to delivering Net Zero** should be systematically reviewed and removed. Since many of the solutions cut across systems, fully integrated policy, regulatory design and implementation is crucial. Much of this will depend on reserved powers.
- The recommendations of the **Infrastructure Commission for Scotland should be reflected in Scotland's next Infrastructure Investment Plan:**
  - The Infrastructure Commission for Scotland's two reports in 2020 set out a 30-year vision for infrastructure in Scotland (Phase 1) and recommendations for delivery (Phase 2). The findings were framed around a long-term vision for inclusive economic growth and net-zero carbon emissions.

[70] The Green Book is currently under review by HM Treasury.

[71] See, for example, UCL (2020) *A net-zero emissions economic recovery from COVID-19,* and Oxford Smith School of Enterprise and the Environment (2020) *A net-zero emissions economic recovery from COVID-19* .

The Commission recommended that in independent body should be created to provide advice on investment decisions for the social, economic and natural infrastructure needs and priorities required to deliver an inclusive net zero carbon economy in Scotland.

  - Our 2019 Progress Report identified key infrastructure priorities for Scotland, including low-carbon heat and energy efficiency in buildings, electric vehicle charging infrastructure, heat networks, hydrogen production and carbon storage infrastructure, 5G and fibre broadband, risk management for flooding and coastal erosion, and natural infrastructure.

- **The Scottish Government should lead by example**, by reducing emissions and ensuring climate resilience across its estate, using zero-carbon vehicles, ensuring public bodies report on progress in reducing their own emissions, and assessing climate risks, in line with best practice in the business community.
- In partnership with the UK Government and the governments of Wales and Northern Ireland, **review the planned UK Emissions Trading System** following the Committee's advice on the Sixth Carbon Budget and adjust it to align to the Net Zero pathway.
- The next **National Planning Framework (NPF4) should be closely aligned to Net Zero and adaptation**, providing a favourable planning and consenting regime for a low-carbon and efficient energy system and climate-resilient infrastructure.
- **Adaptation must also be integrated into all Government policy, and Scotland's plans for reaching Net Zero must be consistent with a changing climate**. Climate change brings significant risks to Scotland and the Net Zero target does not preclude the need to adapt (B0x 6.1). Across multiple areas, and in particular on buildings and land use, there are benefits to thinking holistically about how policy can reduce emissions, while ensuring it improves resilience to the UK's changing climate.

Box 6.1. Adaptation as core Scottish Government policy

The UK's National Risk Register for the next five years places flooding, severe weather (including storms, heatwaves, cold snaps, wildfire) and human and animal diseases among its top risks to the country.[72] All of these risks are increasing due to the changing climate:

- **Scotland's Net Zero goal does not preclude the need to adapt to the changing climate.** Climate change impacts in Scotland will be determined by global, not Scottish emissions. Even if the world moves to net zero emissions in the second half of this century, further climate change is inevitable and even the minimum level expected will pose significant risks to meeting most of the Government's economic, social and environmental goals.
- **The changing climate brings significant risks to Scotland,** both direct risks from the physical effects of climate change and systemic risks for the environment and the economy. The short-term and long-term range of potential impacts are assessed as part of the Government's five-yearly UK Climate Change Risk Assessment (CCRA). The Committee is currently collating evidence for the third UK CCRA Evidence Report, which will be published next year. Without additional action to prepare for these risks over and above what is happening today, Scotland faces significantly worsening impacts from climate change over coming decades.

[72] Cabinet Office (2017) National Risk Register of Civil Emergencies, 2017 Edition.

Box 6.1. Adaptation as core Scottish Government policy

- **It is not clear that Scotland is yet prepared for the range of climate risks faced, including the minimum level of change expected.** The Adaptation Committee has to date published two reviews of the first Scottish Climate Change Adaptation Programme (SCCAP):
  - The first review in 2016 found that some actions were underway to prepare for climate change in Scotland, but a lack of evidence made it difficult to judge whether Scotland's vulnerability to climate impacts was increasing, remaining constant, or decreasing.
  - Our final review in 2019[73] found that progress had been made in peatland restoration, increasing marine resilience and an improved understanding of flood risk in Scotland, but areas of continued concern remain including increases in pests and diseases in Scottish forests, declines in seabird populations and soil health. Key data and evidence gaps remained in Scotland that make it difficult to assess progress for a number of adaptation priorities, including the extent of housing and other infrastructure development in flood risk areas and health impacts from climate change.
  - The Scottish Government has since published its second Climate Change Adaptation Programme. Scottish Government may request the Adaptation Committee to undertake further reviews of this new programme in due course.
- **Effective policy should reduce risks and support those that are worst affected.** Adaptation policy should be transparent, enable households and businesses to take action, provide incentives and investment to strengthen resilience, and integrated into all policies to ensure they can be met in the face of climate change.
- **Scotland's plans for reaching Net Zero emissions must also be resilient to the changing climate.** There are particular overlaps in buildings (e.g. where the overheating risk must be managed alongside improvements to energy efficiency and a shift to low-carbon heating systems) and land use (e.g. where new forests and bioenergy crops must be suited to the future climate). The large infrastructure programme required to reach Net Zero emissions must be designed to prosper under the coming changes. The Committee will further explore the overlaps between Net Zero and adaptation in our December advice on the Sixth Carbon Budget.

Source: Adapted from CCC (2020) *Reducing UK emissions - Progress Report to Parliament*, Chapter 6 Section 2.

2. Transforming Scotland's buildings

Our Net Zero report makes it clear that the Scotland's buildings will need to move entirely over to low-carbon heating systems by 2050 at the latest. Boiler lifetimes of around 15 years imply that markets and supply chains for low-carbon heating need to scale up to cover all new installations in Scotland by the first half of the 2030s.

The current expectation is that low-carbon heating will have higher financial costs than continuing to operate fossil gas boilers. This points to the need for energy efficiency to improve more quickly, and further innovation and investment is also required to drive down installation costs while continuing to improve quality.

As these changes are taking place, resilience measures also need to be included to make homes safe and comfortable in the changing climate, including passive cooling, water efficiency and flood protection.

[73] CCC (2019) *Final assessment of Scotland's first Climate Change Adaptation Programme.*

The Committee set out comprehensive thinking on this challenge in our reports on *Next Steps on Heat Policy* (2016) and *Housing - Fit for the Future* (2019).

