
Fiscal Sustainability Perspectives: Climate Change

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Foreword

The Scottish Fiscal Commission is the independent fiscal institution for Scotland. Our statutory duty is to provide independent and official forecasts of the economy, tax revenues and social security spending to inform the Scottish Budget.

The focus of this report is an initial exploration of the effects on Scottish public finances from damage created by climate change, the costs of adapting to a changing environment and taking action to meet Scotland's statutory emissions targets to reach net zero by 2045. We also discuss the data and information we'd need from the Scottish and UK Governments to produce projections of climate change funding and spending.

The analysis and conclusions in this report represent the collective view of the independent Commissioners. We take full responsibility for the judgements that underpin the analysis, and for the conclusions we have reached. We have been supported in this by the staff of the Scottish Fiscal Commission, to whom we are as usual enormously grateful.

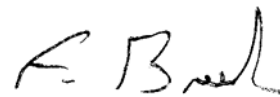
We have benefited from discussions with experts from a wide range of organisations who have taken the time to speak to us about this report and our work on climate change.

In particular, we would like to thank the Climate Change Committee, the Office for Budget Responsibility, Northern Ireland Fiscal Council, officials in the Scottish Government, HM Treasury, Audit Scotland, Adaptation Scotland, the Climate Emergency Response Group, the Institute for Fiscal Studies, Professor Dave Reay at Edinburgh University and co-Chair of the Just Transition Commission, Dr Ian Cochran at Edinburgh University, Dr Sarah Govan at the Edinburgh Climate Change Institute, Stop Climate Chaos Scotland, the Sustainable Scotland Network, the Fraser of Allander Institute, the Scottish Parliament Information Centre and the Scottish National Investment Bank.

We are very grateful for their insights. We would also emphasise that despite the valuable assistance received, all judgements and interpretation underpinning the analysis and conclusions in this report are ours alone.



Professor Graeme Roy



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Professor Domenico Lombardi



Professor David Ulph

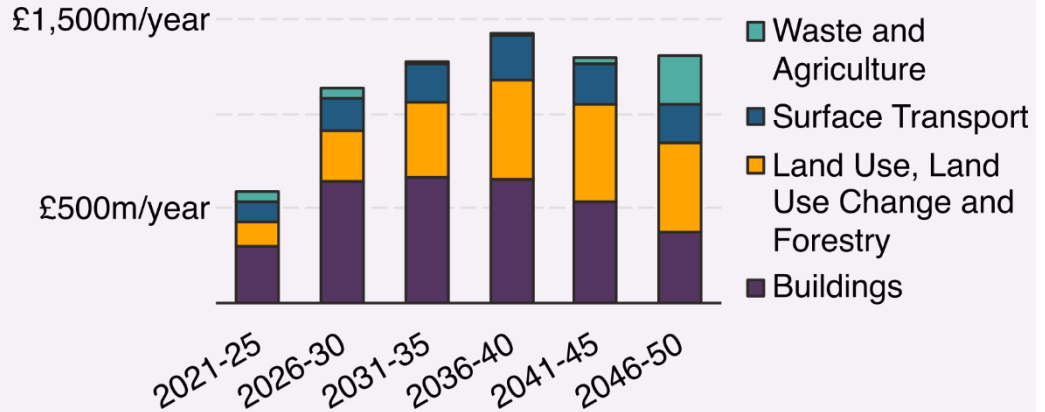
14 March 2024

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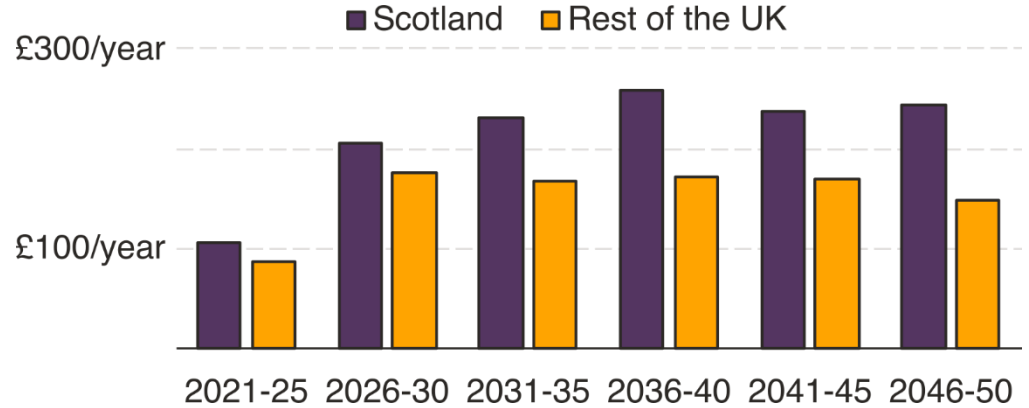
Significant investment by Scottish Government required to reach net zero

Public spending expected to be highest on Buildings to reach net zero followed by Land Use, Land Use Change and Forestry (LULUCF).



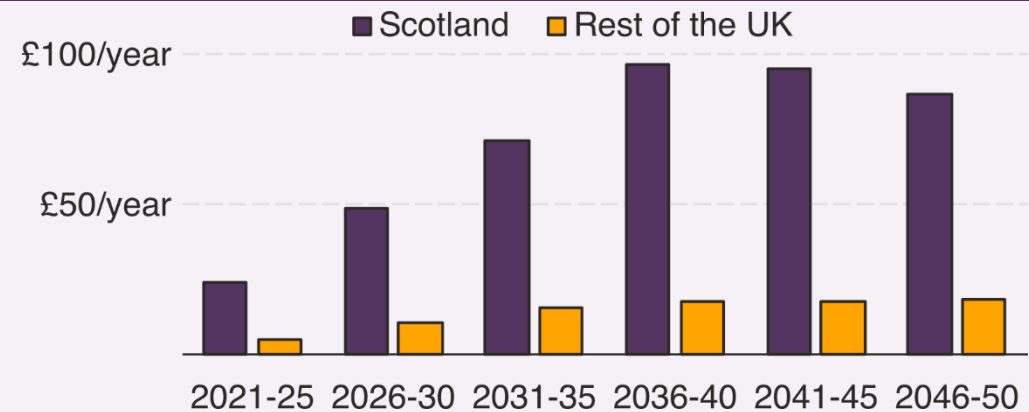
Required public investment per person in devolved areas higher in Scotland

More public spending per person in devolved areas is needed in Scotland than in the rest of the UK, potentially making it difficult for the Scottish Government to fund the transition to net zero.



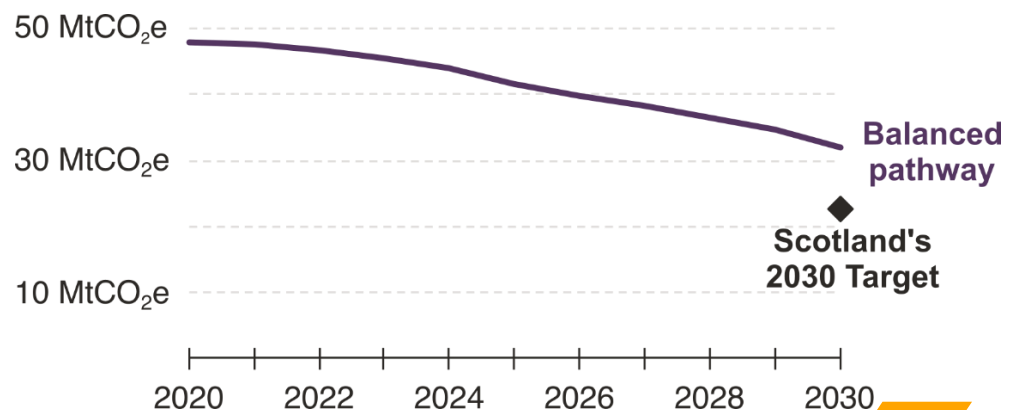
Public investment in land use and forestry per person significantly higher

Scotland contains 32 per cent of the UK's land mass, with roughly half of its trees and 70 per cent of its peatland, meaning Scotland is expected to invest more in LULUCF relative to the size of its population.



Scotland's legislated 2030 emissions reduction target is challenging

The Climate Change Committee have described the Scottish Parliament's 2030 emissions reduction target as "extremely challenging." We think it could be difficult for Scottish Government to fund meeting it.



Summary

Introduction

1 In March 2023 we published our first Fiscal Sustainability Report.¹ This report is the first in our Fiscal Sustainability Perspectives series and focuses on climate change. We look at some of the implications for the Scottish public finances of meeting Scotland's statutory emissions target to reach net zero by 2045, adapting to climate change and handling the damage it will cause.

Responding to climate change

2 The global climate is warming. The United Nations Intergovernmental Panel on Climate Change identifies human activity as responsible for the global average temperature increasing by 1.1°C by 2011 to 2020 from the average temperature between 1850 and 1900, and an average temperature rise of 1.5°C or more is expected by the mid-century.² This is largely due to burning fossil fuels which produces carbon dioxide and other greenhouse gases (GHG).³

3 There are three ways through which climate change will affect the public finances:^{4,5,6}

- **Damage** from climate change through countries needing to invest in response to more frequent and intense severe weather events.
- **Adaptation** to climate change, such as through investment to reduce the impacts of climate change damage.
- **Mitigation** of climate change as countries transform their economies to reduce GHG emissions to limit further global warming.

4 The UN Climate Change Conference in Paris in 2015 agreed to hold the average global temperature change to below 2°C above pre-industrial levels and to make efforts to limit the increase to 1.5°C.⁷ Achieving this requires global action to reduce GHG emissions to net zero by the middle of the century. In 2019, the Scottish Parliament set the target for Scotland to reach net zero by 2045.⁸ In the same year, the UK Parliament legislated to reach net zero emissions by 2050.⁹

5 The UK and Scottish Government targets are on a territorial basis. The Scottish Government has responsibility for delivering net zero in Scotland though some of these emissions are produced from reserved sectors. The UK Government has responsibility for the entirety of the UK reaching net

¹ Scottish Fiscal Commission (2023) Fiscal Sustainability Report ([link](#))

² Intergovernmental Panel on Climate Change (2023) Climate Change 2023 Synthesis Report, Summary for policymakers ([link](#))

³ Intergovernmental Panel on Climate Change (2021) Summary for Policymakers ([link](#))

⁴ Bank of England (2018) Climate change and the macro-economy: a critical review, Bank of England Working Paper No. 706 ([link](#))

⁵ OBR (2019) Fiscal risks report – July 2019 ([link](#))

⁶ OBR (2023) Discussion paper No. 4: Next steps for climate change analysis ([link](#))

⁷ United Nations Framework Convention on Climate Change (2016) The Paris Agreement – Publication ([link](#))

⁸ Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 ([link](#))

⁹ The Climate Change Act 2008 (2050 Target Amendment) Order 2019 ([link](#))

zero, including Scotland. The challenge of reaching net zero is intertwined for the two governments and each is dependent on the other for achieving their targets.

- 6 Even in devolved areas, UK Government policy can have implications for the Scottish Government. For example, Surface Transport is largely devolved, but how this works in practice is complicated. The Scottish Government maintains and improves trunk roads and funds local authority road maintenance. The operation of rail services in Scotland is devolved, although the UK-wide Network Rail is responsible for most of the infrastructure, and many ferry services are provided by a Scottish Government operator. The Scottish Government provides concessionary bus travel for certain groups of people. The Scottish Government therefore controls most public spending on Surface Transport in Scotland but many aspects of its regulation are reserved, for example banning polluting vehicles or imposing more stringent emission standards.¹⁰ This illustrates how policy decisions at the UK level are important in ensuring the Scottish Government can meet its net zero targets.
- 7 In addition to the interdependencies between the Scottish and UK climate responses, there are also associated public funding links. The Scottish Government's funding position is influenced by UK Government choices. The Scottish Budget is funded through revenue from devolved Scottish taxes and funding from the UK Government, with some Scottish Government capital borrowing.¹¹ The largest source of funding is the Block Grant. When the UK Government changes spending plans in a devolved area, the Scottish Government receives a population share of that change to its Block Grant as determined by the Barnett formula. If the UK Government's response to climate change involves more spending by UK Government departments in devolved areas, this will result in more funding for the Scottish Government. Conversely if the UK Government uses levers other than spending or focuses spending in reserved areas, there would be less Block Grant funding.
- 8 Climate change will bring risks of fiscal pressures on the Scottish Government as it invests in mitigation and adaptation and responds to damage. There are risks from the UK and Scottish Government policy approaches diverging and UK regulatory choices making mitigation and adaptation more difficult for the Scottish Government. Conversely UK Government choices could support Scottish Government achieving its intended outcomes.
- 9 Climate change brings risk of greater volatility on a global level which may lead to macroeconomic shocks that are more frequent and larger than those experienced historically. In their 2021 Fiscal risks report, the OBR produced an illustrative unmitigated warming scenario. They assumed this would be associated with increased spending on adaptation of 0.3 per cent of GDP per year with each degree of warming, and the size and frequency of shocks progressively increases with rising temperatures, doubling relative to historic trends by the end of the century. As a result, they projected the UK's debt-to-GDP ratio reaching 289 per cent by the end of the century compared to a stable deficit baseline of 90 per cent.¹² This illustrates how unmitigated climate change would have catastrophic impacts on individuals, businesses, and the public finances. In this report we provide an estimate of the cost of the transition to net zero for the Scottish Government but do not incorporate the potential costs of unmitigated climate change and the associated shocks to the economy.
- 10 In this report, we identify potential risks to Scottish Government finances where there are asymmetries in spending between the UK and Scottish Government due to relative need or policy

¹⁰ While setting maximum emission levels in vehicles is reserved, as it relates to product standards, the creation of Low Emission Zones (LEZ) in urban areas is devolved and the Scottish Government can give local authorities permission to implement a LEZ.

¹¹ For further information on the Scottish Government's funding arrangements, see Scottish Fiscal Commission (2021) Funding for the Scottish Budget ([link](#)).

¹² OBR (2021) Fiscal risks report – July 2021 ([link](#))

choices. These risks could include the effects of climate change being felt differently in Scotland to the rest of the UK. For example, if severe weather caused more damage in Scotland in one financial year and more damage in the rest of the UK another year, under the fiscal framework the Scottish Government's capacity to cope with the corresponding fiscal pressures would be limited.

- 11 The extent of macroeconomic risks from climate change will depend on how climate-related policies are managed. In its 2019 Fiscal risks report, the OBR highlighted how well-signalled and orderly policies that allow time for the economy to adjust and for technological advances to reduce costs might pose little risk.¹³ In contrast, uncertainty around policy changes could mean a greater risk in terms of foregone economic growth.
- 12 In this report we consider the ways in which climate change and the response by the UK and Scottish Governments could affect the fiscal sustainability of the Scottish Government. We consider fiscal sustainability under the current devolution settlement and fiscal framework. We do not project funding and spending in this report and do not assume current policies are held constant. Given the lack of costed climate change plans, we use the Climate Change Committee's Sixth Carbon Budget to estimate potential costs of mitigation and we discuss risks around adaptation and damage.¹⁴ We look at how the sustainability of the devolved public finances is affected by the interaction of the fiscal framework with the policy choices made by both the UK and Scottish Governments.

Adaptation and damage

- 13 The amount of economic damage from climate change and the level of adaptation required will depend on the extent of mitigation at a global level. There is widespread scientific consensus on the broad scale of the challenge. However, there is uncertainty in how climate change will be felt in different locations and its associated damage. Particularly for the second half of the century, estimates have a wide range and there are possible tipping points which would lead to more extreme or catastrophic impacts. Losses and damage will occur as it is not possible to foresee or adapt to all the impacts of climate change.
- 14 The costs of adaptation are likely to be significant for both the overall economy and public sector. The CCC has estimated additional investment of around £10 billion a year for the UK on adaptation for the period from 2020 to 2030.¹⁵ This is a partial estimate, and the optimal level of investment is unknown as the trajectory of warming and climate change is uncertain.
- 15 It is a risk for fiscal sustainability that full adaptation costs are not known at the UK or Scottish level. It means whether there is more pressure on the UK or Scottish Government is uncertain and we cannot estimate the scale of any pressures. If more investment is required in devolved areas in Scotland than in England, it could present a risk for Scottish Government finances. The scale of uncertainty associated with adaptation costs is a risk in itself.
- 16 There are different implications for the Scottish Government's finances depending on both the timing and the relative scale of climate damage in England and Scotland. For example, if the UK Government increased spending to deal with damage due to flooding from a storm affecting England, this would result in additional funding for the Scottish Government through the Block Grant. However, if climate damage is greater in Scotland overall or in a particular year, the Scottish Government would largely need to manage those costs within its existing budget. The Scottish

¹³ OBR (2019) Fiscal risks report – July 2019 ([link](#))

¹⁴ Climate Change Committee (2020) Sixth Carbon Budget ([link](#))

¹⁵ Climate Change Committee (2023) Investment for a well-adapted UK ([link](#))

Government cannot borrow to fund additional spending or meaningfully transfer spending between years. The increasing risk of climate change damage could make the Scottish Budget more vulnerable to volatility and create pressures on spending that require reprioritisation of commitments within the financial year.