Under the Scotland Act, heat policy, energy efficiency and building standards are devolved. However, regulation of energy markets, oil and gas, electricity and gas networks and consumer protection remain reserved to the UK Government. Scotland currently participates in the GB-wide Renewable Heat Incentive (RHI) which is due to end in 2022.

a) Actions for the Scottish Government

The Scottish Government is well set up to take action now on the areas that are firmly within devolved powers,[74] and must make a decision on the future of low-carbon heating in Scotland that fits with the UK Government's Heat and Buildings Strategy and wider energy policy:

- **A clear direction is needed for both buildings heat and efficiency in Scotland.** The Energy Efficient Scotland Programme has set good foundations for this overall strategy and is nearing completion. The Scottish Government – in close collaboration with the UK Government, which has reserved control over key policy levers – should produce an ambitious strategy for heat that complements the Energy Efficient Scotland Programme. This must set the direction for the next 30 years, reaching zero emissions from Scotland's buildings by 2050 at the very latest, and by 2045 if possible. A clear, loud and stable signal for the future market is vital to unlocking the overall challenge:
  - There should be clear trajectories of standards across the housing stock for both efficiency and carbon performance, culminating in a phase-out of the installation of new oil and gas boilers, by the late-2020s and mid-2030s at the latest, respectively. Some exemptions may be suitable, for example where an area has a clear and costed plan to switch over to low-carbon hydrogen.
  - Electrification, alongside low-carbon district heating schemes where viable, should offer the primary route to zero-carbon heating systems, with a possible supplementary role for hydrogen in providing flexibility for different regional solutions and/or for managing peak demand. BEIS will need to signal how it, alongside Ofgem, intends to manage decisions over the future of the gas grid.
  - Hybrid heating systems (e.g. with a heat pump installed alongside a gas boiler) can play a useful role both on and off the gas grid, at least over the next decade and possibly beyond.
  - Standards should encourage holistic building designs and retrofit opportunities that incentivise low-carbon heat and energy efficiency, while ensuring buildings are resilient to the future impacts of climate change.
- **Finalise – and take action on – the clear direction for energy efficiency in the Energy Efficient Scotland Programme.** Scotland's plans for energy efficiency in homes are much more advanced than those in England, with a clear trajectory set out to 2040 that is planned to be backed up by regulations – including mandatory standards on homes at key trigger points and a regulatory backstop date for efficiency standards**,** once legislated. Following the

[74] I.e. standards for energy efficiency, technical aspects of district heating, and measures to decarbonise heat in buildings not using mains gas.

publication of an updated Energy Efficiency Strategy Route Map later in 2020, this strategy should begin to take action, with an acceleration in energy efficiency retrofits**.**

- **Identify options for making low-carbon heat cost-competitive in the context of the UK's Heat and Buildings Strategy**. The Scottish Government's Heat Policy Statement later in 2020 should provide more detail on the options under consideration for low-carbon heat in Scotland. Broadly, the Scottish Government has two options for providing direct financial support for low-carbon heat for on-gas properties as the Renewable Heat Incentive (RHI) is phased out:
  - Continue to participate in a GB-wide support scheme for low-carbon heat, retaining the flexibility to provide 'top-up' grants, loans, support and/or advice for Scottish consumers.[75] **If UK Government delivers an effective successor to the RHI,[76] this is the Committee's recommended option** due to economies of scale, clarity for UK suppliers of low-carbon heat equipment, and alignment with other reserved UK policies on energy taxation, markets and networks. The Scottish Government would retain the ability to target additional support where it is most needed.
  - Develop a separate low-carbon heat strategy. Without access to the full set of policy levers (especially those concerned with the gas grid and energy prices) this would present a co-ordination challenge to the UK Government. It would also require significant expenditure through a Scottish Budget.
- **Deliver enabling measures.** There are a set of barriers that must be tackled to reach higher quality and quantity of installations:
  - Retraining packages and certification schemes are required to increase the availability of skilled installers and to give consumers confidence in low-carbon technologies.
  - Performance measurement must develop to reflect real-world energy use and real-world performance of buildings and heating systems. This can be achieved in homes by rolling out digital Green Building Passports across the stock. The passports should build on proposals from the Green Finance Taskforce,[77] and be extended to cover water efficiency, flood resilience and other resilience measures. In new buildings, accurate performance testing and reporting must be made widespread – going beyond airtightness testing – to hold developers to the standards they advertise. Many of the barriers related to assessment are currently being considered by Scotland's short-life working group (SLWG) on assessment.
  - The planning system must be fit for purpose. The next National Planning Framework (NPF4) should identify and close loopholes that allow homes to be built which do not meet the current minimum standards for new dwellings and tighten rules around permitted development rights relating to change of use.
  - The compliance and enforcement framework should be overhauled so that it is outcomes-based (focussing on performance of homes once built), places risk with those

[75] Existing schemes that exist to maximise the up-take of the RHI in Scottish households and businesses include the Renewables and Energy Efficiency Specialist Advice Service; the District Heating Loan Fund and the Warm Homes Projects Fund; the Low Carbon Infrastructure Transition Programme; the interest-free Home Energy Scotland Loan Scheme; and the SME Loan Scheme.

[76] For example the Clean Heat Grant as proposed in BEIS (2020) *Future support for low carbon heat.*

[77] Green Finance Taskforce (2018) *Accelerating Green Finance.*

able to control it, and provides transparent information and a clear audit trail, with effective oversight and sanctions.

  - Innovation support should be provided, both to drive down the costs of key technologies like heat pumps and hydrogen and to develop the consumer offering (e.g. through 'heat as a service' business models and smart heating controls).
  - Consumer education will be important, to increase familiarity with and confidence in low-carbon heating systems and understanding of the need to switch. Support guiding people through the retrofit process is key – building on the example of the Scottish Home Renewables Advice service. This could be done through more rapid mainstreaming of the retrofit coordinator role under PAS2035[78] in co-ordination with the UK Government.

- **Drive near-term progress.** Scottish heat policy must deliver immediate actions to drive more rapid near-term progress.
  - Scotland's new build standards (due to be legislated in 2021) should 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.
  - Home retrofit plans should be rolled out as soon as possible across the full housing stock. These should be integrated with widespread local energy planning, with local authorities and network operators to broaden awareness and support broader decision making, particularly around heat infrastructure.[79] This can be co-ordinated via the Local Heat & Energy Efficiency Strategies (LHEES) which have now been developed by every local authority in Scotland.
  - Set out an approach to decarbonise high-carbon fossil fuel heat (e.g. oil and LPG boilers) in properties off the gas grid. The Committee has recommended that the phase-out of new oil boiler installations should be within the next decade at the very latest. The Scottish Government has devolved powers to regulate for the phase-out of high-carbon heating in off-gas properties. The Scottish Government's recent Call for Evidence found support for a phased regulatory approach that would set specific dates to ban new installations of high-carbon heating systems.[80] Continued financial support would be required alongside any phased policy framework.
  - Trials, pilots and demonstrations must all progress in the near-term, at sufficient scale to inform future policy making and to build consumer confidence.
  - The next National Planning Framework (NPF4) should make it clear that where LHEES have identified zones in which low-carbon sources heat are readily accessible and their integration within district heating schemes is cost-effective in providing low-carbon heat in new-build areas, these should be integrated into Local Development Plans.

[78] 'PAS 2035 – Specification for the energy retrofit of domestic buildings' was introduced as a result of the 2015 'Each Home Counts' review, with the backing of industry and BEIS.
[79] Energy Systems Catapult (2020*) Local Area Energy Planning: Supporting clean growth and low carbon transition*; Energy Systems Catapult (2020) *Net zero carbon buildings: Towards an enduring policy framework*; Association for Decentralised Energy (2019) *Zoning for Heat and Energy Efficiency – A framework for decarbonisation to net zero for domestic and non-domestic buildings*.
[80] Scottish Government (2019) *The future of low carbon heat for off gas buildings: Analysis of responses to the call for evidence.*

- **Set an equally stretching pathway for non-residential buildings** in the next phase of the Energy Efficient Scotland Programme:
  - The Scottish Government is yet to set out its proposals for non-residential buildings, including a benchmarking mechanism to create a long-term energy efficiency standard and setting regulatory 'backstop' dates as milestones for non-residential buildings. The Scottish Government could work with the UK Government to introduce an in-use performance programme based on the NABERS model[81] for the whole of the UK.
  - There is also scope to phase out fossil fuel boilers and reach zero emissions earlier in non-residential buildings, but the end of the non-domestic RHI scheme poses a risk of a policy gap for the support of non-residential heat in Scotland.
  - The public estate can play an important role in driving the wider market and showing leadership, with the Scottish Government leading the way. These targets must be supported with adequate funding from the Scottish Government and/or permission for public bodies to raise finance. Local authorities should be supported to monitor and report emissions from their own estate and local areas and report on climate resilience.
  - Under the Climate Change (Scotland) Act, public bodies in Scotland are required to contribute to the delivery of our emissions reduction targets, and many are already going well beyond their legislative duty. New regulations were laid in Parliament strengthening the requirements on public bodies to set a target date for achieving zero direct emissions of greenhouse gases (or such other targets that demonstrate how the body is contributing to Scotland achieving its emissions reduction targets). Public bodies will be required to include this in their report on emissions from 2021/22.
  - As well as reducing emissions, the Scottish Government must also tackle the challenges of fuel poverty (e.g. through the 2021 Fuel Poverty Strategy) and wider issues of housing condition, including overheating, poor indoor air quality and sustainable drainage.

b) Actions for the UK Government

The Committee gave a series of recommendations to the UK Government in our 2020 Progress Report, centred around the Buildings and Heat Strategy later this year. Our recommendations that will directly help to decarbonise Scotland's buildings through reserved policies are summarised below. The UK Government should:

- **Set a clear direction for heat in the UK.** BEIS, in collaboration with HMT and MHCLG, should produce an ambitious Heat and Buildings strategy which sets the direction for the next 30 years, reaching zero emissions from buildings by 2050. A clear, loud and stable signal of the future market is vital to unlocking the overall challenge.
- **Make low-carbon heat cost-competitive.** HMT must work with BEIS to ensure that households and businesses installing energy efficiency and low-carbon heating are left financially better off.
- **Set enabling measures.** There are a set of barriers that must be tackled to reach higher quality and quantity of installations. Some of these barriers are best tackled with reserved policy, including innovation support and green financing.

[81] See: https://www.nabers.gov.au/

- **Drive near-term progress.** Heat policy must deliver immediate actions to drive more rapid near-term progress. The new green levy for biomethane will ensure a stable market for biomethane throughout Great Britain through the next decade, and Scotland can learn from trials, pilots and demonstrations elsewhere in the UK.

3. Decarbonising transport: getting there sooner and other transport priorities

a) Actions for the Scottish Government and Transport Scotland

The COVID-19 pandemic is already changing how people travel, and provides an opportunity to encourage sustainable behaviours such as working from home and active travel (e.g. walking and cycling). Some cities are already redesigning streets to encourage walking and cycling instead of car use. Without Government support in these areas there is a risk of lower use of public transport and increased use of cars, in the short term. The Scottish Government should:

- **Strengthen schemes to support walking, cycling and public transport** to reduce demand for higher-carbon travel, and to lock in positive changes to travel habits in response to the COVID-19 pandemic. The public sector should lead the shift to other positive behaviours that reduce travel demand (e.g. encouraging homeworking, facilitated through prioritising broadband investments over road network expansion). New funding has been made available for buses and active travel infrastructure, but supporting lasting changes in transport behaviour will be the test of success.
- **Continue to invest in the public EV charging network**. More progress is needed to support EV charging for those without off-street parking, for shared car parks and renters. Development of charging infrastructure will benefit from grants made available by either the UK or Scottish Governments but will also require private investment, including by regulated electricity network companies, notably the Distribution Network Operators (DNOs) that are developing investment business cases that will be submitted to Ofgem for the period 2023-2028.
- **Maintain 'top-up' subsidies for electric vehicles** that build on existing OLEV grants, but plan for a transition to fiscally neutral incentives as battery costs fall.
- **Deliver on commitments to phase out all new petrol and diesel vehicles from Scotland's public sector fleet by 2030,** as set out in the 2018 Climate Change Plan.
- Follow through on new plans to electrify 100% of passenger rail by 2035 in Scotland.
- **Review Scottish airport capacity strategies** in light of COVID-19 and Net Zero, including a household & business survey of long-term travel expectations. Demand-side policies should also be introduced to ensure emissions stay on track to Net Zero.
- Encourage the UK Government to formally include International Aviation & Shipping (IAS) emissions within the UK's climate targets, as Scotland has already done.

b) Actions for the UK Government

The Committee gave a series of recommendations to the UK Government in our 2020 Progress Report. Our recommendations that will directly help to decarbonise transport in Scotland through reserved policies are summarised below.

The UK Government should:

- **Confirm the earlier phase-out of new petrol/diesel and plug-in hybrid car and van sales by 2032 at the latest**, in the next phase of the Transport Decarbonisation Plan later this year. A policy package is required to deliver on that goal.
- **Increase the ambition of UK vehicle efficiency standards** for new car and van CO_2 emissions for 2025 and 2030, with more regular target intervals than the EU's five years, backed by a rigorous real-world testing regime.
- **Maintain purchase subsidies for electric vehicles** and plan for a transition to fiscally neutral incentives.
- **Reform Vehicle Excise Duty** to provide stronger incentives to purchase zero emission vehicles and halt the shift towards larger, higher emitting cars.
- **Develop plans for a comprehensive framework to decarbonise HGVs**, covering financial incentives, regulation and infrastructure for the 2020s.

These policies are needed to drive the UK market for zero-emission vehicles. They will also strengthen the case for investments in the supply of these vehicles in the UK, and the batteries that they will require. Government policies directed at that supply and in supporting innovation to improve performance and reduce cost are also welcome.