Mitigation

- 17 Our quantitative analysis focuses on potential spending required to mitigate emissions and reach net zero. We estimate potential costs of climate change mitigation for Scottish Government using the Climate Change Committee's (CCC) balanced pathway scenario from the Sixth Carbon Budget.¹⁶ This provides hypothetical emissions reductions for each sector each year and their required investment for the UK and Scotland. We apply assumptions as to whether sectors are devolved or reserved and assume a split of costs between the public and private sectors to estimate the level of investment required by the Scottish Government to reach net zero.
- 18 The costs do not reflect the Scottish Government's target of a 75 per cent reduction in emissions by 2030 or policies which may be included in the Scottish Government's Climate Change Plan published later in 2024. Both UK and Scottish Governments may choose to invest more or less, in different sectors or at different times than is presented in this analysis. The value of our approach is that the assumptions for Scotland and the UK are the same so that it allows us to identify where differences and potential pressures emerge, even assuming policy is the same. This allows us to illustrate the scale of investment required and highlight some potential risks for the Scottish Government.
- 19 We use the CCC's balanced pathway scenario to estimate the potential costs for the Scottish Government and compare these to the costs at the UK level. The balanced pathway scenario reflects Scotland reaching net zero by 2045 and the UK reaching net zero by 2050 as Scotland is expected to be net negative by 2050. This reflects the CCC's assumption that Scotland has greater capacity for emissions reductions in forestry and land use.

Investment required in mitigation

- 20 Our analysis focuses on the sectors which are mainly devolved: Buildings; Land Use, Land Use Change, and Forestry (LULUCF); Surface Transport; and Waste and Agriculture. The costs we estimate are additional capital investment across the whole economy, this is additional investment in mitigation required above 2020 levels and we apply an assumed share of public investment to estimate costs for the Scottish Government. Figure 1 shows the projected average annual spend by the public sector in 2024 prices on mitigation for each of the devolved sectors based on the CCC's balanced pathway scenario to net zero. The biggest area of additional capital investment is expected to be decarbonising buildings, followed by LULUCF. The rise in waste and agriculture at the end of the projection is driven by an increase in spend on mitigation measures related to waste from 2045.

¹⁶ Climate Change Committee (2020) Sixth Carbon Budget ([link](#))

Figure 1: Devolved average annual additional public capital investment by sector on the balanced pathway scenario

Devolved public sector additional capital is mostly expected in the Buildings sector and LULUCF

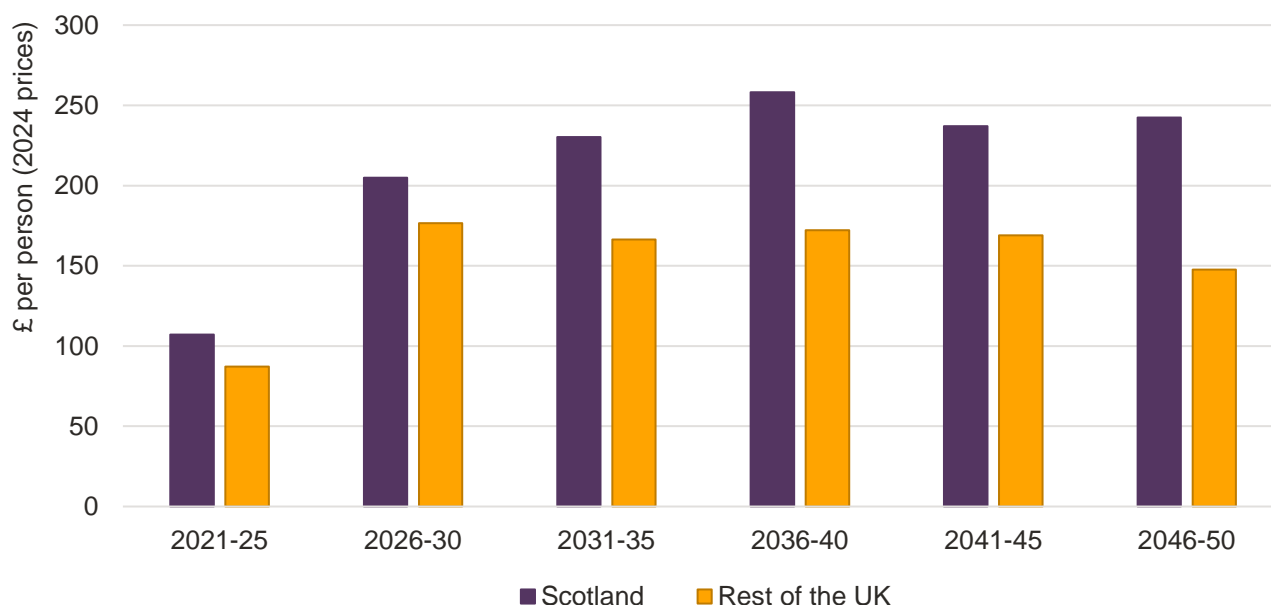


Description of Figure 1: Stacked bar chart showing, in 2024 prices, the average yearly amount of Scottish Government spending on mitigation to 2050 on the balanced pathway scenario. The most expensive sector of devolved responsibility is Buildings. Land Use, Land Use Change and Forestry (LULUCF) is the second largest area of required investment. Source: Scottish Fiscal Commission

21 Figure 2 shows that on a per person basis the need for public investment on mitigation in devolved areas is greater in Scotland than the rest of the UK. Under our assumptions, the average additional capital investment required per year by the Scottish Government is £1,136 million, in the rest of the UK it is £9,582 million (in 2024 prices). This is equivalent to £207 per person per year by Scottish Government compared to £149 per person per year in the rest of the UK. This will create a pressure for the Scottish Government to manage as it will have to meet the differential need from within its existing budget or raise more revenue from other devolved sources.

Figure 2: Total devolved annual public additional capital investment per person on the balanced pathway scenario

Public spending on mitigation is expected to be relatively higher per person in Scotland than the rest of the UK



Description of Figure 2: Bar chart showing, in 2024 prices, five-year average public additional capital investment per person until 2050 for mitigation on devolved sectors in Scotland and the rest of the UK. The amount of spending in Scotland is expected to be considerably higher than in the rest of the UK across the projection period.

Source: Scottish Fiscal Commission

22 We can put these additional costs into perspective by comparing them to current capital budgets. Capital spending in 2024-25 is expected to be £6,193 million. So investing £1,136 million a year would represent 18 per cent of the Scottish Government capital budget being spent on mitigation to reach net zero. With capital budgets expected to fall by 20 per cent over the next five years in real terms, this proportion will increase in the years after 2024-25.¹⁷ This reflects UK Government capital spending plans which involve the expected end of financial transaction funding and other capital funding remaining flat in nominal terms and therefore falling in real terms.

23 The Scottish Government can borrow up to £450 million a year to a total of £3,000 million in debt stock to support capital investment, although it is currently quite close to its borrowing limit.¹⁸ It can move funding from the resource to the capital budget, but the resource budget also has pressures on spending. These options could provide some leeway, but the context of forecast capital budgets declining brings pressures for other areas needing investment such as health. The resource budget supports day to day spending such as public sector pay and commitments to social security. The Scottish Government could reprioritise existing spending, raise additional revenue or change the conditionality attached to the funding it distributes.

24 Governments will also need to encourage private investment in mitigation by using taxation and regulation as levers for change. The Scottish Government has responsibility for some environmental taxes. These account for a small share of tax paid in Scotland, but they can influence behavioural change. The Scottish Parliament also has the power to introduce new national taxes with the

¹⁷ Scottish Fiscal Commission (2023) Scotland's Economic and Fiscal Forecasts – December 2023 ([link](#))

¹⁸ These limits will increase each year by the GDP deflator following the fiscal framework review in 2023.

agreement of the UK Government and Parliament. This power has only been used once to date.¹⁹ Non-tax approaches can be used, for example charging for single use carrier bags.

- 25 Overall, the Scottish Government has fewer levers than the UK Government to reduce emissions. The scale of investment required to meet its targets is expected to create a fiscal pressure for the Scottish Government. To address this fiscal pressure the government would have to decide whether to cut spending in different areas, use non-spending levers to achieve its objectives or raise additional revenue.
- 26 We note that based on our assumptions, public investment in devolved areas is between 80 and 90 per cent of the total public sector investment required in Scotland over the projection period. This is substantially more than the devolved share of overall public spending in Scotland by any existing metric.²⁰ This is partly because we assume the reserved sectors with the largest additional capital requirement such as electricity and fuel supply, are funded by private investment and consumers rather than the public sector. It is also partly explained by the total additional capital required in devolved areas being larger than in reserved areas.

Land Use, Land Use Change and Forestry

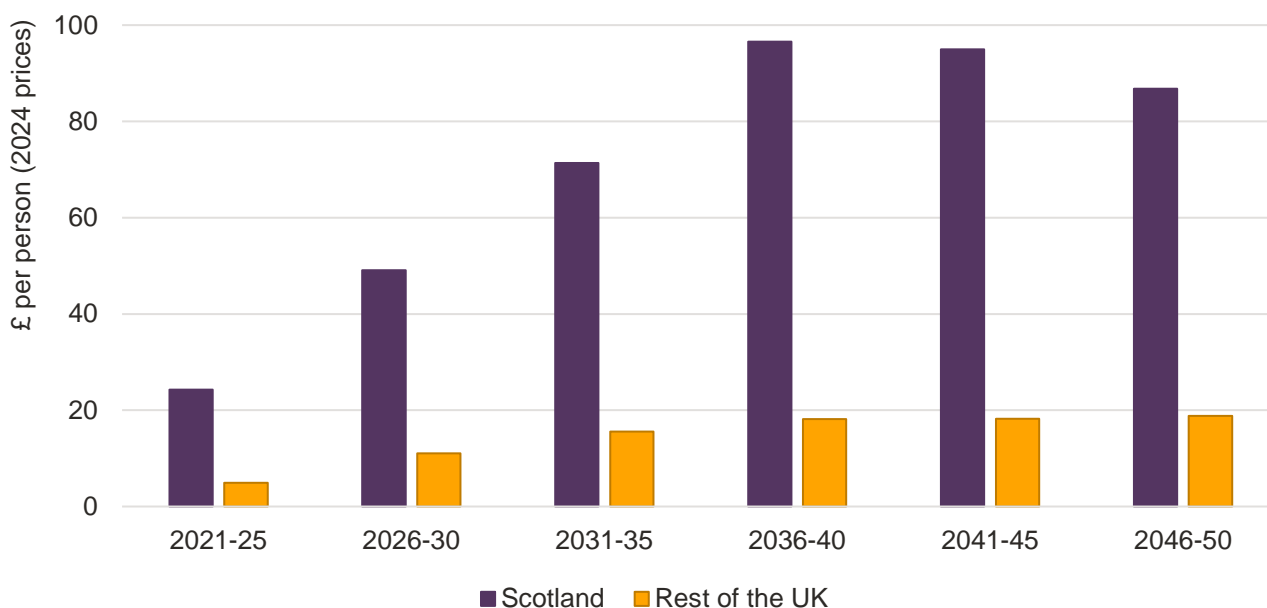
- 27 Figure 3 shows that the driver of the difference in investment costs for mitigation between Scotland and the rest of the UK is the Land Use, Land Use Change and Forestry (LULUCF) sector. This refers to crops grown to be burnt for energy, restoration of peatlands, and forestry. Scotland contains 32 per cent of the UK land mass, roughly half of the trees and 70 per cent of the peatland. The CCC estimates that 30 per cent of UK-wide costs associated with LULUCF are assigned to Scotland. This is substantially more than Scotland's population share in the UK. When peatlands are degraded, they release emissions, but in good condition they can capture and store carbon dioxide. Between 2024 and 2050 the LULUCF sector is expected to become a net remover of carbon dioxide. All remaining emissions in Scotland by 2050 are expected to be offset by technological removals and the LULUCF sector.

¹⁹ The Scotland Act 1998 (Specification of Devolved Tax) (Wild Fisheries) Order 2018 ([link](#))

²⁰ HM Treasury (2023) Country and Regional Analysis ([link](#)) data suggests devolved spending was 65 per cent of identifiable public spending in Scotland on average (2018-19 to 2022-23). The Scottish Government (2023) Government Expenditure and Revenue Scotland 2022-23 ([link](#)) adds to reserved Scotland-specific spending a notional amount of non-identifiable expenditure, such as payment for national debt interest, based on their published methodology. On that basis, devolved spending was slightly less than 65 per cent of total public spending in Scotland.

Figure 3: Land Use, Land Use Change and Forestry annual public additional capital investment per person on the balanced pathway scenario

Public spending on LULUCF is expected to be considerably higher in Scotland than the rest of the UK per person from 2021 to 2050



Description of Figure 3: Bar chart showing, in 2024 prices, the 5-year average public capital investment per person for mitigation in Scotland and the rest of the UK on Land Use, Land Use Change and Forestry until 2050. The amount of spending Scotland is expected to be considerably higher than in the rest of the UK per person.

Source: Scottish Fiscal Commission

- 28 Assuming Scotland and the UK both follow the balanced pathway scenario to net zero, the Scottish Government would need to invest on average five times as much per person as the rest of the UK in LULUCF. On average, this would be £68 per person a year compared to £14 per person a year for the rest of the UK. Over the projection period, investment by Scottish Government would peak at £97 per person a year between 2036 and 2040, while the peak in the rest of the UK (which occurs between 2046 and 2050) would be £19 per person per year.
- 29 The difference in the scale of investment needed could lead to a potentially substantial pressure on the Scottish Budget. Different pathways to net zero could be followed, but preventing peatlands from further degradation, restoring degraded peatlands, and using them and forests to capture carbon dioxide will inevitably require investment. Our analysis assumes the public sector is responsible for all the investment in the LULUCF sector, mirroring the assumption made by the OBR for the UK as a whole. Although a share of the costs could be required to be met by the private sector, there will still be a significant cost to the public sector.
- 30 The requirement for investment at this scale could be a risk for Scottish Government’s capacity to meet its targets for net zero which in turn would put the UK targets at risk. The CCC has noted that Scottish Government targets in LULUCF are less than what it has advised.²¹ The pathways used here are hypothetical, Scottish Government may choose to offset emissions using different approaches. Changes in funding for Scottish Government via the Block Grant are derived on a per person basis. As the need for investment in LULUCF reflects Scotland’s different geography rather

²¹ Climate Change Committee (December 2022) Scottish Emissions Targets – first five-yearly review ([link](#))

than population, corresponding spending in the rest of the UK will not deliver the level of funding required for the LULUCF sector.

Buildings, Surface Transport and other sectors

- 31 Other risks of funding pressure relate to potential difference in shares and timing of public investment between Scotland and the rest of the UK. Decarbonising heating in Buildings is vital to reduce emissions and is expected to come at a substantial public cost. The costs to the public sector will come from decarbonising publicly owned buildings as well as supporting emissions reduction from heating in privately owned buildings., for example through replacing gas boilers with heat pumps. The cost to the public sector will depend on how much governments invest themselves and how much private investment they expect. The assumption used for the public share of investment in buildings in this analysis is 43 per cent on average for residential and non-residential buildings.
- 32 We find the expected public spend on Buildings per person is similar in Scotland and the rest of the UK. If public shares of investment are the same and investments occur at a similar point in time, then the expected spending at the UK level should broadly cover the expected spending needed by the Scottish Government. These projections are uncertain and illustrative, but overall they do not indicate a particular pressure for the Scottish Budget. However, the scale of expected public investment in this sector means that differences in the expected cost of decarbonising different types of property or the timing of spending being incurred could result in additional pressure on the Scottish Budget.
- 33 A potential risk for the Scottish Budget arises from different choices being made by the UK and Scottish Governments relating to the share of the cost funded by the public sector. With Buildings being a devolved area, if the Scottish Government opted for measures that involve the public sector providing a larger share of investment it may mean having less to spend in other parts of the budget.
- 34 The levels of public investment needed on Surface Transport to 2050 in Scotland and the rest of the UK are similar suggesting the funding received should broadly cover the expected spending. Other sectors that the Scottish Parliament has powers over, namely Waste and Agriculture, though important to reach net zero, do not pose a significant risk to the Scottish Budget due to the small scale of public investment assumed to be required.