Though decarbonising aviation and shipping are longer-term priorities, action now is also required. The UK Government should:

- **Work to reduce International Aviation and Shipping (IAS) emissions** by working with the International Civil Aviation Organisation (ICAO) and International Maritime Organisation (IMO) to set ambitious long-term goals and develop robust mechanisms to achieve these.
- **Develop incentives for new low-carbon ammonia and hydrogen** supply chains and accompanying port infrastructure, with the UK's first clean maritime cluster built by 2030.
- **Commit to an ambitious Net Zero goal for UK aviation in the forthcoming Aviation & Climate Change Consultation**, with UK international aviation reaching Net Zero by 2050, and domestic aviation potentially before 2050.
- **Monitor non-CO_2 impacts** of aviation and shipping and consider how best to tackle them alongside UK climate targets.
- **Review the whole UK's airport capacity** strategy in light of COVID-19 and the Net Zero transition.

4. Helping industry to cut carbon and promoting resource efficiency

Key reserved policy levers for industry – including those associated with energy markets, networks and prices; industry regulations; international trade; and large-scale funding programmes such as the Industrial Energy Transformation Fund – will set the direction for industry in Scotland. A UK-wide successor to the EU ETS, agreed jointly by the governments of UK, Scotland, Wales and Northern Ireland, will also play a crucial role (see Section 6).

The Scottish Government has roles to play in industrial decarbonisation, particularly through schemes which promoting energy efficiency and resource efficiency, incentivising low-carbon heat in industry, and developing a skilled workforce for the low-carbon jobs of the future.

a) Actions for the Scottish Government

- **Set out new policies for resource efficiency in industry.** The Circular Economy Bill should be reintroduced next Parliament, with a particular focus on policies for encouraging efficiency within manufacturing and construction and reducing consumer demand for products.
- **Enable Scottish businesses to access UK-wide funding.** The Scottish Government has signalled its intention to engage more closely with businesses though a Mission Zero Business Summit, a new online 'single entry point' for businesses, and a new business support partnership between Scottish Enterprise, Highlands and Islands Enterprise, the Scottish Environment Protection Agency and Scottish Natural Heritage. The Scottish government also provides advice on different sources of funding available.[82] If delivered effectively, this support and information will enable Scottish industry to access UK-wide schemes.
- **Skills and training.** Develop and roll-out of plans for training and skills for the Net Zero transition, with buildings and manufacturing being priority areas.
- **Support a just transition for Scotland's manufacturing clusters and oil and gas sector** through continued support of the Transition Training Fund, the Grangemouth Future Industry Board and continued financial support for developing carbon capture and storage in Scotland.

b) Actions for the UK Government

The Committee gave a series of recommendations to the UK Government in our 2020 Progress Report. Our recommendations that will directly help to decarbonise industry in Scotland through reserved policies are summarised below. The UK Government should:

- **Support the recovery.** Government should seek to support and create jobs through its industrial decarbonisation policies, especially in regions with high reliance on industrial jobs – including the North Sea oil and gas industry.
- **Avoid 'lock-in'. Wider recovery support must not 'lock-in' industrial sectors to higher emissions. Any** oil and gas sector recovery support should be contingent on deep upstream emissions intensity reductions and clear plans for a just transition for workers and moves towards a net-zero business model.
- **Set a clear strategy.** Government has launched a number of new industrial decarbonisation policies in the past 18 months, but these do not all fit together, do not set a long-term vision of enduring policies and there are gaps in the approach. Government should publish a comprehensive manufacturing and construction decarbonisation strategy in early 2021 that is integrated with policy development in hydrogen and CCUS.
- **Increase ambition of existing policies on resource efficiency and energy efficiency.** The UK Government should agree an ambitious and tight set of Climate Change Agreements with industry to help deliver industrial energy efficiency improvements across the UK.

[82] Scottish Government (2020) *Energy efficiency and decarbonisation – advice and support for industrial users.*

It should also set out which policies will deliver the additional 12 TWh of industrial energy efficiency potential identified in the Government response to our 2019 Progress Report, specifically detailing how these will total 12 TWh.[83]

- **Fill policy gaps** on fuel switching, fossil fuel production and non-road mobile machinery (NRMM).

5. Delivering low-carbon land use and reducing waste

The agriculture, land-use and waste sectors present an opportunity for the Scottish Government to demonstrate its low-carbon credentials by mobilising the full range of devolved powers in these sectors. Waste emissions have fallen steadily, and tree-planting and peatland restoration has accelerated in recent years, but there has been no meaningful progress on tackling agricultural emissions in Scotland.

Sufficient funds must be made available to Scotland by the UK Government to replace the Common Agricultural Policy (CAP), commensurate with the scale of contribution that Scotland's land can make to reducing UK emissions.

Some schemes will benefit from UK-wide co-ordination, including a market mechanism for tree planting – which would, for example, allow Scottish land managers to be paid to offset emissions from flights taking off from England – a UK-wide Bioenery Strategy, and support for carbon capture and storage technology that eventually can be fitted to energy from waste plants.

a) Actions for the Scottish Government

Scotland's net-zero and climate resilience goals will not be met without changes in farming and land use. Our scenarios for deep reductions in land-based emissions balance the need to reduce emissions with other essential functions of land, including maintaining food production (which will help prevent the off-shoring of emissions), climate change adaptation and biodiversity. They require the rapid adoption of low-carbon farming practices, a shift to less carbon-intensive diets and sustainable improvements in crop yields, such that at least one-fifth of agricultural land in Scotland is released by 2050 for actions that reduce emissions and sequester carbon.

Scotland's successor to the Common Agricultural Policy provides an early opportunity to shape changes in land use. The Scottish Government introduced a Rural Support Bill in 2019, which is designed to maintain and simplify the existing CAP scheme in the three to five years after leaving the EU. It does not set out the future direction of Scottish rural support policy, nor does it make provisions for Ministers to create new policy or reform existing policy. The Scottish Government has expressed a desire to do so in a future Scottish Agriculture Bill rather than accept the inclusion of a Scottish schedule in the UK Agricultural Bill.

A new policy framework should incentivise emissions reductions across Scotland, and deliver wider environmental co-benefits:

- **Strengthen the regulatory baseline** to ensure low-cost, low-regret options are taken up, including banning rotational burning of peat, peat extraction and the use of peat in compost.

[83] BEIS (2019) *Leading on clean growth: government response to the Committee on Climate Change 2019 progress report to Parliament – Reducing UK emissions.*

- **Develop mechanisms for both private and public finance to support land-based solutions**. Develop a market mechanism (e.g. trading scheme or auctioned contracts) to incentivise afforestation and energy crop planting, and ensure that post-CAP public funds incentivise low-carbon farming practices, agroforestry, peat restoration and non-carbon benefits of afforestation. This should also support the clear co-benefits for wider environmental goals, including climate change adaptation and encompassing flooding, biodiversity and air quality, amongst others.
- **Introduce new schemes to address non-financial barriers** to change such as retraining and awareness raising, tackling tax treatment of woodland creation and tenancy and landlord constraints.
- **Encourage consumers to shift to lower-carbon diets and reduce food waste**, starting with the public sector and schools.
- **Support wider public interest objectives.** Reducing emissions and increasing carbon sequestration sit alongside many other public interest objectives for Scotland, including adaptation to climate change and biodiversity. Policies to increase carbon sequestration should be implemented in a way that also supports these wider objectives, for example by aligning the timing and security of payments for different environmental goods.
- **Interim policies** should be implemented to avoid a hiatus in action before the new framework is fully in place. It is important that a hiatus in the take-up of measures required for delivering net zero is avoided while awaiting the implementation of new policies. It is therefore critical that 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.

Achieving significant emission reductions in the waste sector requires a step-change towards a circular economy, moving away from landfill and energy from waste[84] (and the associated methane and fossil CO_2 emissions), and towards a reduction in waste arisings and collection of separated valuable resources for re-use and recycling. This applies at local, regional and national levels:

- **Ensure Scotland stays on-track for a 15% reduction in waste generation and a 70% recycling rate by 2025 at the latest.** Scotland exceeding its proposed targets – once legislated – will be key to phasing out waste exports and limiting fossil emissions from energy from waste plants. Reduction and re-use also avoid the need for recycling or residual treatment. The Scottish Government should also plan how waste reduction and higher recycling rates will impact the utilisation of (and need for further) energy from waste plants, and via a set of guidance notes, help align local authority waste contracts and planning policy to these findings.
- **Mandatory business food waste reporting** would help achieve reductions in food waste, building on the current voluntary approach,[85] alongside reductions in household food waste.

[84] Including Energy from Waste (EfW) incineration along with other waste to power/heat conversion technologies, such as gasification and pyrolysis plants classified as 'Advanced Conversion Technologies' (ACT) by BEIS.
[85] WRAP (2020) *Food Waste Reduction Roadmap*.

Scotland achieving its 33% reduction target by 2025 and then the UN's Sustainable Development Goal 12.3 (halving per capita food waste by 2030) would also free up more land for carbon sequestration.

- **Ensure new energy from waste plants are future-proofed for CCS.** New energy from waste plants (and plant expansions) above a certain scale should only be constructed in areas confirmed to soon have CO_2 infrastructure available, and should be built 'CCS ready' or with CCS.[86] Local councils should be carefully considering the fossil emissions from waste to energy plants, and how these plants will retrofit CCS in the future.
- **Ensure the biodegradable municipal waste landfill ban is not delayed again, and is strengthened to also include non-municipal wastes by 2025.** Local authorities and private waste management firms need to urgently invest in collection infrastructure and new re-use, recycling, composting and anaerobic digestion facilities – sufficient capacity must be made available well before 2025, so that increases in energy from waste or exports due to the ban are avoided. A significant expansion in Scottish energy from waste capacity occurred in anticipation of the 2021 ban date, and a repeat of this should be avoided, due to the risk of locking-in increased fossil emissions (most Scottish facilities are small, so it will be expensive to retrofit CCS, even with local CO_2 networks available).[87]

b) Actions for the UK Government

The Committee gave a series of recommendations to the UK Government in our 2020 Progress Report. Our recommendations that will directly help to decarbonise waste in Scotland through reserved policies are summarised below. The UK Government should:

- **Develop capture and storage technology for energy from waste plants.** Fossil emissions from EfW and ACT plants are growing rapidly (currently at 6.8 $MtCO_2e$/yr for the UK), and will continue to do so in the near term. Once built, the main emissions mitigation option from these plants will likely be CCS, even at modest plant scales. [88] When regional CO_2 infrastructure becomes available, operational plants above a certain scale should be incentivised or required to retrofit CO_2 capture. These retrofit dates and capacity thresholds should to be set as part of the UK's new Bioenergy Strategy, and aligned with CCS infrastructure plans from BEIS.

6. A low-carbon, flexible energy system: accelerated electrification, CCS, hydrogen, bioenergy and increased flexibility

Most levers related to the UK's energy systems are reserved. The decarbonisation of the power sector has been a strong UK success story, and has been demonstrated most clearly in Scotland, where a combination of natural resources for renewables and a favourable planning and consenting regime have enabled Scotland to lead the way. UK policy will still have an important role in future to ensure the market delivers sufficient scale and flexibility to support the decarbonisation of the rest of the economy.

[86] DECC (2009) *Carbon Capture Readiness (CCR)*.
[87] 5 EfW plants with a total operating capacity of 63 MWe have been built in Scotland since 2017, taking total current capacity up to 81 MWe across 7 plants. There are 67 MWe currently under construction, with a further 32-62 MWe granted planning permission (range due to some planning expiry dates not being specified). See BEIS (2020) *Renewable Energy Planning Database*.
[88] Energy Systems Catapult (2020) *Energy-from-waste plans with carbon capture*.

Emissions trading is a devolved matter (although other possible mechanisms for pricing carbon – such as a carbon tax – may be reserved). Until now the UK has participated in the EU emissions trading system (EU ETS), and the UK Government has led negotiations with the other EU Member States regarding what follows from 2021.

The future of UK emissions trading is still uncertain. A whole-UK ETS would provide benefits in terms of market liquidity compared with smaller schemes. Current plans for a whole-UK ETS must be agreed jointly with the governments of the UK, Scotland, Wales and Northern Ireland.

a) Actions for the Scottish Government

The Scottish Government should:

- **Set out an updated assessment of how much renewable and low-carbon energy 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. A similar direction in the forthcoming Hydrogen Policy Statement and Hydrogen Action Plan as a companion to the Climate Change Plan Update is also welcome. This will require working with energy network companies and local authorities to develop a clear vision of changes to gas and electricity demand that might be expected within Scotland as heat, transport and industry are decarbonised in line with the updated Climate Change Plan and UK-wide carbon budgets.
- In partnership with the UK Government and the governments of Wales and Northern Ireland, **review the planned UK Emissions Trading System** following the Committee's advice on the Sixth Carbon Budget and adjust it to align to the Net Zero pathway. This will also have important implications for industry in Scotland (Section 4).
- **Align the National Planning Framework (NPF4) to a Net Zero energy system** by ensuring Scotland has a favourable planning and consenting scheme for onshore wind and other renewables, and supporting repowering and life extension of existing wind power in Scotland.

b) Actions for the UK Government

UK reserved powers will continue to have a significant impact on the future of electricity generation in Scotland. The forthcoming energy White Paper is an opportunity for the Government to reflect on the success of electricity market reform over the past decade, and apply the same ambition to delivery of low-carbon electricity, CCS, hydrogen and bioenergy during the 2020s and 2030s. Thinking about these elements together and taking a whole systems view of system flexibility will be essential to meeting future demand for energy:

- **Renewables** can now be deployed at scale in the UK with no or little expected average subsidy over their lifetime. However, the high development and capital costs of renewables and uncertainties around future revenues in a wholesale market with high penetration of low short-run cost generation mean that Government should take advantage of the cost reductions in renewable electricity over the past decade and should continue to use the Contracts-for-Difference (CfD) mechanism with a clear pathway of auctions to deliver ambitious power sector decarbonisation during the 2020s, consistent with plans for electrification of transport and heat. The UK Government has committed to 40 GW of installed offshore capacity by 2030, bringing overall UK wind capacity to over 50 GW.