Scottish and UK emissions reduction targets for 2030

- 35 We have assumed Scotland and the UK both follow the CCC's balanced pathway scenario to reach net zero in our analysis. Without published costed plans from either government we cannot reflect their intentions in our projections or assess the implications for fiscal sustainability. However, the Scottish and UK targets for emissions reductions by 2030 differ and the Scottish Government have a more stringent target. The Scottish Government has a statutory target of a 75 per cent reduction compared to levels of territorial emissions in 1990.²² This differs from the UK Government which aims for a 68 per cent reduction.²³
- 36 Meeting the Scottish Government's more ambitious 2030 target is a fiscal risk. It would require technologies and other changes to be more advanced than set out in any of the CCC's pathway scenarios to reach net zero, and this would require substantial public investment. On top of this, the Scottish Government would need to spend to make up for the emissions from reserved areas in

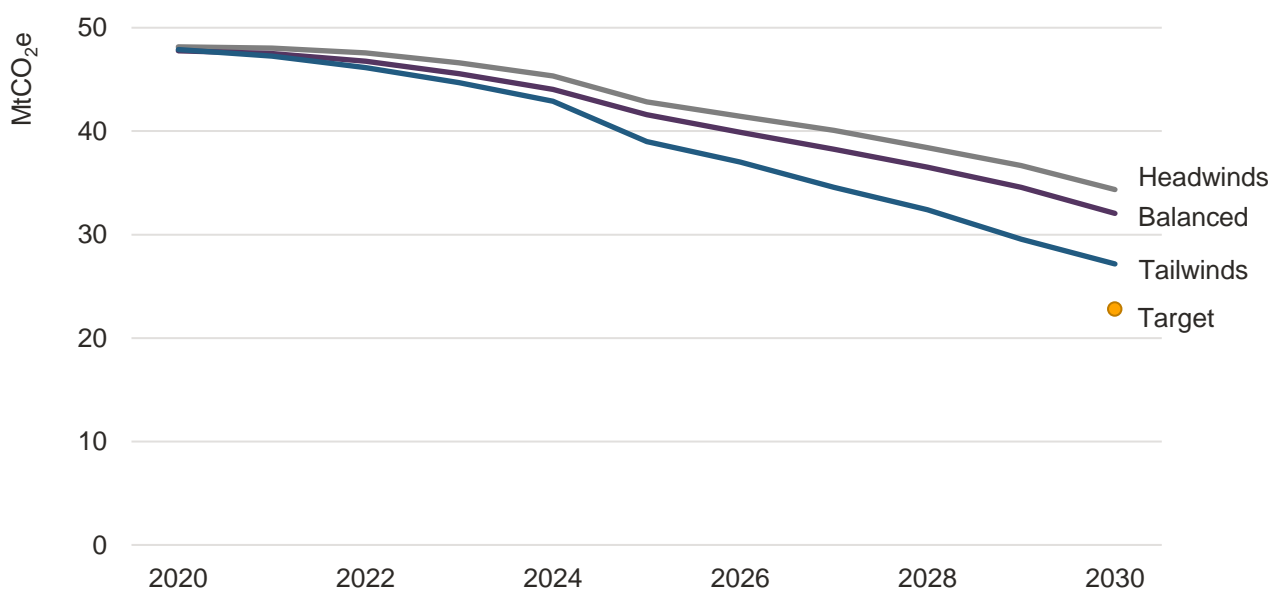
²² Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 ([link](#))

²³ UK Government (2022) UK's Nationally Determined Contribution, updated September 2022 ([link](#))

Scottish territory and could only make reductions in devolved areas. Its funding via the Block Grant would not keep pace with these demands as the UK Government is target in line with a 75 per cent reduction in emissions by 2030. Overall, this presents a substantial pressure for public spending and could be difficult to manage within the Scottish Budget. The 2045 target is not considered a risk in the same way as it is achievable under the balanced pathway scenario for the UK's 2050 target.

Figure 4: Climate Change Committee's Scotland pathway scenarios with Scottish Government's 2030 target

The Scottish Government target is missed under the CCC pathway scenarios



Description of Figure 4: Line chart showing the Climate Change Committee's pathway scenarios to 2030 and the Scottish Government target. Under all the pathway scenarios the 2030 target is missed.

Source: Scottish Fiscal Commission, Climate Change Committee (2020) Sixth Carbon Budget ([link](#)) Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 ([link](#)).

- 37 The added complexity of the Scottish 2030 target being different to the UK's illustrates that the UK and Scottish Government's climate responses are interrelated. The UK and Scottish Government efforts to mitigate emissions are mutually dependent on one another. The policy, regulatory, and investment decisions made have implications for one another and the emissions produced in reserved and devolved sectors impact the two territorial targets.
- 38 Coordination and cooperation by the UK and Scottish Governments will be required to succeed in reducing emissions. The CCC highlighted a need for improved coordination in its 2022 progress report on mitigation for Scotland.²⁴ It recommended both governments assess the impact of their decisions, have regular communication and map the interactions between UK and Scottish Governments highlighting Scottish Government dependencies on reserved powers, the UK market and on shared infrastructure.
- 39 The CCC's most recent progress report on adaptation for Scotland recommended engaging and working with the UK Government across many outcomes.²⁵ The UK and Scottish Governments face a common challenge in climate change, their responses are interlinked and will impact each other.

²⁴ Climate Change Committee (2022) Scottish Emissions Targets – first five-yearly review ([link](#))

²⁵ Climate Change Committee (2023) Adapting to Climate Change Progress in Scotland ([link](#))

Clear plans and a coordinated approach by the two governments can ease risks around the transition to a net zero and well adapted UK.

Climate change plans and costs

- 40 In order to inform our future work on fiscal sustainability and to improve transparency and accountability, we make recommendations on data improvements in this report. The UK and Scottish Governments should articulate their plans on how to achieve net zero and what level of public spending will be required. Looking at these plans together with how the economy and demographics will change, long-term spending and funding projections, and pressures on other public services such as health is needed to support planning and prioritisation and to assess fiscal sustainability. We recommend that the Scottish Government publish the costs of each policy and programme supported in the Climate Change Plan and Scottish National Adaptation Plan. We recommend that spend on mitigation and adaptation be identifiable in budget documentation and outturn so that spending plans can be linked to delivered spending. This would improve transparency and accountability and support our future work on fiscal sustainability.

Chapter 1

Introduction

Overview

- 1.1 The global climate is warming. The United Nations Intergovernmental Panel on Climate Change assesses human activity as responsible for a 1.1°C increase in the global average temperature in 2011 to 2020 from the average temperature between 1850 and 1900, and an average temperature rise of 1.5°C or more is expected by the mid-century.²⁶ This is largely because of burning of fossil fuels which produces carbon dioxide and other greenhouse gases (GHG).²⁷ Once emitted, GHG persist for tens or hundreds of years meaning past emissions make some warming inevitable. However, reducing future GHG emissions can mitigate further warming.
- 1.2 Climate change will place costs on the economy and society. Some of the costs will be borne by governments and therefore present a risk to fiscal sustainability. There is uncertainty about the scale of the costs, their timing and the split between the public and private sectors.
- 1.3 There are three ways through which climate change will affect the public finances.^{28,29, 30}
 - **Damage** from climate change through countries needing to invest in response to the harm caused by more intense and frequent severe weather events.
 - **Adaptation** to climate change, such as through infrastructure investment to reduce the risks of climate change damage.
 - **Mitigation** of climate change as countries transform their economies to reduce greenhouse gas emissions to limit further global warming.
- 1.4 Damage from climate change will occur because rising global temperatures and more frequent and severe weather events are likely to result in the damage or destruction of assets, as well as disruption to economic activity which reduces productivity. Governments may need to spend to replace public assets, compensate the private sector and households for damage to private assets or intervene where private markets fail. As well as government spending increasing, there may also be reductions in tax bases and revenues because of lower productivity and disrupted economic activity.
- 1.5 There needs to be spending on adapting to climate change to reduce the vulnerability to hazards and damage from climate change. Societies are expected to invest in adapting to the hotter climate, more rainfall, more frequent and intense severe weather events, and higher sea levels. The costs of adapting to climate change for the public sector will be through infrastructure investment in public

²⁶ Intergovernmental Panel on Climate Change (2023) Climate Change 2023 Synthesis Report, Summary for policymakers ([link](#))

²⁷ Intergovernmental Panel on Climate Change (2021) Summary for Policymakers ([link](#))

²⁸ Bank of England (2018) Climate change and the macro-economy: a critical review, Bank of England Working Paper No. 706 ([link](#))

²⁹ OBR (2019) Fiscal Risks Report – July 2019 ([link](#))

³⁰ OBR (2023) Discussion paper No. 4: Next steps for climate change analysis ([link](#))

goods such as flood defences, air conditioning in public buildings or making roads, railways and energy networks more resilient to higher temperatures and heavier rainfall.

- 1.6 Mitigation aims to reduce GHG emissions to help limit the rise in global temperatures. The public sector will bear some of the costs of reducing emissions. For example, the investment required to decarbonise buildings, such as replacing heating systems and improving energy efficiency, is likely to be split between the public sector, households and businesses. Reducing emissions can also bring fiscal risks through the loss of tax revenues, following a move to greener transport, technologies and jobs.
- 1.7 There will also be some opportunities associated with climate change. For example, new employment opportunities from the transition to a low emissions economy. Rising temperatures could bring some benefits like increased agricultural productivity.³¹ However, the risks are far greater than the opportunities. We recognise the potential for some benefits but we focus on the cost associated with climate change.³²
- 1.8 The Scottish Budget is funded through revenue from devolved Scottish taxes and funding from the UK Government, with some Scottish Government capital borrowing. The largest source is the Block Grant from the UK Government, changes to the Block Grant reflect a Scottish population share of changes in UK Government spending in devolved areas. If the UK Government's response to climate change involves more spending by UK Government departments in devolved areas, this will result in more funding for the Scottish Government. Conversely if the UK Government uses levers other than spending or focuses spending in reserved areas, there would be less Block Grant funding.
- 1.9 The links between the Scottish and UK public finances means that, as we stated in our 2023 Fiscal Sustainability Report, the achievement of fiscal sustainability is a shared endeavour between the Scottish and UK Governments. The risks to fiscal sustainability from climate change need to be handled accordingly.³³
- 1.10 In this report we consider the ways in which climate change and the response of both governments could affect the fiscal sustainability of the Scottish Government. We only consider fiscal sustainability under the current devolution settlement and fiscal framework. We do not project funding and spending in this report, nor do we assume current policies are held constant. Given the lack of costed climate change plans, we use the Climate Change Committee's (CCC) Sixth Carbon Budget to estimate potential costs of mitigation and we discuss risks around adaptation and damages. We look at how the fiscal sustainability of the devolved public finances is affected by the interaction of the fiscal framework with the policy choices made by both the UK and Scottish Governments.

Climate change

- 1.11 The UN Climate Change Conference in Paris in 2015 agreed to hold the average global temperature change to below 2°C above pre-industrial levels and to make efforts to keep the

³¹ Sniffer (2021) Evidence for the third UK Climate Change Risk Assessment (CCRA3) Summary for Scotland ([link](#))

³² Climate Change Committee (2021) Evidence for the third UK Climate Change Risk Assessment (CCRA3) Summary for Scotland ([link](#))

³³ Scottish Fiscal Commission (2023) Fiscal Sustainability Report ([link](#))

increase to 1.5°C.³⁴ Achieving this requires global GHG emissions to peak by 2025 and to reach net zero by the mid-century.³⁵

- 1.12 Reducing global emissions to net zero requires global action, and much of this is beyond the control of the Scottish and UK Governments. Global trends in emissions will determine the level of global warming. The amount of economic damage from climate change and the level of adaptation required will therefore depend on the extent of mitigation at a global level.
- 1.13 Temperature rises are now inevitable based on previous and future GHG emissions. There is widespread scientific consensus on the broad scale of the challenge. However, there is uncertainty in the estimates of how climate change and the associated damage from climate change will occur. Tipping points at which more extreme or catastrophic change occurs are possible. Losses and damage will occur as it is not possible to foresee all the impacts of climate change or adapt to these.

UK and Scottish Government climate response

- 1.14 The first UK legislation was in 2006 and the Climate Change Act in 2008 set an emissions target for 2050. The Scottish Parliament passed its first climate change legislation in 2009. In 2019 the Scottish Parliament set the target for Scotland to reach net zero by 2045.³⁶ In the same year the UK Parliament legislated to reach net zero by 2050.³⁷ The CCC was established as an independent advisor to the UK Government under the 2008 Act and subsequently appointed as the Scottish Government's independent statutory adviser.
- 1.15 There are some differences in the approaches to these targets by the UK and Scottish Governments. Although Scotland's net zero target is five years earlier than the UK's, the CCC consider this as achievable on the same pathway to net zero as Scotland has more geographical capacity to mitigate emissions.³⁸ Scotland and the UK also have different interim targets for 2030. The Scottish Parliament included interim targets that emissions be 75 per cent lower than 1990 levels by 2030. This has been assessed as particularly challenging by the CCC.³⁹ Comparatively the UK target is a reduction of 68 per cent on 1990 levels in 2030.⁴⁰
- 1.16 UK climate change legislation refers to taking social, economic and fiscal circumstances into account. Scottish climate change legislation requires due regard for the principles of a just transition, meaning reaching net zero should be in partnership with those directly impacted, and should help address inequality and poverty. The Scottish Government Climate Change Plan update in 2020 included policies to support this. Potentially, a just transition could require more or earlier investment than the equivalent plans by the UK Government.
- 1.17 The current UK and Scottish Climate Change Acts both reference preparing for, and adapting to, climate change but neither has quantitative targets for adaptation. Every five years the UK Government produces a UK Climate Change Risk Assessment and a national adaptation plan for England. The Scottish Government produces a national adaptation programme on a five-year

³⁴ United Nations Framework Convention on Climate Change (2016) The Paris Agreement – Publication ([link](#))

³⁵ Intergovernmental Panel on Climate Change (2022) Climate Change 2022 – Mitigation of Climate Change – Summary for Policymakers ([link](#))

³⁶ Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 ([link](#))

³⁷ The Climate Change Act 2008 (2050 Target Amendment) Order 2019 ([link](#))

³⁸ Climate Change Committee (2020) Sixth Carbon Budget ([link](#))

³⁹ Climate Change Committee (December 2022) Scottish Emissions Targets – first five-yearly review ([link](#))

⁴⁰ UK Government (2022) UK's Nationally Determined Contribution, updated September 2022 ([link](#)) The first five carbon budgets were set to achieve the previous target of an 80 per cent reduction by 2050. The Sixth Carbon Budget covers the period 2033 to 2037 and aims to deliver a 77 per cent reduction in national emissions, reflecting the UK Government's new target to achieve net zero by 2050.

cycle.⁴¹ Both governments have been criticised by the CCC for not having clear plans for adaptation or estimated costs of adaptation or damages.⁴²

Fiscal sustainability and climate change

- 1.18 There are a wide range of policy responses which governments can take to the challenges presented by climate change. The fiscal implications depend on the extent to which governments choose to bear the costs themselves. The same objective can often be achieved with different approaches. For example, if a government wants all vehicles to be electric, this could be incentivised through spending on subsidies, tax relief or public investment in the charging infrastructure or by banning the sale of fossil fuel vehicles or imposing additional taxes to make electric vehicles more attractive to consumers. Each approach would result in a different cost to the public and private sectors. Assessing the fiscal impact of a policy objective such as reducing emissions therefore requires information on how that objective will be achieved.
- 1.19 Governments are faced with similar choices on how to adapt to climate change or repair damage. Public funds can be invested and governments can introduce regulations or incentivise behaviour change through taxation.
- 1.20 Environmental taxes are a powerful fiscal tool to influence the behaviour of producers and consumers. These could be a wide-reaching carbon tax or be focused for example on fuel use or pollution. Environmental taxes can raise revenue while encouraging behaviour changes. This is important as some taxation is likely to be lost as consumers and producers change their behaviour. The Office for Budget Responsibility (OBR) has noted that, since fully electric vehicles pay no fuel duty and are exempt from Vehicle Excise Duty until 2025, the UK Government's fiscal sustainability is at risk if these lost revenues are not replaced.^{43,44} Finally, there are other approaches that are more market-driven, such as emissions trading schemes.⁴⁵
- 1.21 The effects of both climate change and the government response on the economy are important considerations for how the public finances are affected by climate change. Policies to lower emissions could reduce productivity and economic growth by diverting resources from productive investment and by raising input costs. This may be the case early in the energy transition but in the longer run, as green technologies advance and their costs fall, mitigation policies are typically seen as a source of economic growth.⁴⁶
- 1.22 The effects on productivity of climate change and the transition to net zero are uncertain. There are potential negative effects, for example through the reduction in output during heatwaves or extreme weather events. The transition to net zero could also enhance productivity, for example the OBR notes that establishing an early dominant position in new green technologies could create a source of comparative advantage internationally, benefitting future exports.

⁴¹ Scottish Government (2024) Draft Scottish National Adaptation Plan (2024-2029) ([link](#))

⁴² Climate Change Committee (2023) Adapting to climate change Progress in Scotland ([link](#))

⁴³ OBR (2021) Fiscal risks report – July 2021 ([link](#))

⁴⁴ OBR (2023) Working Paper 18: Emissions and our tax forecast ([link](#))

⁴⁵ The UK Emissions Trading Scheme was set up in 2021 following the UK's departure from the EU. It was jointly established by the UK Government, Scottish Government, Welsh Government and Northern Ireland Executive. Scottish Government. See Scottish Government – UK emissions trading scheme ([link](#))

⁴⁶ OBR (2019) Fiscal risks report – July 2019 ([link](#))

The Scottish context

- 1.23 The effects of climate change on devolved public finances are complicated as Scotland and the UK's climate responses and the associated public funding effects are interlinked and interdependent. The specifics of how to respond and adapt to a changing climate, or how to mitigate emissions can vary between the UK nations but it is a shared challenge and the response of each government has implications for the other.

Policy responsibility

- 1.24 To consider the potential effects on the Scottish Budget it is important to first think about how responsibility for policies is split between the UK Government (reserved areas) and the Scottish Government (devolved areas). We typically think of areas such as health as being fully devolved and defence as being fully reserved. However, when it comes to climate change, devolved and reserved responsibilities are less clear cut. The interdependencies for climate change are even more significant than the demographic effects set out in our 2023 Fiscal Sustainability Report.⁴⁷
- 1.25 The balance of reserved and devolved powers varies across the policy areas covered by the net zero targets and by adaptation. A joint report by the four audit offices for the UK nations gave the example of how, "UK-wide policy decisions will be critical in defining pathways towards decarbonising heating in buildings, such as on whether to pursue hydrogen or electrification (or both) as a fuel source, but this will need to be supplemented by action at a devolved level on issues such as planning and improving energy efficiency".⁴⁸
- 1.26 Another example which illustrates the complexity is Surface Transport. The Scottish Government maintains and improves trunk roads and funds local authority road maintenance. The operation of rail services is devolved, although the UK-wide Network Rail is responsible for most of the infrastructure, and many ferry services are provided by a Scottish Government operator. The Scottish Government provides concessionary bus travel for certain groups of people. The Scottish Government therefore controls most public spending on transport in Scotland. However, many aspects of regulation relating to transport are reserved. For example, banning polluting vehicles or imposing more stringent emission standards.⁴⁹
- 1.27 Policy decisions at the UK level are therefore important in ensuring the Scottish Government can meet its net zero targets. In parallel, choices made by the Scottish Government are important for the UK achieving its net zero target.

Fiscal framework

- 1.28 Alongside the split in responsibilities, the Scottish Government's funding arrangements are also an important factor in how climate change affects the devolved public finances. The fiscal framework sets out the Scottish Government's funding arrangements following the Scotland Act 2016 and the devolution of some taxes and social security payments.
- 1.29 The UK Government sets the overall fiscal position for the UK and funds spending across the UK through reserved tax revenues and borrowing. The Scottish Government has limited powers to

⁴⁷ Scottish Fiscal Commission (2023) Fiscal Sustainability Report ([link](#))

⁴⁸ Audit Scotland, Audit Wales, National Audit Office and Northern Ireland Audit Office (2023) Approaches to achieving net zero across the UK ([link](#))

⁴⁹ While setting minimum emission levels in vehicles is reserved, as it relates to product standards, the creation of Low Emission Zones (LEZ) in urban areas is devolved and the Scottish Government can give local authorities permission to implement a LEZ.

borrow further under the fiscal framework. It cannot accumulate substantial debt, or reserves, and is required to have a largely balanced budget. Although the Scottish Government can raise additional revenue through devolved taxes, most of its funding is provided through the Block Grant. Therefore, the level of tax and spending, and any borrowing necessary to bridge the gap, is influenced by the UK Government.

- 1.30 The Scottish Government has responsibility for some environmental taxes. Scottish Landfill Tax is a tax designed to reduce the amount of waste sent to landfill. The Scotland Act 2016 included the power to introduce replacement taxes for the UK Air Passenger Duty and Aggregates Levy although replacement taxes have not yet been introduced. Air Departure Tax is the Scottish Government's planned replacement of Air Passenger Duty, a tax on all eligible passengers leaving UK airports. Aggregates Levy is a tax on the use of rock, sand and gravel for commercial purposes like building roads and houses and aims to encourage greater use of recycled and alternative materials. A Scottish Aggregates Tax is being developed to replace the existing UK-wide levy in Scotland. These taxes are small, but they can influence behavioural change.
- 1.31 The Scottish Government's recent consultation on heat and buildings recognised the option for using additional charges on Council Tax and Non-Domestic Rates for buildings not meeting required standards.⁵⁰ The Scottish Parliament has the power to introduce new taxes, with the agreement of the UK Government and UK Parliament. This power has only been used once to date.⁵¹ Non-tax approaches can also be used, for example the single use carrier bags charge requires all retailers to charge a minimum of 10 pence for each bag. The income from the charge is received by the retailers not by the Scottish Government, but the charge can change behaviour.
- 1.32 Other environmental taxes are reserved. For example, Fuel Duty is charged on motor fuels and the Climate Change Levy is a tax on non-domestic use of energy. The Plastic Packaging Tax was introduced in 2022 and applies to the manufacture or import of plastic packaging that does not contain at least 30 per cent recycled plastic.
- 1.33 The effects of climate change on the economy would feed through to the Scottish Budget directly through income tax revenues, and indirectly through the effects on the UK Government's fiscal position. However, the Scottish Government's finances are partly insulated from a loss of economic output caused by climate change. For central governments reduced economic output results in a loss of tax revenues from income tax, corporation tax and VAT. Under the current fiscal framework, the impact on Scottish Government would be limited to the extent that reduced economic output feeds through to lower levels of employment or earnings (for income tax) or property prices (for Land and Buildings Transaction Tax), and only to the extent that these fall relative to the rest of the UK. For example, if employment in Scotland is more negatively affected by climate change than the rest of the UK, then this could reduce Scottish Budget funding as Scottish revenues would fall by more than the corresponding Block Grant Adjustment.
- 1.34 The Block Grant is the largest source of funding for the Scottish Government. Changes to the Block Grant are determined by the Barnett formula. That is, when the UK Government changes its planned spending in devolved areas, the Scottish Government receives a population share of that change. Therefore, if the UK Government's response to climate change results in an increase or decrease in spending in devolved departments, this will increase or decrease respectively the funding available to the Scottish Government.

⁵⁰ Scottish Government (2023) Delivering Net Zero for Scotland's Buildings – Heat in Buildings Bill: consultation ([link](#))

⁵¹ The Scotland Act 1998 (Specification of Devolved Tax) (Wild Fisheries) Order 2018 ([link](#))

- 1.35 The Scottish Government can choose to spend its funding on any devolved area, but only within the total it has available for a given year. If the need for public investment related to climate change is greater in Scotland because of the geographic, economic, or demographic differences, or if the Scottish Government's policy is to provide greater support from the public sector, then this may create fiscal pressure and require the Scottish Government to decide which areas of whether to prioritise or cut spending in different areas or to raise additional revenue. If the need for public investment is lower in Scotland and spending is higher in England, the Scottish Government still receives the corresponding funding via the Block Grant.
- 1.36 If the UK Government uses regulation to require the private sector and households to finance the transition, there would be no corresponding funding for the Scottish Government. Whether such regulations would apply in Scotland depends on the specific policy area. The Scottish Government may be required to regulate in a similar way if they cannot meet the costs of doing otherwise from within the Scottish Budget.
- 1.37 Fiscal risks from adaptation and damages may stem from Scotland and the rest of the UK experiencing climate change differently. Higher temperatures, extreme weather and rising sea levels will not be evenly distributed across the UK or may occur at different points in time. For example, if in a particular year storm damage was worse in Scotland than in England, the Scottish Government would need to manage any additional spending from within its existing budget as it cannot borrow to fund this spending. This would likely require either a greater allocation of contingency funding at the start of the year, or a reprioritisation of spending in-year. If in another year there was worse storm damage in England than in Scotland, this would result in additional funding from the UK Government if spending increased in England. The Scottish Government can only save money through the Scotland Reserve, and the limits are such that this is primarily used to manage regular underspends and cannot be used to meaningfully transfer spending between years.
- 1.38 Climate change can exert pressures in reserved areas, such as lost revenues from fuel duties or the investment required to upgrade the national grid so that it can supply much greater amounts of electricity and is resilient to severe weather. As they are reserved, they affect the UK Government fiscal position, so the Scottish Budget may not be directly affected. However, it can eventually be affected indirectly depending on how the UK Government deals with its fiscal pressures:
- For example, if the UK Government creates a new carbon tax on polluting activities to replace the revenue from fuel duty or fund the upgrade of the national grid, people and businesses in Scotland will pay it, but the Scottish devolved public finances will not be directly affected.
 - If the UK Government increases existing taxes, the Scottish Budget could be affected if the tax of choice is devolved. For instance, if the gap is bridged with rises in income tax the Scottish Budget will be affected, since more funding will be deducted through Block Grant Adjustments and the Scottish Government would need to decide whether to respond with a similar tax change. This would not be the case for reserved taxes. For example, if Vehicle Excise Duty (road tax) is increased to compensate for lost fuel duty, drivers in Scotland will pay the tax, but funding available to the Scottish Government will not be directly affected.
 - If the UK Government instead opts for cutting public spending, the Scottish Budget may be affected if the cuts are in devolved areas, as this will reduce the Block Grant.

Unmitigated warming and late action scenarios

- 1.39 Our March 2023 Fiscal Sustainability Report showed that, in a scenario in which the UK is fiscally unsustainable, the Scottish Budget is likely to be affected as the UK Government addresses its long-term fiscal pressures. The projection of the annual budget gap assumed unchanged policy from both governments. Our analysis did not take account of Scottish Government plans to reach net zero, or of adapting to and addressing the harms of climate change over the next fifty years.
- 1.40 To fully assess how climate change might affect the sustainability of the Scottish devolved public finances, we would need a baseline estimate of the costs if the world did not achieve net zero. Climate change brings risks of greater volatility on a global level with the potential to exceed historical macroeconomic shocks. The challenge is unprecedented and impacts beyond what we discuss in this report are likely.
- 1.41 We refer to the previous work of the OBR which has illustrated scenarios of unmitigated emissions and a late transition to net zero and demonstrated that the costs of these scenarios outweigh the costs of a balanced pathway to net zero.
- 1.42 In their 2021 Fiscal risks report, the OBR produced an illustrative unmitigated warming scenario, assuming an average temperature increase of 4°C in the UK by the end of the century, based on the Met Office’s most pessimistic temperature projections at the time. They assumed this would be associated with increased spending on adaptation of 0.3 per cent of GDP per year with each degree of warming, and the size and frequency of shocks progressively increases with rising temperatures, doubling relative to historic trends by the end of the century. As a result, they projected the UK’s debt-to-GDP ratio would reach 289 per cent by the end of the century compared to a stable deficit baseline of 90 per cent. They noted they had made broad brush assumptions and did not incorporate complexities like the interaction between an ageing population and unmitigated warming.⁵²
- 1.43 If efforts are made to mitigate emissions, but these are belated and therefore sudden, we could still see adverse macroeconomic consequences. The economy could be exposed to energy price shocks for longer and loss of profits if assets become obsolete.⁵³ It may also be harder to deliver the Scottish Parliament’s commitment to a just transition. The OBR’s Fiscal risks and sustainability report in 2023 showed how a late and disruptive transition would be more expensive than an early and smooth transition to net zero.⁵⁴
- 1.44 The extent of macroeconomic risks from climate change will depend on how policies are managed. In its 2019 Fiscal risks report the OBR highlighted how well-signalled and orderly policies that allow time for the economy to adjust and for technological advances to reduce costs might pose little risk.⁵⁵ In contrast, uncertainty around policy changes could mean a greater risk in terms of foregone economic growth.

⁵² OBR (2021) Fiscal risks report – July 2021 ([link](#))

⁵³ Bank of England (2018) Climate change and the macro-economy: a critical review, Bank of England Working Paper No.706 ([link](#))

⁵⁴ OBR (2023) Fiscal risks and sustainability report – July 2023 ([link](#))

⁵⁵ OBR (2019) Fiscal risks report – July 2019 ([link](#))

Chapter 2

Adaptation and damages

Overview

- 2.1 In this chapter we discuss investment needed to adapt to climate change. Given how the fiscal framework and the Scottish Government's funding operates, we outline some risks specific to the Scottish Government. In the absence of Scottish cost estimates we do not undertake quantitative analysis to support our narrative but draw from external sources. As an illustration, we consider some of the risks of damages costs to the public sector drawing from Storm Babet in 2023.
- 2.2 Since the 1980s, Scotland's climate has got warmer, heatwaves are more common and intense, rainfall has increased, and sea levels are higher.^{56,57} Climate impacts are already affecting society and the economy. It is probable that whatever the course of global emissions over the next decades, by the mid-century the UK will experience wetter milder winters, and hotter drier summers in addition to more intense and frequent rain and temperature extremes. The course of climate change after the mid-century depends on the path of global greenhouse gas (GHG) emissions, with impacts lessened if net zero is reached by the mid-century or more extreme if not. As global emissions continue to increase, it is unlikely that global net zero will be met by the middle of the century.⁵⁸
- 2.3 This change to the climate creates new risks and adaptation is needed to reduce their impact. Investments such as making infrastructure resilient to extreme weather or improving flood defences lessens future costs and destruction. However, not all climate change can be foreseen or adapted to and there will be damage and loss such as to infrastructure and buildings, disruption to the economy, harm to health, and loss of habitats and biodiversity.
- 2.4 Adaptation is an ongoing process and even assuming a certain GHG emissions pathway, there are a range of possible outcomes which would result in different adaptation requirements. This makes setting targets and long-term quantitative outcomes more difficult. The costs of adaptation are likely to be significant for both the overall economy and the public sector. The CCC has estimated additional investment of around £10 billion a year is needed for the UK on adaptation from 2020 to 2030.⁵⁹ This is a partial estimate. The optimal level of investment is unknown as the trajectory of warming and climate change is uncertain.
- 2.5 It is a potential risk for fiscal sustainability that full adaptation costs are not known at the UK or Scottish level. If more investment is required in devolved areas in Scotland than in England, it could present a risk for Scottish Government finances. The scale of uncertainty associated with adaptation costs is a risk in itself.

Adaptation in Scotland and the UK

- 2.6 The Climate Change Committee (CCC) provides an Independent Assessment of UK Climate Risk every five years outlining the risks and opportunities for adaptation. It covers the UK and provides summaries for England, Wales, Scotland and Northern Ireland. In 2021, it considered a range of 2°C

⁵⁶ Climate Change Committee (2021) Independent Assessment of UK Climate Risk ([link](#))

⁵⁷ Adaptation Scotland (2021) Climate Projections for Scotland Summary ([link](#))

⁵⁸ Intergovernmental panel on climate change (2023) Climate Change 2023 Synthesis Report Summary for Policymakers ([link](#))

⁵⁹ Climate Change Committee (2023) Investment for a well-adapted UK ([link](#))

to 4°C warming in line with the path of global GHG emissions and looked at the natural environment, health, homes, infrastructure, and the economy. It identifies 61 adaptation risks and opportunities, these were mainly risks. The risk scores are broadly the same for Scotland and England.