- **Carbon Capture and Storage** is a necessity, not an option, for the UK's Net Zero objectives. Plans should be delivered for CCS to be operational at multiple industrial clusters from the mid-2020s facilitating production of hydrogen and/or production of electricity in a low-carbon way using fossil gas and/or with 'negative emissions' using bioenergy, with ambition for scaling up infrastructure beyond this.
- **Low-carbon hydrogen** is critical to achieving Net Zero, and needs to be made commercially viable during the 2020s. Given the potential of the fuel across multiple sectors, a cross-cutting vision and strategy for a hydrogen economy will be required from Government, with production and use starting from the early 2020s. Risk sharing mechanisms for the first users and producers of low-carbon hydrogen are likely to be required, in order to develop a market for low-carbon hydrogen.
- Publish a new cross-department **Bioenergy Strategy**, aligning policy with the best-uses of biomass and wastes to 2050 (maximising sequestration and displacement of emissions).
- **Improve system flexibility** through the implementation of all actions in the Smart Systems and Flexibility Plan.Plans should ensure the flexibility available from the interactions between sectors (e.g. electric vehicles, electrified heat) and vectors (e.g. power, hydrogen, energy storage) is used.
- **Develop clear plans to ensure adequate resilience of energy supplies** as heat and transport become more electrified.

7. Delivering a low-carbon and resilient Government estate

All public bodies should follow best practice shown by leading businesses to monitor and verify their paths to a Net Zero and climate resilient future. Reducing emissions across the Scottish Government and UK Government estates is a good place to start.

This combined public estate in Scotland is vast, comprising hundreds of thousands of assets, from ports to prisons, railways, schools and hospitals, managed by over one thousand property management organisations. In many areas, public landowners have the purchasing power and potential for co-ordination to drive change in a sector. The Scottish Government can lead by example via its own procurement strategies, developing low-carbon markets and standards that act to reduce emissions, as well as addressing overheating, green space and sustainable drainage.

At a minimum the Scottish Government should establish the planned Net Zero Carbon Standard for new public buildings and accelerate efforts to use 100% renewable electricity on the Scottish public estate.

The UK Government has a role to play in decarbonising its estate in Scotland, including the Ministry of Defence. The UK Government should deliver the commitment in the Clean Growth Strategy to halve emissions across the public estate by 2032 at the latest.

The public sector can also lead action in decarbonising their vehicle fleets.

8. Getting the rules right: the role of Scottish and UK regulators and public bodies

Designing and implemented **rules and regulation** across the economy can ensure that the Government's climate objectives are prioritised equally alongside other objectives such as consumer protection, and economic efficiency. Economic regulators should have climate change as part of their core objectives. Specifically, regulators will also need to help drive the transition to Net Zero emissions and a climate resilient future in a number of areas:

- These most obviously include **Ofgem**, especially on energy networks. Regulatory frameworks may need to evolve as new vectors emerge and with an increasing integration between systems (e.g. hydrogen, which will need to be produced using CCS or renewable electricity and could supply power generation, heating, transport and industry). Ofgem's recent decarbonisation action plan sets out Ofgem's initial thinking on the impact of Net Zero on its activities. Ofgem should also set out ambitious requirements for reductions in leakage of methane from the gas grid.
- There could also be a role for **financial and pension regulators**, for example in requiring and monitoring disclosure of exposure to climate risks and compatibility of investments with a Net Zero target.
- Scottish Water has a net zero emissions target across all operational and capital investment activities by 2040. This goes beyond the Water UK target for 2030 of net zero operational emissions. The water industry will have a critical role to play in enabling adaptation to the UK's changing climate, and should embed this as a core objective.
- Some regulators, such as the **Oil and Gas Authority (OGA)**, are reviewing their strategies in light of Net Zero. The UK Regulators Network is also considering the implications of Net Zero for its regulator members.
- **Audit Scotland** has a role to play in holding Government to account on meeting its climate objectives.
- The soon-to-be established **Environmental Standards Scotland (ESS)** will be important in enforcing environmental regulations once the UK has left the EU, although the sections of the Climate Change (Scotland) Act that relate to climate change targets were excluded from the remit of ESS in the draft legislation was introduced to the Scottish Parliament.[89]
- NHS Scotland should take actions to improve the carbon efficiency of the NHS in Scotland, reduce non-CO_2 emissions (e.g. nitrous oxide and F-gases) and ensure the health system is resilient to a changing climate. Climate policy should aim to maximise the co-benefits for health from active travel, access to green space, air quality, better buildings and healthier diets.

Where Government leads, **public bodies** should follow. The Government's strategy for the 301 public bodies that exist across the UK is due to expire at the end of this year.[90] This presents an opportunity to refresh the strategy to put plans in place to monitor and reduce the carbon footprint of public bodies – with energy use and transport being priority areas – while ensuring their plans are resilient to current and future climate change.

[89] The UK Withdrawal from the European Union (Continuity) (Scotland) Bill [2020] excludes Parts 1 to 3 of the Climate Change (Scotland) Act 2009 (those that deal with greenhouse gas emissions reductions and targets) from the definition of environmental law in the Bill. Part 5 of the Climate Change (Scotland) Act, dealing with climate change adaption, was included within the definition and, therefore, would be subject to enforcement by the ESS.
[90] Cabinet Office (2019) *Public Bodies 2018-19.*

9. Government leads, others act: the role of people, business, local government, and the need for a just transition

a) Public engagement

To date, much of the success in reducing Scotland's emissions has been invisible to the public. Government policy has enabled emissions reductions to proceed in a way that has not required mass engagement, by reducing the 'supply' of emissions into the economy. For example, Scotland now produces nearly 100% of its own gross electricity consumption from renewable sources, but with no change to the service that electricity provides. Reaching Net Zero emissions will require more involvement from people in engaging with the emissions reductions required, and reducing or adapting demand for energy intensive services:

- Our 2019 advice on Net Zero highlighted that over 60% of the required emissions reductions involves at least some degree of change from consumers (e.g. driving an electric car, or installing a heat pump instead of a gas boiler).
- Within this, around 10% is driven by consumer choices – shifting more quickly towards healthier diets, reducing growth in aviation demand and choosing products that last longer and therefore improve resource efficiency.
- People should understand why and what changes are needed, see a benefit from making low-carbon choices and have access to the information and resources required to make the change happen. A public engagement strategy for Scotland should recognise the importance of co-benefits such as improved air quality, comfort and health and the need to adapt to the impacts of climate change, alongside reducing emissions.

It will not be possible to get close to meeting a Net Zero target without engaging with people or by pursuing an approach that focuses only on supply-side changes:

- At the moment, while the public are generally supportive of action to tackle climate change, and 75% of people are concerned about climate change, just 35% of people report having heard of 'Net Zero' as a concept, and only half of people are aware that their gas boiler causes emissions.[91] People who wish to reduce their impact on emissions are not provided sufficient support to make decisions that achieve this.
- People will need help to make low-carbon choices, both in terms of behaviours and in adopting low-carbon technologies. This will require businesses to make low-carbon choices more available and easier to use, provision of information, trials to see what works and policy that learns by doing. Some of the difficult decisions that will be required, (e.g. on the balance of electrification and hydrogen that replaces fossil gas heating), will only be possible if people are engaged in a societal effort to reach net-zero emissions and understand the choices and constraints.

The Citizens' Assembly convened by UK Parliament (Box 6.2) and the Scottish Government's Big Climate Change Conversation should be the beginning of a wider conversation on the Net Zero target. These events, and future programmes like them, should inform policy development and wider efforts to engage the public in the Net Zero challenge. Similar exercises should also be conducted on public engagement with climate change adaptation.

[91] See BEIS (2020) *Public Attitudes Tracker,* and Energy Systems Catapult (2020) *Net Zero: A Consumer Perspective.*

Box 6.2. The Climate Assembly UK

In June 2019, six Select Committees of the House of Commons commissioned a citizens' assembly on climate change. The mission of the assembly was to provide a better understanding of "public preferences on how the UK should tackle climate change because of the impact these decisions will have on people's lives." Participants convened over six weekends in the period January to May 2020. In September 2020, the assembly published its report, The full report *The path to net zero* identified seven recurring themes that the assembly, should constitute principles of the climate policy decision-making process:

- **Education and information** on climate change available to everyone
- **Fairness** of the solutions, as they affect people working and living in a wide spectrum of conditions
- **Freedom of choice** wherever and as much as possible, when it comes to solutions
- **Co-benefits** to help address tangential issues that can benefit from the action to tackle climate change, such as the improvement of health and the reduction of pollution
- **Nature**, which needs to be restored and accessible to everyone
- Strong and clear **leadership** from government to forge cross-party consensus and allow for certainty and long-term planning in climate policy
- **A joined-up approach across society** which will incentivise everyone to play their part, a necessary condition for effective change

The report also provided detailed recommendations on the ten topics considered by the assembly. Key among them were:

- A ban on the sale of new petrol, diesel and hybrid cars by 2030-2035, along with a reduction of car usage by 2-5% per decade and an improvement of public transport;
- A balanced approach to flying in the future, which would see the air passenger numbers grow by 25-50% by 2050, scrapping incentives to fly, and investment in alternatives to air travel;
- Increased choice in the domestic energy and heat sector, the ability of local authorities to choose solutions for their own areas, and reliable and clear information available to the public to allow all income groups and housing types to make decisions on how to lower their emissions;
- Support to farmers and communities for local produce and food production, which, along with a diet change that would see a 20-40% reduction in meat and dairy consumption, and a "managed diversity" of land use would lead to a fall in sectoral emissions;
- A change in consumers' and businesses' mentalities that emphasises repairing and sharing, and making products using fewer resources more efficiently respectively
- Strong support of offshore and onshore wind, as well as solar power, for electricity generation. Bioenergy, nuclear power and fossil fuels were not as popular among participants, and neither were BECCS and DACCS as greenhouse gas removals methods, with the assembly favouring forests, restored peatlands and carbon storage in soil instead.

Following the publication of *The path to net zero*, the Chairs of the six committees that commissioned the assembly are to respond to its recommendations with what they intend to do. The report will also be used by Parliament to scrutinise the Government's progress toward net zero.

Source: Climate Assembly UK (2020) *The path to net zero: Climate Assembly UK full report.*

b) The need for a just transition

Economies are always in transition. Scotland's energy sector has seen transitions prompted by the industrial revolution, by the decline of coal mining and rise of gas and oil extraction in the North Sea, by privatisation and most recently by the need to decarbonise.

Broader transitions currently underway include the ongoing digital revolution and the accompanying wave of new disruptive technological developments (often referred to as the 'Fourth Industrial Revolution') including artificial intelligence, automation and robotics. Similarly, the COVID-19 pandemic is forcing a reshaping of society.

Greater focus is needed on the wider socioeconomic impacts of decarbonisation (Box 6.3). The transition to Net Zero will necessitate a shift in employment, away from some inherently high-emitting activities (e.g. fossil fuel supply) to highly-skilled jobs to deliver the emissions reductions required.

The transition to a zero-carbon economy differs from other transitions as much of it will need to be policy-led, rather than a reaction to changing technologies and circumstances. The required speed of the transition is fast and the scale large, spanning across most aspects of the economy.

Like past transitions, the transition to Net Zero GHG emissions will result in the creation of new markets and industries and a shift away from old industries, with consequences for employment. It will also bring down costs of some goods and services, while increasing the cost of others.

In many areas a transition to a Net Zero and a climate resilient future presents a vision for a positive impact on society, by reducing emissions and improving resilience to the impacts of climate change, but also improving air quality, healthier diets and increased green space, for example. This shift should be managed so that burdens and benefits are fairly distributed amongst society, ensuring a just transition.

A strategy will be needed to ensure a just transition across society, with vulnerable workers and consumers protected. The Treasury's Net Zero review will play an important role in informing this, and must include analysis at the regional level and for specific industrial sectors.

Box 6.3. Scotland's Just Transition Commission

The Just Transition Commission was established by Scottish Ministers to advise on how Scotland should be incorporating just transition principles in its actions to tackle climate change. The purpose of the Commission is to produce practical recommendations within two years of its inaugural meeting, which took place at the beginning of 2019.

The recommendations, which are now expected in January 2021, will support:

- maximising the economic and social opportunities that arise from moving to a net-zero economy by 2045;
- building on Scotland's existing strengths and assets; and
- understanding the risks to social cohesion, poverty and equalities created by the move to a sustainable labour market, and mitigating them.

The Commission published an interim report in February 2020, which stressed the need for immediate action in certain areas to achieve Scotland's climate targets, and recognised the importance of that action being delivered in a fair way in order for it to be sustainable.