- 2.7 Based on the CCC report, the Department for Environment, Food and Rural Affairs publishes the UK Climate Change Risk Assessment (CCRA). In response to the CCRA both Scotland and England produce national adaptation plans. In Scotland, the Climate Change (Scotland) Act 2009 requires that ministers lay a programme for climate change adaptation following each CCRA. The second adaptation programme covers up to 2024 and the draft Scottish National Adaptation Plan (2024-2029) is under consultation to be published in its final form in September 2024.^{60,61} The CCC has stated the UK's adaptation is not matching with the pace of climate change.⁶²

Investing in climate change adaptation

Overview

- 2.8 Adaptation costs are inevitable. Early investment is considered likely to save money in the long term and reduce the costs of damage from future climate impacts.^{63,64} The latest CCRA included cost benefit analysis finding net economic benefits of £2 to £10 for each £1 invested in adaptation.⁶⁵ There are potential fiscal pressures from adaptation spending for the Scottish Government to manage because of how funding depends on UK Government spending. However, the fiscal implications of not investing in adaptation would be harmful in the long term and could lead to even more pressure on future Scottish Budgets.
- 2.9 Public investment in adaptation is most needed to protect public assets like roads and hospitals from the impacts of climate change. The Scottish Government will be responsible for most Scottish infrastructure costs, such as trunk roads and railways. It will also pay for upgrading the Scottish public estate such as hospitals, schools, prisons, and government offices, so they can cope with warmer, wetter and more extreme weather.

Fiscal risks for the Scottish Government

Levers available to support adaptation

- 2.10 The public sector has a role in creating an enabling environment for private investment. Governments can support adaptation by reducing regulatory barriers, incentivising homeowners and businesses to adapt, and building climate resilience into regulatory requirements. As we discuss in **The Scottish context**, the division of reserved and devolved responsibility is not entirely clear cut. The Scottish National Adaptation Plan focuses on outcomes rather than devolved or reserved areas

⁶⁰ Scottish Government (2019) Climate Ready Scotland: Second Scottish climate change adaptation programme 2019-2024 ([link](#))

⁶¹ Scottish Government (2024) Draft Scottish National Adaptation Plan (2024-2029) ([link](#))

⁶² Climate Change Committee (2021) Independent Assessment of UK Climate Risk Advice to Government For the UK's third Climate Change Risk Assessment ([link](#))

⁶³ Climate Change Committee (2021) Independent Assessment of UK Climate Risk Advice to Government For the UK's third Climate Change Risk Assessment ([link](#))

⁶⁴ The National Centre for Social Research (2022) Climate Change Adaptation and Transport Infrastructure A Rapid Evidence Assessment ([link](#))

⁶⁵ Paul Watkiss Associates (2021) Monetary Valuation of Risks and Opportunities in CCRA3, Report to the Climate Change Committee as part of the UK Climate Change Risk Assessment 3 ([link](#))

and some outcomes such as public services and infrastructure encompass adaptation in reserved areas for example energy systems.

- 2.11 The Scottish Government cannot introduce regulations in reserved areas. Where it does have regulatory responsibility, the Scottish Government can use regulations to support adaptation for example plans to use buildings regulations to ensure new buildings are adapted for climate change.⁶⁶ The Scottish Government has set outcomes relating to energy in its Draft Energy Strategy and Just Transition Plan such as reducing vulnerability to extreme weather and floods and ensuring a reliable and affordable power supply. Scottish Government actions in some areas are limited to influencing the UK Government. Scottish Government outcomes could be harder to achieve and there could be pressure to use more public spending if the regulatory and policy environment provided by the UK Government are not aligned with Scottish Government objectives.
- 2.12 Incentivising households and businesses behaviours often depends on subsidies, sharing investment, or taxation. Subsidies require public spending which may bring the risk of asymmetry in public spending choices between the Scottish and UK Governments. The Scottish Government can introduce new taxes with the agreement of the UK Government though it has only done this once to date. There are other potential actions to encourage adaptation such as information sharing and mainstreaming adaptation into existing market codes. Barriers to investment noted by Adaptation Scotland's climate finance working group include uncertainty about benefits of adaptation, low commercial interest due to unknown revenue streams and the lack of a standard set of adaptation business models.⁶⁷

Relative need between Scotland and the rest of the UK

- 2.13 Scotland's Block Grant is updated with a per person share of changes to UK Government spending on devolved areas. Adaptation costs will be driven by population, the makeup of the economy and geography so funding on a per person basis may not cover the investment needs. Where funding does not meet the adaptation cost, other areas of spending may need to be reduced or additional revenue may need to be raised. Full estimates of adaptation costs for Scotland and England do not exist so it is not possible to quantify this risk but there are indications that Scotland may need relatively higher investment because of its geography. For instance, the Green Finance Institutes central estimates of a financing gap on protecting and restoring biodiversity were almost equal in absolute terms for Scotland and England, making them considerably higher in Scotland on a per person basis.⁶⁸
- 2.14 The availability of cost estimates for adapting to different risks in the latest CCRA varies as does the quality of evidence informing these.^{69,70} Cost data is not available for all risks and cost estimates are described in aggregate terms ranging from less than ten million to billions per year. The capacity of and levers available to the Scottish and UK Governments to manage these costs differ because of the need for the Scottish Budget to be broadly balanced each year, so higher costs presents a greater fiscal risk to the Scottish Government. There are risks around adaptation costs due to uncertainty on how these would vary between Scotland and England but also because overall costs are largely unknown.

⁶⁶ Scottish Government (2024) Draft Scottish National Adaptation Plan (2024-2029) ([link](#))

⁶⁷ Adaptation Scotland (2022) A Guide to Adaptation Finance ([link](#))

⁶⁸ Green Finance Initiative (2021) The Finance Gap for UK Nature ([link](#))

⁶⁹ Paul Watkiss Associates (2021) Monetary Valuation of Risks and Opportunities in CCRA3, Report to the Climate Change Committee as part of the UK Climate Change Risk Assessment 3 ([link](#))

⁷⁰ Climate Change Committee (2023) The Costs of Adaptation, and the Economic Costs and Benefits of Adaptation in the UK ([link](#))

Damage

- 2.15 Climate change will result in loss and damage which may affect public sector revenues and require unexpected spending. Damage can destroy assets and can have effects such as disruption of economic activity and reduced productivity due to severe weather or heatwaves. There may also be effects on population health and wellbeing.
- 2.16 There are different fiscal implications for the Scottish Government depending on whether climate change damage is more concentrated in England or Scotland or impacts both similarly. If the UK Government incurs costs for instance due to flooding from a storm in England, this would result in additional funding for the Scottish Government through the Block Grant.
- 2.17 However, when climate damage is greater in Scotland, the Scottish Government will need to manage the costs from within its existing budget. The Scottish Government cannot borrow to fund additional spending or use the Scotland Reserve as a meaningful savings mechanism. Increasing risk of climate change damage could make the Scottish Budget more vulnerable to volatility. This may create pressures on spending and require reprioritisation of spending within the financial year.
- 2.18 In extreme weather events the harm is wider than just damaged infrastructure. Losses in the private sector are often hard to quantify. Private households, businesses and third sector organisations are generally expected to have insurance, some areas are seeing increased flood risks and higher insurance premiums.⁷¹ Losses do not affect everyone uniformly and may have greater consequences among those that are socioeconomically vulnerable.
- 2.19 Dealing with natural hazards is generally devolved, but regulation and taxation of insurance services are reserved. Insurance can cover households and businesses for the costs associated with climate damage, meaning insurance companies have an interest in reducing the likelihood and scale of climate damage. However, there is no incentive for insurance companies to invest directly in adaptation, and there is an incentive for companies to remove insurance cover for certain damages or to increase premium costs for those facing significant risks. In 2014 the UK Government created a levy-funded scheme, Flood Re, which protects people across Great Britain in high flood risk areas from rising insurance premiums.⁷²
- 2.20 If the Scottish Government wants to intervene in this area, it can only do so by providing financial support. This could be by compensating businesses and people who endure losses because they could not afford insurance, or by helping them offset rising insurance costs. As such, it would have to be funded from its relatively fixed budget. Box 2.1 outlines how the UK and Scottish Governments responded to the impact of Storm Babet.

⁷¹ BBC (2023) 'Who will buy my house if they can't get insurance' ([link](#))

⁷² Flood Re was established by virtue of the Water Act 2014 ([link](#)). The scheme underwrites the flood risk of all residential properties in Great Britain and charges insurers based on council tax band, rather than actual flood risk.

Box 2.1: A case study of climate change damage in Scotland

In October 2023, Storm Babet brought heavy downpours across the UK, with the most intense rainfall and devastating consequences in North East Scotland. It led to severe flooding in Brechin, Angus. Brechin has had a long history of flooding, and although its flood defences were significantly upgraded in 2016, damage to public infrastructure across Angus Council was estimated at around £4.1 million.⁷³

Local response to severe weather events is a devolved matter. The Scottish Government's Bellwin Scheme supports councils in Scotland for extraordinary spending related to emergencies.⁷⁴ The UK Government also operates a similar scheme.⁷⁵

The Scottish Government's borrowing power does not change in response to severe weather events, and most devolved taxes are already fixed for the year. Although it could request access to HM Treasury reserves in exceptional circumstances, in most cases the Scottish Government needs to provide financial support from within its relatively fixed budget.

Following Storm Babet, the Scottish Government provided support to the four local authorities under the Met Office's red warning (Aberdeenshire, Angus, Dundee City, and Perth & Kinross). This included compensation to repair local infrastructure, grants of £1,500 and £3,000 for affected households and businesses respectively, a share of the homelessness budget, and grants for farmers to repair damaged flood banks.^{76,77} Together with Bellwin claims for other severe weather events, in 2023-24 the Scottish Government has increased funding for local government by an extra £15 million.

More Block Grant funding to pay for support may be available if severe weather events also affect England and the UK Government responds with public spending on top of existing budgets. In this case, the UK Government provided affected parties with lower grants in general (£500 and £1,500 for households and businesses respectively) but greater subsidies of £5,000 if property owners invested in flood resilience.⁷⁸ Overall, £10 million more was added to the Department for Housing, Levelling Up and Housing's budget for the response to severe weather events. This translated to under £1 million of Block Grant funding for Scotland.

Climate change is likely to increase the frequency and intensity of storms. Where these affect Scotland hardest or when the Scottish Government opts to provide greater levels of financial support than the UK Government for England, there will be added pressure on the Scottish Budget.

⁷³ Angus Council (2023) Report No 354/23 – Storm Babet – Financial Issues and Implications Update ([link](#))

⁷⁴ Scottish Government (2023) Bellwin Scheme ([link](#))

⁷⁵ UK Government (2017) Bellwin scheme: guidance notes for claims ([link](#))

⁷⁶ Scottish Government (2023) Storm Babet package of support ([link](#))

⁷⁷ Scottish Government (2023) Supporting farmers impacted by floods ([link](#))

⁷⁸ UK Government (2023) Government announces support for flood-hit areas ([link](#))

Chapter 3

Mitigation

Overview

- 3.1 In this chapter, we examine the fiscal sustainability implications of Scottish and UK targets for net zero. We look at the expected emissions reductions by climate change sector and we consider how potential costs compare for the Scottish Government and the rest of the UK. We discuss the implications of the differing UK and Scottish targets for 2030.
- 3.2 Mitigation refers to actions taken to reduce emissions of greenhouse gases (GHG) to limit the rise in global temperatures and meet national emissions targets. In **Chapter 1** we describe the UK and Scottish targets to achieve net zero. The Scottish Government last set out its policies and proposals to reduce emissions in December 2020 in its Climate Change Plan Update.⁷⁹ A new draft Scottish Climate Change Plan is anticipated to be published later in 2024. In the absence of costed emissions reduction plans, we have used the pathway scenarios set out in the Climate Change Committee's (CCC) Sixth Carbon Budget to estimate the investment required to reach net zero.⁸⁰
- 3.3 Our decision to use these pathways is partly based on the detail and potential mitigation costs provided by the CCC which are more detailed than the Scottish Government's 2020 plan. These costs reflect the CCC's view on how the UK as a whole can reach net zero by 2050. While these are not specifically designed for Scotland, the estimates for Scotland from this dataset provide the best available estimates as a scenario of the likely emissions and costs pathways to reach net zero in Scotland. In 2022 the CCC published an updated Scotland pathway but they do not include the associated costs in detail so we have not included this in our analysis.⁸¹ More detail on the data can be found in **Annex A**.
- 3.4 The UK and Scottish net zero targets are interdependent and both are based on the CCC's advice. Under the CCC's pathway scenario for the UK to reach net zero by 2050, Scotland reaches net zero in 2045. The UK Government needs reductions in Scottish emissions to achieve the overall UK target. Similarly, the Scottish Government's targets include emissions from sectors, such as energy, over which it has limited powers to intervene and reductions in emissions in these sectors relies on UK Government policy.
- 3.5 Whether and when Scotland reaches net zero will depend on the policies implemented and the extent to which UK activity to remove emitted GHG takes place in Scotland. As a significant amount of carbon capture and removals may take place in Scotland the CCC determine the 2045 target to be reasonable.⁸²
- 3.6 As discussed in **Chapter 1**, the fiscal framework means the Scottish Government's finances are interlinked with the UK Government's. Where the UK Government spends in devolved areas on mitigation the Scottish Government will receive Block Grant funding. Where Scotland's mitigation

⁷⁹ Scottish Government (2020) Update to the Climate Change Plan ([link](#))

⁸⁰ Climate Change Committee (2020) Sixth Carbon Budget ([link](#))

⁸¹ Climate Change Committee (2022) Progress in reducing emissions in Scotland – 2022 Report to Parliament ([link](#))

⁸² Climate Change Committee (2022) Progress in reducing emissions in Scotland – 2022 Report to Parliament ([link](#))

targets require a higher or earlier level of spending than is required to meet the UK's targets, the level of funding from the UK Government may not be sufficient. In this case the Scottish Government will either need to fund the spending from elsewhere in the Scottish Budget, increase devolved taxes or use other tools to incentivise private investment. We compare spending for Scotland and the rest of the UK under the CCC's balanced pathway scenario and we discuss where there could be pressures on the Scottish Budget due to differences in the need to spend on mitigation.

- 3.7 This analysis does not include any examination of the wider effects of spending on mitigation such as the potential effects on productivity and economic growth. This will have indirect effects on the Scottish Budget. The Bank of England suggests that policies to lower emissions could reduce productivity and economic growth by diverting resources from productive investment and by raising input costs.⁸³ This may be the case in the initial years of the energy transition but in the longer run, as green technologies advance and their costs fall, mitigation policies are typically seen as a source of economic growth.⁸⁴
- 3.8 Another potential benefit of the transition to a low-carbon economy is the reduced risk from energy price shocks. In its 2023 Fiscal risks and sustainability report, the OBR concluded that for the UK "continuing our dependence on gas at the current level could, in an adverse scenario, be as expensive fiscally as completing the transition to net zero".⁸⁵
- 3.9 Funding for the Scottish Budget is, to a certain extent, insulated from energy price shocks as the most significant costs fall to the UK Government. For example, support for household energy bills following the invasion of Ukraine was provided by the UK Government. Where an energy shock has a negative effect on incomes across the UK, Scottish income tax revenues will fall, but if UK revenues fall as well, then the corresponding Block Grant Adjustment is also reduced. However, as discussed in **Chapter 1** and in our previous FSR, the overall fiscal sustainability of the UK has implications for Scotland. If the UK Government responds to its fiscal pressures by changing spending or tax policy in devolved areas, then this will result in changes to the Scottish Government's funding.

Pathway to net zero

Overall emissions reduction

- 3.10 The CCC has set out five different pathway scenarios for the UK to reach net zero: balanced pathway, tailwinds, headwinds, widespread innovation and widespread engagement. These hypothetical pathways were constructed to show how net zero could be reached. We focus on the CCC's balanced pathway scenario. In the headwinds scenario behavioural shifts and innovations are not widespread and there is greater reliance on hydrogen and carbon capture and storage so emissions reduction happens more slowly. The optimistic tailwinds scenario diverges the most from the balanced pathway scenario and the CCC suggest it stretches feasibility in a wide range of areas and goes beyond current evidence in others. When examining potential costs and emissions reductions, we are comparing against the CCC's baseline scenario which does not consider the increased costs of adaptation and damage from climate change if insufficient global mitigation action is taken.