Box 6.3. Scotland's Just Transition Commission

The interim report identified three main themes that should underpin urgent climate action: the development of clear transition plans for all sectors, the need for ongoing and proactive dialogue with all corners of society to generate the necessary buy-in to affect change, and bringing equity to the heart of climate change policy, so that benefits from it are shared widely.

The report concluded with a list of opportunities for action in near-term decision-making, key among which were:

- Ensuring Fair Work is promoted across publically funded climate change programmes
- Developing a Climate Emergency Skills Action Plan
- Placing equity at the heart of the Climate Change Plan update
- Establishing a Citizens Assembly in Scotland on climate change
- Ensuring a just transition for the agricultural sector through continued support post-2024
- Continuing to support successful energy efficiency initiatives, and managing the opportunities and challenges of the transition to low-carbon heating
- Enabling the oil and gas industry to transition
- Using COP26 to promote Scotland's approach to just transition and learn from other countries

The interim report does not pre-empt the final conclusions of the Commission; rather, it uses the opportunity to urge the Scottish government to prioritise acting on climate change and influence key elements of climate policy, while also embedding just transition principles in it. The report was followed by a call for evidence to inform the final recommendations of the Commission, which are still expected at the beginning of 2021.

The Commission gave further advice in July 2020 on a 'just green recovery'. This report added to the evidence in support of an economic recovery from COVID-19 that is consistent with Scotland's climate ambition The Commission produced a number of recommendations for immediate action: investment in warmer homes; improving and decarbonising bus services; investing in Scotland's nature and rural economy; providing new jobs for oil and gas workers; developing skills for the net-zero transition; and giving a clear sense of direction and attaching environmental conditions to funding.

Source: Just Transition Commission (2020) *Interim Report;* Just Transition Commission (2020) *Advice for a Green Recovery.*

c) The role of business

Businesses are committing to Net Zero targets and can play a key role in delivering the UK's Net Zero objectives. Over 120 leading businesses wrote to the Prime Minister in support of the UK's Net Zero target, and more have recently written in support of a green economic stimulus policy to respond to the COVID-19 pandemic.

For companies seeking to begin or accelerate their journey to Net Zero, a key step is to assess and disclose how they will be impacted and the actions they are taking in response to climate change risks and opportunities, including transition risks (mitigation) and physical risks (adaptation), through the Task Force on Climate-related Financial Disclosures (TCFD) as well as the Carbon Disclosure Project (CDP), as many businesses are doing:

- Effective disclosures will include planning for both a '2°C or lower' scenario as stipulated by the TCFD, as well as scenarios involving a greater than 2°C global temperature rise by 2100 (such as 4°C), to address both transition and physical risks.
- Companies must also disclose the metrics and targets they use to manage relevant physical and transition risks and opportunities, including their GHG emissions in line with the GHG Protocol methodology.

Increasingly, businesses will need to ensure they deliver on ambitious climate objectives. This includes managing not just the impact of their own activities but also choosing low-carbon options in business-to-business transactions in supply chains and encouraging low-carbon choices by their employees. Although strong policy levers do need to be developed by government that enable significant emissions reduction while preserving competitiveness, businesses can take a lead by driving markets for low-carbon goods and services and making good on public commitments to net zero:

- Businesses can switch vehicle fleets to electric vehicles, purchasing genuine low-carbon energy, and monitoring the emissions resulting from all of their activities.
- It should be ensured that heating for processes and premises comes from low-carbon sources, heavy goods vehicles run on low-carbon hydrogen or electricity and any remaining emissions reduced to zero as much as possible.
- The market for offsets is likely to be limited in the scale of sustainable offsets available. Where possible, zero emissions should be the goal, with emissions removal offsets used as a last resort:
  - Many businesses include plans for international offsetting of their emissions. The past decade has seen the expansion of the voluntary offset market amongst businesses and individuals (although it remains significantly smaller than the global compliance offset market – the Clean Development Mechanism (CDM)). The market allows actors to purchase offsets for their carbon-intensive activities by funding projects such as reforestation or renewable energy developments. Independent organisations have emerged who aim to verify the credentials of offset projects. This provides more credibility to a market which has historically been difficult to regulate, verify and assess.
  - As business commitments continue to scale up, companies are outlining targets compatible with a 1.5°C pathway, which will require deeper and more challenging reductions in emissions. In the coming years, it is likely ambitions will be ratcheted up further. To be in line with the Committee's recommendations for the UK's Net Zero target, businesses should eliminate or significantly reduce the use of offsets in meeting climate targets, limiting their use to emissions that are otherwise unavoidable.[92]

[92] House of Commons Hansard (12 June 2019) *Net Zero Emissions Target, Volume 661, Columns 673 and 682.*

Businesses, local government and other 'non-state actors' will also play an important role in COP26 and are crucial to maintaining momentum in jurisdictions where national governments are not currently prioritising climate action (e.g. the US). We will provide further analysis on the role of business in decarbonisation in our work on the Sixth Carbon Budget later this year.

d) The role of Scotland's cities and local authorities

Cities and local authorities are well placed to understand the needs and opportunities in their local area, although there are questions over whether they have enough resources to contribute consistently and strongly to reducing emissions. They have important roles and opportunities in the transition to Net Zero:

- They should have a key role in local area energy plans, alongside network operators, especially in relation to building community consensus on plans for decarbonising heating. The requirement for local authorities to produce Local Heat and Energy Efficiency Strategies (LHEES) is a good foundation for ensuring local authorities are engaged.
- They have important roles on transport planning, including providing high-quality infrastructure for walking and cycling, provision of charging infrastructure for electric vehicles, and ensuring that new housing developments are designed for access to amenities and public transport.
- They can improve health outcomes for people who live and work in the area by implementing clean-air zones that discourage use of polluting vehicles and other technologies.
- They can also put in place plans to ensure their local area is resilient to the future impacts of climate change.

Local authorities in Scotland are embracing these objectives, with more than half of them having declared 'Climate Emergencies' over the past 18 months, and many are considering how to implement ambitious emissions reductions strategies.[93] Nonetheless significant gaps remain:

- A lack of resources can mean climate change is one of many competing priorities, with monitoring of local emissions not taking place on a commonly recognised basis, and emissions reductions pathways not being co-ordinated across the country.
- Climate adaptation is not given enough attention in local plans, despite significant local powers to improve adaptation.

The National Planning Framework should also support delivery of climate objectives at a local level. The Scottish Government should incentivise, support and enable local authorities to deliver emissions reductions and climate adaptation measures at a local level. This can only be achieved with nationally supportive, consistently aligned Net Zero policy from all levels of government in Scotland.

[93] UK Climate Emergency Network (2020) *Scotland Declarations.*

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