⁸³ Bank of England (2018) Climate change and the macro-economy: a critical review ([link](#))

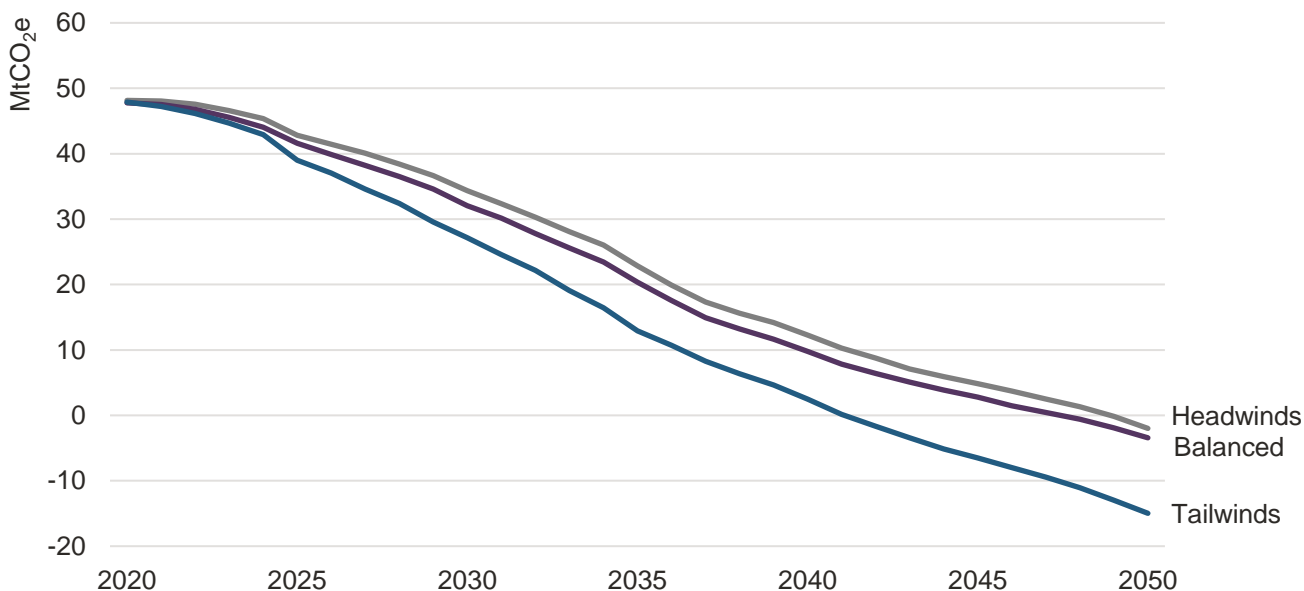
⁸⁴ OBR (2019) Fiscal risks report – July 2019 ([link](#))

⁸⁵ OBR (2023) Fiscal risks and sustainability report – July 2023 ([link](#))

3.11 Figure 3.1 shows the balanced, tailwinds and headwinds pathway scenarios for emission reduction to meet net zero. We present the emissions in millions of tonnes of carbon dioxide equivalent (MtCO₂e).⁸⁶

Figure 3.1: Climate Change Committee’s Scotland pathway scenarios to net zero

Significant reductions have to be made to reach net zero



Description of Figure 3.1: Line chart showing the trajectory of greenhouse gas emissions in Scotland from 2020 to 2050 under different scenarios. Headwinds, balanced and tailwinds scenarios all entail progressive reductions until Scotland is net zero by 2040 (tailwinds), or 2045 (headwinds and balanced) and net negative thereafter.

Source: Scottish Fiscal Commission, Climate Change Committee (2020) Sixth Carbon Budget ([link](#)).

We have assumed a population share of UK removals in Scotland.

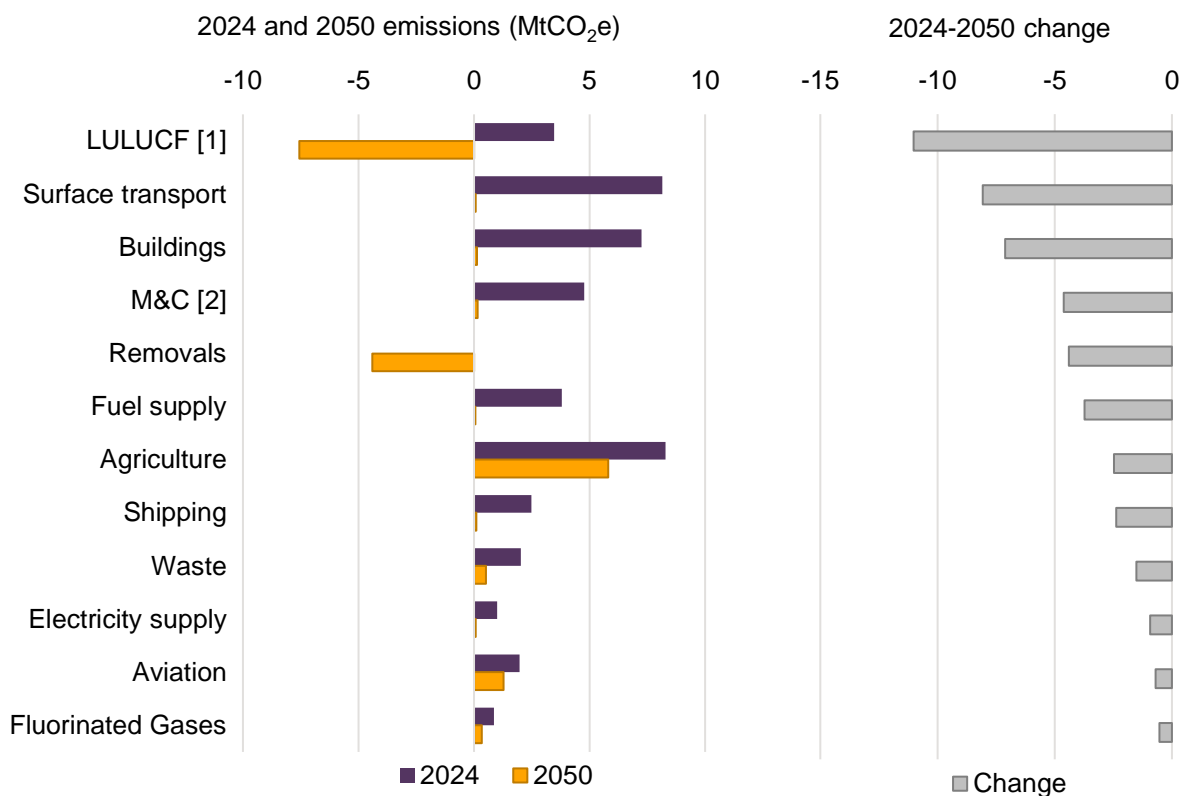
Emissions reduction by sector

3.12 Emissions data and climate change plans typically divide total emissions into 12 categories which cover the climate change sectors. These sectors are related to, but different from standard economic sectors. For Scotland to reach net zero, emissions will need to fall across each of the sectors. The scale and timing of these reductions differ by sector.

⁸⁶ MtCO₂e captures all GHG emissions in a single measure, weighting other gases by their global warming potential relative to carbon dioxide.

Figure 3.2: Climate Change Committee’s balanced pathway scenario Scottish sector emissions

Significant reductions have to be made to across each sector



Description of Figure 3.2: Two bar charts, the first showing emissions for each sector in 2024 and 2050 under the Climate Change Committee’s balanced pathway scenario and the second with grey bars showing the amount of change. The largest reductions in emissions are expected for the Land Use, Land Use Change and Forestry (F) sector, with the Surface Transport sector and the Buildings sector also requiring significant reductions. The largest reductions in emissions are expected for the Land Use, Land Use Change and Forestry (LULUCF) sector, with the Surface Transport sector and the Buildings sector also requiring significant reductions. LULUCF and Removals are expected to be net negative by 2050, Agriculture, Aviation and Waste the only sectors still emitting somewhat, and the rest of sectors net zero.

Source: Scottish Fiscal Commission, Climate Change Committee (2020) Sixth Carbon Budget ([link](#))

[1] Land Use, Land Use Change and Forestry.

[2] Manufacturing and Construction

Figures for 2024 are from the CCC balanced pathway scenario. Actual Scottish emissions are only known up to 2021.

3.13 Figure 3.2 shows the sector requiring the largest net change in emissions in Scotland is Land Use, Land Use Change and Forestry (LULUCF). This refers to forestry, perennial energy crops, and restoration of peatlands. Between 2024 and 2050 the LULUCF sector is expected to change from a net contributor to emissions to an area that removes and stores emissions. All remaining emissions in Scotland in 2050 are expected to be offset by removal technology and the LULUCF sector. As the CCC’s Sixth Carbon Budget does not attribute the technological removals to any specific places in the UK, we assume a population share of the removals will take place in Scotland.

Investment for reduced emissions in Scotland

3.14 To estimate the costs of reaching net zero for the Scottish Government we use the additional capital measure provided in the CCC’s Sixth Carbon Budget in the balanced pathway scenario.⁸⁷ Our approach does not include operational costs or future potential savings to operational spending. We

⁸⁷ Climate Change Committee (2020) Sixth Carbon Budget ([link](#))

do not expect this would cause results to differ substantially. [Annex A](#) provides a detailed description of our assumptions and methodology.

Box 3.1: Potential effect on the labour market

Though we do not examine the overall effects on the economy, the transition to net zero has potential risks and opportunities. One such area is the labour market.

A report by Robert Gordon University (RGU) indicates what could happen to the UK offshore energy workforce by 2030 under different scenarios for the energy transition.⁸⁸ If the UK and Scottish Governments' net zero targets were to be met, then the new job opportunities in the offshore renewables sectors could exceed the jobs lost in the oil and gas industry, so that the overall UK offshore energy workforce would expand. This effect is not guaranteed. A more rapid decline in the oil and gas industry combined with a slower energy transition would mean a reduction in the workforce involved in offshore energy.

The RGU report highlights that Scotland's offshore energy workforce could be disproportionately impacted if progress towards net zero does not happen in the energy sector by 2030. The RGU report states that the offshore energy industry currently represents close to one in every two hundred jobs in the UK and around one in every thirty jobs in Scotland. Moreover, 43 per cent of UK oil and gas jobs are located in Scotland, with a particularly high concentration in the North East.⁸⁹

Looking at a wider range of potential effects on UK employment, the CCC found that, by 2030, there is potential for the net zero transition to create more jobs than will be lost, driven by demand from low-carbon sectors such as buildings retrofit, the manufacture of electric vehicles, and renewable energy generation.⁹⁰ The report also highlights that the potential for employment growth in some sectors, such as hydrogen, carbon capture and storage, battery manufacturing, and food processing, is not guaranteed. It is conditional on developing supply chains domestically, which can be enabled by clear signals and strong incentives from governments.

- 3.15 The pathways included in the CCC's Sixth Carbon Budget do not result in the Scottish Government's 2030 target for Scotland being met. Our analysis is based on the balanced pathway scenario so the estimated costs do not reflect the spend required to meet the 2030 target. Attempting to cost the early investment required to meet the 2030 target would be highly speculative and would have been heavily based on judgement about the changing cost effectiveness of investment in emissions reduction.
- 3.16 The CCC's Sixth Carbon Budget reflects the total cost of additional capital, the CCC do not explicitly split these costs between the public and private sectors. We use the same public shares of investment as the OBR in its 2021 Fiscal risks report to create public sector shares of investment for Scotland.⁹¹ These public shares illustrate the potential scale of the spending required by the public sector, but there is significant uncertainty as to how the costs will be split.

⁸⁸ Robert Gordon University (2023) Powering up the Workforce ([link](#))

⁸⁹ Offshore Energies (2023) Workforce Insight 2023 ([link](#))

⁹⁰ Climate Change Committee (2023) A Net Zero workforce ([link](#))

⁹¹ OBR (2021) Fiscal risks report – July 2021 ([link](#))

3.17 Figure 3.3 summarises the public sector cost in Scotland. Under the CCC’s assumptions there is expected to be an additional £145 billion invested in Scotland between 2020 and 2050. This equates to £41 billion invested by the public sector, based on the OBR’s central public shares assumption.⁹²

Figure 3.3: Total public additional capital investment in Scotland on the balanced pathway scenario between 2020 and 2050

| 2024 prices | Additional capital (£ million) | Public share (Per cent) | Public Sector cost (£ million) |
|--------------------------------|--------------------------------|-------------------------|--------------------------------|
| Devolved sectors | | | |
| Buildings | 36,661 | 43 | 15,846 |
| LULUCF | 11,603 | 100 | 11,603 |
| Surface Transport | 30,461 | 19 | 5,710 |
| Waste | 1,929 | 100 | 1,929 |
| Agriculture | 1,268 | 11 | 138 |
| Devolved sectors total | 81,921 | 43 | 35,225 |
| Reserved sectors | | | |
| Manufacturing and Construction | 6,341 | 39 | 2,465 |
| Electricity Supply | 43,730 | 5 | 2,310 |
| Fuel Supply | 10,049 | 5 | 512 |
| Removals | 449 | 60 | 270 |
| Aviation | 840 | 16 | 131 |
| Shipping | 1,823 | 5 | 89 |
| F-gases | 1 | 29 | 0 |
| Reserved sectors total | 63,233 | 9 | 5,777 |
| Total | 145,154 | 28 | 41,002 |

Source: Climate Change Committee, Scottish Fiscal Commission.

Figures may not sum due to rounding.

3.18 This analysis reflects just one possible split of public and private investment and illustrates the scale of public spending which may be required. Our focus is on where costs may differ between Scotland and the rest of the UK, to illustrate where need to spend in Scotland may differ from the rest of the UK and funding from the Block Grant may not cover the required spending. This would represent a pressure on the Scottish Budget. We assume the same levels of public investment for both so that we can identify areas with different investment needs and potential risks for Scottish Government finances. The UK and Scottish Governments may opt for the public sector to cover a different share of the costs and this would change the risks to the Scottish Budget.

Devolved share of mitigation costs

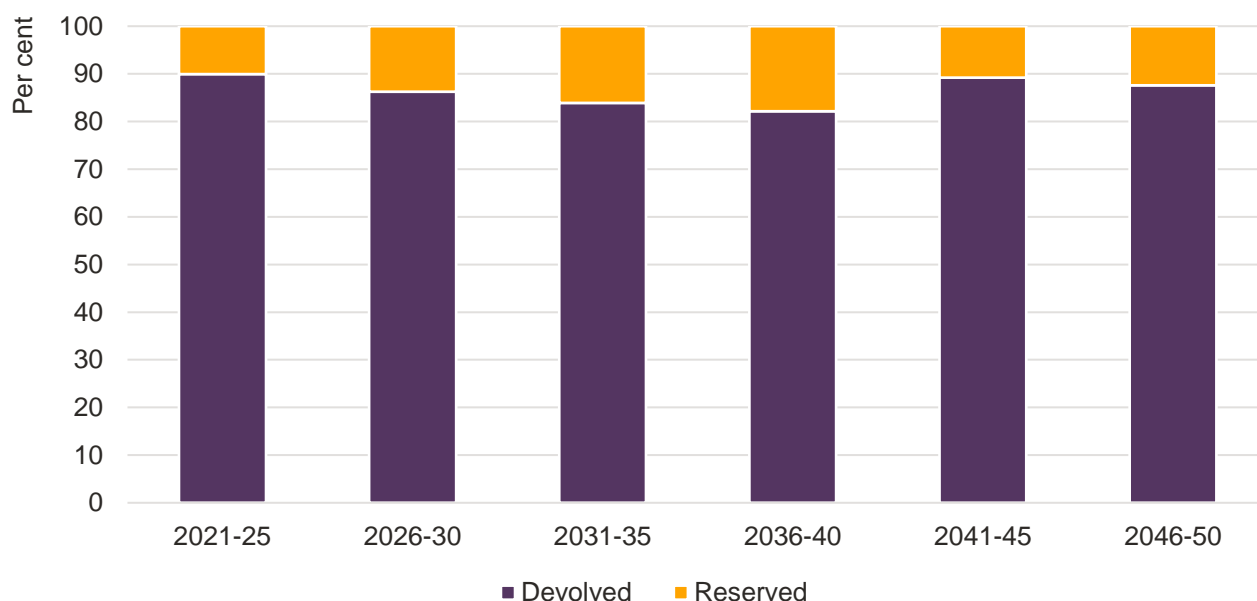
3.19 We allocate sectors as either devolved or reserved to identify how the costs are split between the Scottish and UK Governments. We find that most of the public investment required for mitigation in Scotland falls on to the Scottish Budget. The devolved sectors account for 64 per cent of the total emissions reduction expected on the balanced pathway scenario. As shown in Figure 3.4, the

⁹² Investment by the Scottish and UK Governments. Figures are in 2024 prices.

devolved share of total public investment is between 80 and 90 per cent throughout the projection period. This is substantially more than the devolved share of overall public spending in Scotland by any existing metric.⁹³ This is partly because we assume the reserved sectors with the largest additional capital requirements, such as electricity and fuel supply, are funded by private investment and consumers rather than the public sector as shown in Figure 3.3. It is also partly explained by the total additional capital required in devolved areas being larger than in reserved areas.

Figure 3.4: Devolved and reserved shares of overall public sector mitigation capital investment

The majority of the public sector mitigation costs are expected in devolved areas



Description of Figure 3.4: Stacked bar chart showing how the amount of public spending on additional capital to 2050 is split between devolved and reserved sectors in five-year bands. Most of the cost of mitigation in Scotland will be in devolved sectors and this does not change substantially over time.

Source: Scottish Fiscal Commission

3.20 Figure 3.4 shows mitigating emissions in reserved areas makes up just over 10 per cent of projected public spending on net zero in Scotland between 2025 and 2050. As most mitigation costs are in devolved areas, the Scottish Government finances could be exposed to any differences between the two governments in target levels and timings as well as the chosen degree of public sector involvement, mitigation policy choices, and differences in required emission reductions. The Scottish targets also include a commitment to a Just Transition which may have spending implications.⁹⁴

3.21 As the net zero targets are on a territorial basis both the UK and Scottish Governments are dependent on one another to deliver their respective targets. If the UK Government was to slow down mitigation in reserved areas, the Scottish Government may have to divert resources from elsewhere in the Scottish Budget to cut emissions faster in devolved areas so that targets can still be met. Conversely, if the UK Government invested more and reduced emissions faster than was needed for meeting its targets, the Scottish Government may have additional resources to spend on other areas. The CCC recommend that the UK and Scottish Governments cooperate and map out

⁹³ The HM Treasury (2023) Country and Regional Analysis ([link](#)) data suggests devolved spending was 65 per cent of identifiable public spending in Scotland on average (2018-19 to 2022-23). The Scottish Government (2023) Government Expenditure and Revenue Scotland 2022-23 ([link](#)) adds to reserved Scotland-specific spending a notional amount of non-identifiable expenditure, such as payment for national debt interest, based on their published methodology. On that basis, devolved spending in Scotland was slightly less than 65 per cent of total public spending in Scotland.

⁹⁴ Just Transition Commission (2021) Just Transition Commission: A National Mission for a fairer, greener Scotland ([link](#))

the interdependencies between reserved and devolved areas to limit the risks involved in reaching net zero.⁹⁵

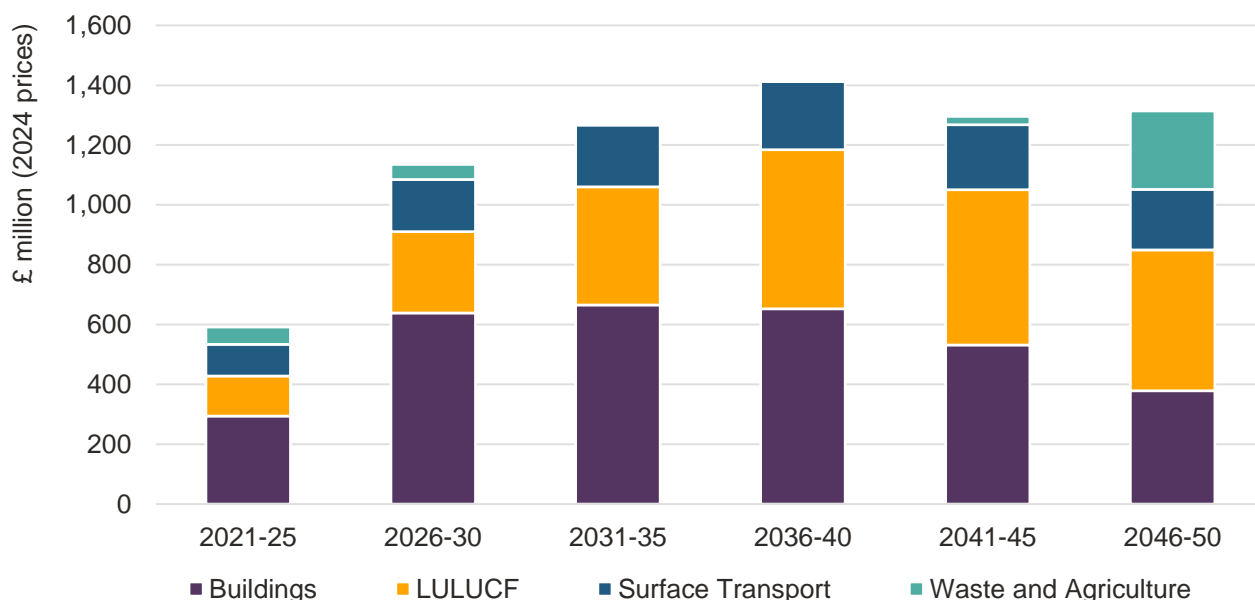
Mitigation costs for Scottish Government

3.22 In the following subsections we show mitigation costs for the Scottish Government under the CCC’s balanced pathway scenario. We compare these to the costs to the rest of the UK and discuss the potential implications for Scottish Government finances. We do this for overall devolved costs and each of the devolved sectors. This provides an illustration of how mitigation costs could affect the Scottish Budget. We do not project Block Grant funding and note funding would be based on spend in England for most sectors.

3.23 Figure 3.5 shows the projected average annual spend on mitigation for each of the sectors based on the CCC’s balanced pathway scenario to reach net zero.

Figure 3.5: Devolved average annual additional public capital investment by sector on the balanced pathway scenario

Devolved public sector additional capital is mostly expected in the Buildings sector and LULUCF



Description of Figure 3.5: Stacked bar chart showing, in 2024 prices, the average yearly amount of Scottish Government spending on mitigation to 2050 on the balanced pathway scenario. The most expensive sector of devolved responsibility is Buildings. Land Use, Land Use Change and Forestry (LULUCF) is the second largest area of required investment.

Source: Scottish Fiscal Commission

3.24 The biggest area of additional capital investment is expected to be decarbonising buildings. Spending on LULUCF is the second largest area of devolved investment in reducing GHG emissions. The rise in Waste and Agriculture at the end of the projection is driven by an increase in spend on mitigation measures related to waste from 2045.

Potential Scottish Government Budget pressures

3.25 As we outline in **Chapter 1**, changes to spending by the UK Government in devolved areas in England results in a change in the Scottish Government’s Block Grant funding. We have compared

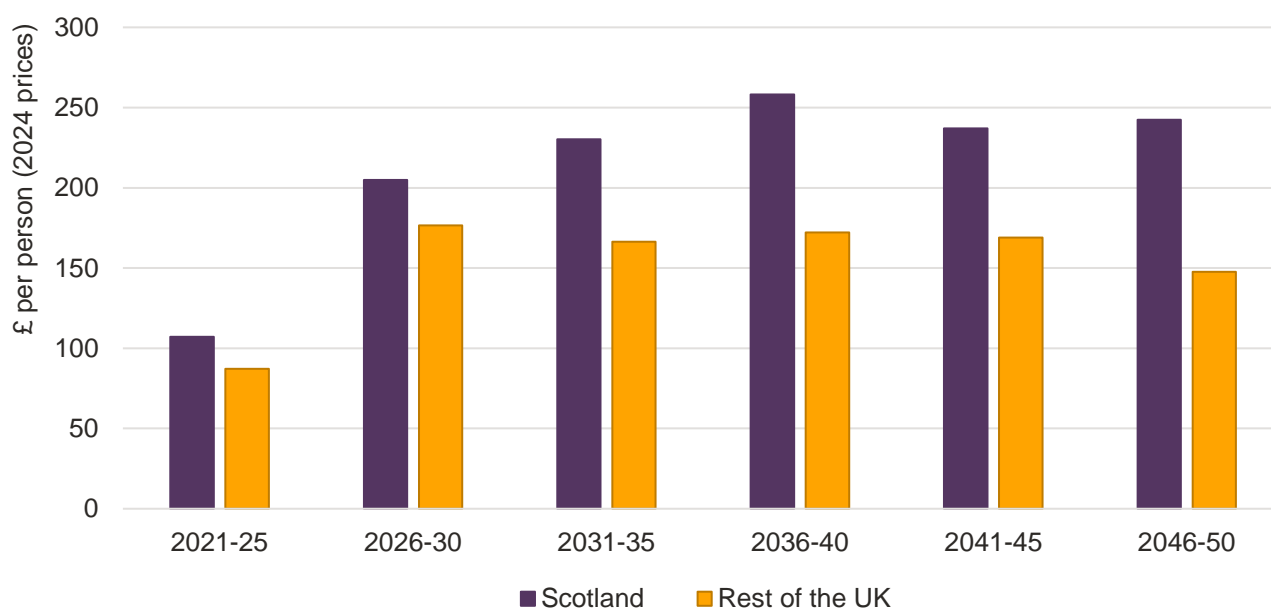
⁹⁵ Climate Change Committee (2022) Progress in reducing emissions in Scotland – 2022 Report to Parliament ([link](#))

expected public spending in Scotland to the equivalent investment in devolved areas in the rest of the UK to illustrate where there are risks of asymmetries in the need to invest which could put pressure on the Scottish Budget.

3.26 Figure 3.6 shows expected public spend on net zero per person in Scotland is higher than in the rest of the UK. This may create pressure for the Scottish Budget as the required investment may not be completely covered by Block Grant funding. Average expected additional investment per person in Scotland is £206 a year in 2024 prices, compared to the rest of the UK which is expected to be £149. The difference is driven by the projected public investment in LULUCF. Other than the LULUCF sector, the projected additional investment per person required for mitigation in each sector is similar for Scotland and the rest of the UK until 2050. In principle, when assuming equal public investment from UK and Scottish Government, these do not highlight a significant risk to the Scottish Budget. As Scotland have legislated for a just transition, this may mean more public investment if the Scottish Government chooses to meet this through increased spending.

Figure 3.6: Total devolved annual public additional capital investment per person on the balanced pathway scenario

Public spending on mitigation is expected to be relatively higher per person in Scotland than the rest of the UK



Description of Figure 3.6: Bar chart showing, in 2024 prices, five-year average public additional capital investment per person until 2050 for mitigation on devolved sectors in Scotland and the rest of the UK. The amount of spending in Scotland is expected to be considerably higher per person than in the rest of the UK across the projection period.

Source: Scottish Fiscal Commission

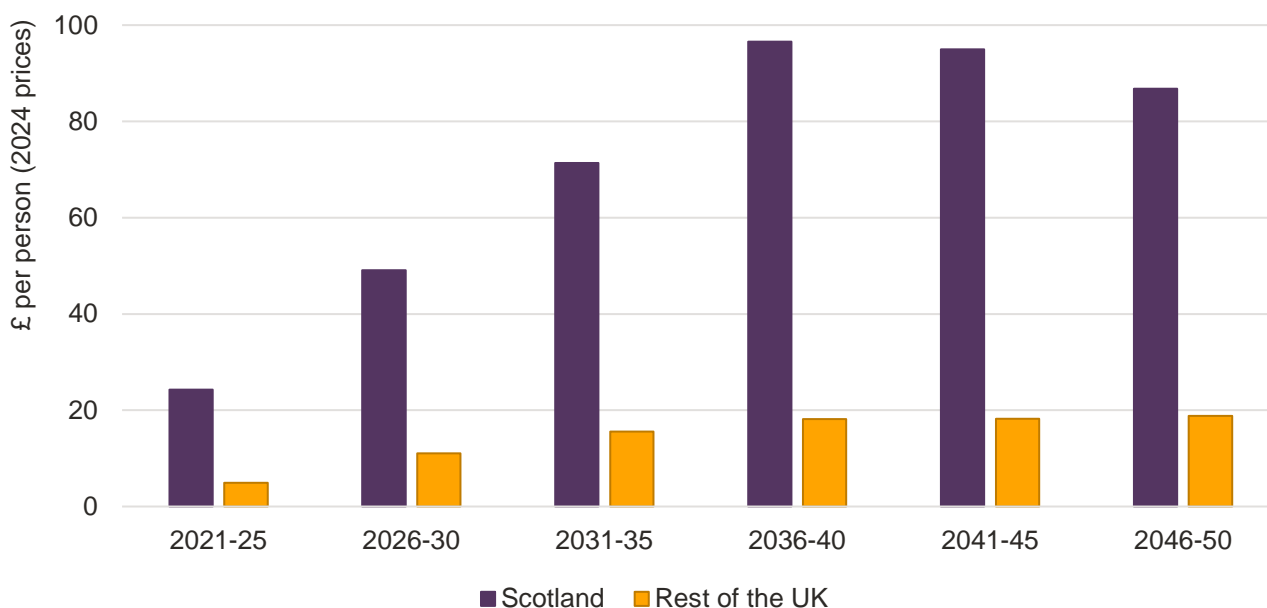
Sector analysis

Land Use, Land Use Change and Forestry

3.27 Figure 3.2 showed how LULUCF is expected to see the biggest net change in emissions in Scotland, moving from a net contributor to a net remover by 2050. Additional capital investment in LULUCF has three main components: investment in forestry, in perennial energy crops, and in restoring peatlands. Forestry makes up 65 per cent of investment associated with LULUCF. We use the OBR assumption that 100 per cent of the cost for LULUCF will be borne by the public sector.

Figure 3.7: Land Use, Land Use Change and Forestry annual public additional capital investment per person on the balanced pathway scenario

Public spending on LULUCF is expected to be considerably higher in Scotland than the rest of the UK per person from 2021 to 2050



Description of Figure 3.7: Bar chart showing, in 2024 prices, the 5-year average public capital investment per person for mitigation in Scotland and the rest of the UK on Land Use, Land Use Change and Forestry until 2050. The amount of spending in Scotland is expected to be considerably higher than in the rest of the UK per person.

Source: Scottish Fiscal Commission

3.28 Figure 3.7 shows the difference in public sector investment per person on LULUCF in Scotland and in the rest of UK using the CCC’s balanced pathway scenario. Spending in Scotland is expected to be considerably higher. This is because of the relative stock of important land use inputs, such as trees and peatlands. Scotland contains 32 per cent of the UK land mass, and has roughly half of the trees and 70 per cent of the peatland. Accordingly, the CCC estimates that 30 per cent of UK-wide costs associated with LULUCF are assigned to Scotland, substantially more than Scotland’s population share in the UK.⁹⁶

3.29 The large relative difference in public investment needs for LULUCF between Scotland and the rest of the UK poses a risk to the Scottish Government’s finances. UK Government spending in this area may generate considerably less funding through the Block Grant than what is needed in Scotland. A considerable amount of spending in this area will have to come from elsewhere in the Scottish Budget if the Scottish Government decides to reduce LULUCF emissions through public spending. The CCC have noted that Scottish Government ambition in this area is less than what it has advised and the pathway scenario used here is hypothetical, Scottish Government may choose to offset emissions using different approaches.⁹⁷ The Scottish and UK targets are both on a territorial basis and the success of each target depends on the other. Scottish Government’s pressure to spend on LULUCF may become a risk for the Scottish Budget but failure to reduce emissions in this area would likely result in both the Scottish and UK targets being missed.

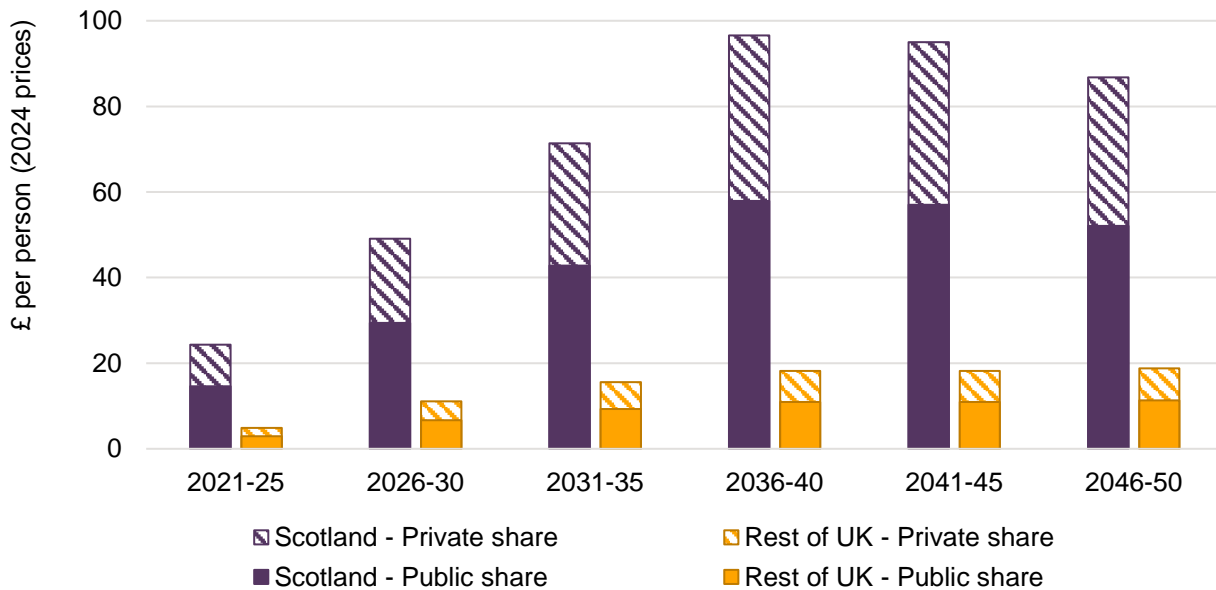
⁹⁶ We have been advised by the CCC to update the share of LULUCF costs assigned to Scotland to 30 per cent. It is described as 70 per cent in the CCC dataset but investigations into the calculations have identified an error in the formula to derive the aggregate additional investment costs. All underpinning assumptions regarding land use measure remain correct.

⁹⁷ Climate Change Committee (2023) Scottish Emissions Targets – first five-yearly review ([link](#))

3.30 As Figure 3.8 highlights, even if the Scottish Government can increase the level of private sector spending there would still be a significant gap in public investment needs between Scotland and the rest of the UK. Without being able to borrow substantially or raise significant extra revenue through taxes, the Scottish Government would have to move resources from other areas of spending in the Scottish Budget to support mitigation on LULUCF.

Figure 3.8: Expected Land Use, Land Use Change and Forestry annual additional capital investment per person with illustrative 60 per cent public investment

Public spending on LULUCF is expected to be higher in Scotland than in the rest of the UK even if the public share of investment is lower than assumed



Description of Figure 3.8: Bar chart showing, in 2024 prices, additional capital investment per person for mitigation on LULUCF in Scotland and the rest of the UK for a 60 per cent public investment scenario. The amount of spending expected in Scotland is still significantly higher than in the rest of the UK.

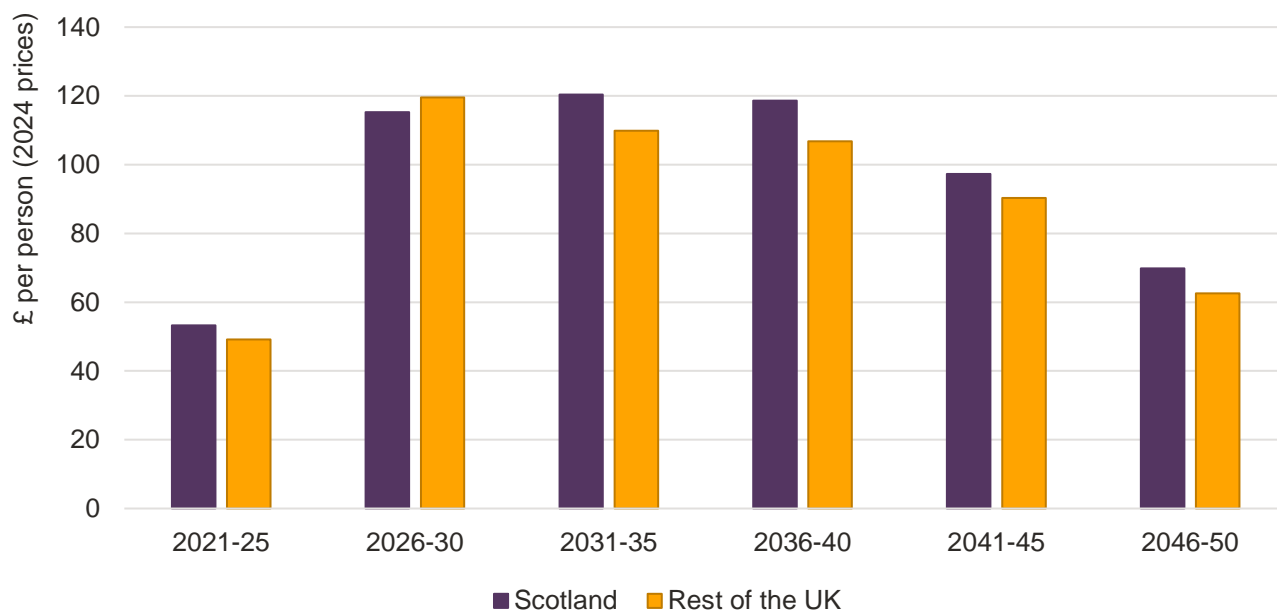
Source: Scottish Fiscal Commission

Buildings

3.31 Decarbonisation of heating in buildings (both residential and non-residential) is vital to reduce GHG emissions. It is expected to come at a substantial public cost. The costs to the public sector will come from decarbonising publicly owned buildings as well as supporting emissions reduction from heating in buildings for example through replacing gas boilers with heat pumps. The cost to the public sector will depend on how much governments invest themselves and how much private investment they expect. The assumption used for the public share of investment in buildings in this analysis is 43 per cent on average for residential and non-residential buildings, mirroring the approach taken by the OBR for the UK.

Figure 3.9: Buildings annual public additional capital investment per person on the balanced pathway scenario

Public spending on reducing emissions from the Buildings sector is expected to be similar in Scotland and the rest of the UK from 2021 to 2050



Description of Figure 3.9: Bar chart showing, in 2024 prices, five-year average public capital investment per person for mitigation on Buildings in Scotland and the rest of the UK up to 2050. The amount of spending expected in Scotland and the rest of the UK is at similar levels.

Source: Scottish Fiscal Commission

3.32 Figure 3.9 shows the expected public spend on Buildings per person is similar in Scotland and the rest of the UK. If public shares of investment are the same and investments occur at a similar point in time then the funding received should broadly cover the expected spending by Scottish Government and therefore does not indicate a particular pressure for the Scottish Budget. These projections are uncertain and illustrative. Due to the scale of expected public investment in Buildings, differences in the cost of decarbonising different types of property could result in additional pressure on the Scottish Budget.

3.33 The potential risk for the Scottish Budget arises from different choices being made by the UK and Scottish Government’s relating to the share of the cost funded by the public sector. With Buildings being a devolved area, the Scottish Government could opt for measures that involve the public sector providing a larger share of investment which may result in less to spend in other parts of the budget.

3.34 Similarly, the UK Government could take an approach that requires more private sector investment in England. If the Scottish Government did not do likewise in Scotland it would lead to a similar fiscal risk. Different timing of investment is also a risk. We discuss timing that further in the Surface Transport section.

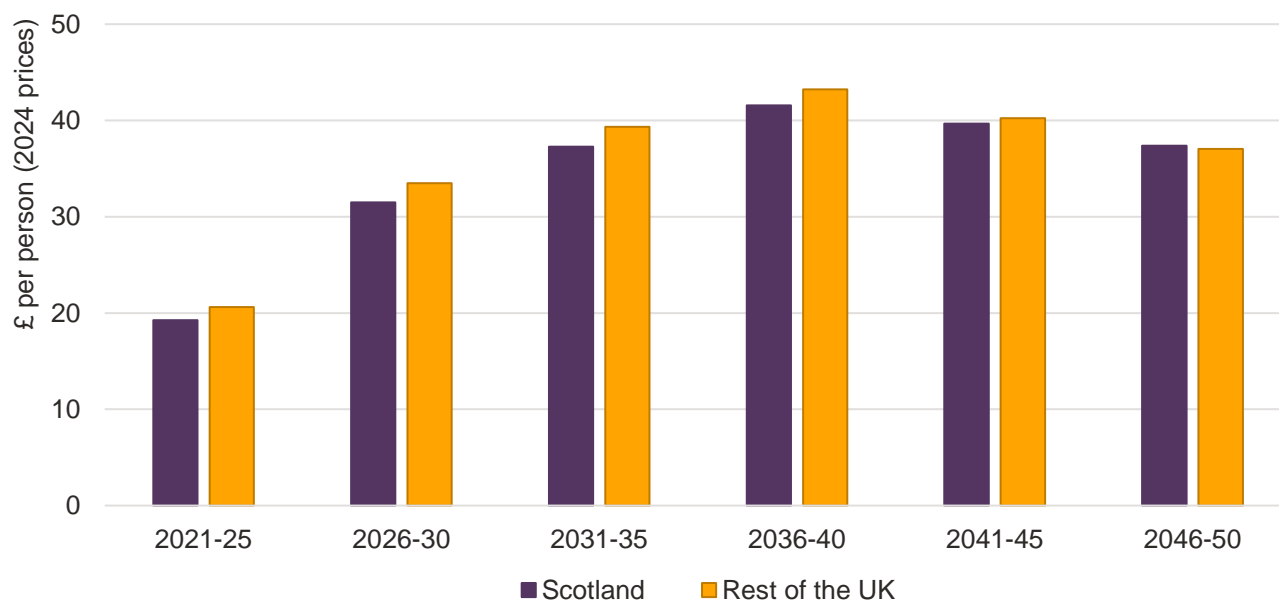
Surface Transport

3.35 Reducing emissions from Surface Transport will require public investment. Though reductions in emissions from heavy goods vehicles and public transport are important, the greatest cuts in emissions must come from cars and vans. We have assumed a 19 per cent share of expenditure on Surface Transport will come from the public sector. Though we have assumed responsibility for

spending sits with the Scottish Government many policy levers for regulation are in reserved areas, such as a potential ban on the sale of internal combustion engine powered cars. This implies communication and cooperation between devolved and reserved policy on this sector is important.

Figure 3.10: Surface Transport annual public additional capital investment per person on the balanced pathway scenario

Public spending on Surface transport is expected to be similar in Scotland and the rest of the UK from 2021 to 2050



Description of Figure 3.10: Bar chart showing, in 2024 prices, five-year average public capital investment per person for mitigation on Surface Transport in Scotland and the rest of the UK up to 2050. The amount of spending expected in Scotland and the rest of the UK on Surface Transport is at similar levels.

Source: Scottish Fiscal Commission

- 3.36 Figure 3.10 shows that the levels of public investment needed on Surface Transport to 2050 in Scotland and the rest of the UK are similar suggesting the funding received should broadly cover the expected spending.
- 3.37 A fiscal risk for this sector relates to timing. If the UK Government prioritised spending on a different timeline to the Scottish Government, the Scottish Government would not receive the funding at the time it needs it to progress in line with its own plans and targets. Differing public shares of investment, as discussed in the Buildings section, is also a risk for Surface Transport.

Other Sectors

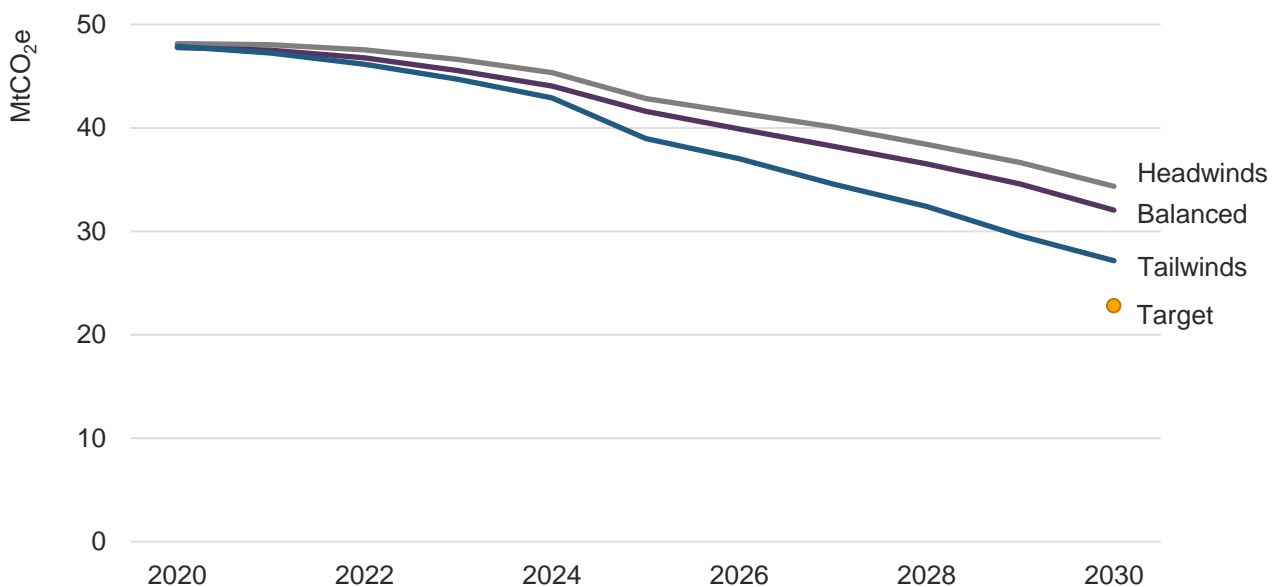
- 3.38 Other sectors that the Scottish Government has powers over, namely Waste and Agriculture, though important to reach net zero, do not pose a significant risk to the Scottish Budget due to the small scale of additional public investment expected under these assumptions.
- 3.39 These sectors are comparatively small as shown in Figure 3.5. However, the Scottish Government could opt to put more weight on these sectors, with greater levels of public investment. If so, this would have funding implications and increase potential risks for Scottish Government finances.

Differences in UK and Scottish Government targets for 2030

3.40 As set out in **Chapter 1**, Scottish Government has legislated to reach net zero by 2045 and the UK has legislated to reach it by 2050. The differing target dates are consistent with one another on the CCC’s balanced pathway scenario to reach net zero. The Scottish and UK interim targets for 2030 are different. The Scottish Government has a statutory target of a 75 per cent reduction compared to 1990 levels of territorial emissions.⁹⁸ This differs from the UK Government which aims for a 68 per cent reduction by 2030.⁹⁹

Figure 3.11: Climate Change Committee’s Scotland pathway scenarios with the Scottish Government’s 2030 target

The Scottish Government target is missed under the CCC pathway scenarios



Description of Figure 3.11: Line chart showing the Climate Change Committee’s pathway scenarios to 2030 and the Scottish Government target. Under all the pathway scenarios the 2030 target is missed.

Source: Scottish Fiscal Commission, Climate Change Committee (2020) Sixth Carbon Budget ([link](#)), Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 ([link](#)).

3.41 Figure 3.11 shows that the Scottish Government’s 2030 target requires greater MtCO₂e reduction than under the CCC’s pathways. The CCC believe the 2030 target remains extremely challenging.¹⁰⁰ The Scottish Government’s 2030 target is not met under these pathways. This is also true for the widespread innovation and widespread engagement pathways not presented here. Under the balanced pathway scenario the emissions reduction between 2020 and 2030 is 16 MtCO₂e while the Scottish target is for a 25 MtCO₂e reduction.

Increased cost due to timing

3.42 For the Scottish Government to reach its 2030 target there needs to be significant spending across the Scottish economy above the levels identified in the CCC’s pathway scenarios. Under the

⁹⁸ Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 ([link](#))

⁹⁹ UK Government (2022) UK’s Nationally Determined Contribution, updated September 2022 ([link](#))

¹⁰⁰ Climate Change Committee (2022) Progress in reducing emissions in Scotland – 2022 Report to Parliament ([link](#))

balanced pathway scenario, a 75 per cent reduction is met around 2035. To achieve this reduction in emissions, an estimated £12 billion additional capital needs to be spent by the Scottish Government between 2020 and 2035, £6 billion of which is from 2030 to 2035. Bringing this investment forward is unlikely to be sufficient to meet the target. Technologies may not yet be as cheap or developed as the CCC expect them to be after 2030. If this was achieved through increased Scottish Government spending, this would result in reduced spending in other areas of the Scottish Budget or the Scottish Government being required to raising increased revenue from devolved sources.

Fiscal risks for Scottish Government due to differing targets

- 3.43 To meet the 2030 target the Scottish Government would need to spend to make up for the insufficient pace of emissions reductions from reserved areas in Scottish territory and could only make reductions in devolved areas. Its funding via the Block Grant would not keep pace with these demands as the UK Government is not spending in line with a 75 per cent reduction in emissions by 2030. The gap in funding required to reach the Scottish Government target would have to come from elsewhere in the Scottish Budget. Furthermore, any success in reducing emissions in Scotland would potentially lead to less funding as some reductions needed to achieve the overall UK target would have been done already in Scotland. Overall this presents a substantial pressure for public spending and could be difficult to manage within the Scottish Budget.
- 3.44 The 2045 target is not considered a risk in the same way as it is achievable on the balanced pathway scenario for the UK's 2050 target. We have discussed the specific risks by sector associated with this target earlier in this chapter.

Chapter 4

Data on climate change plans and spending

Overview

- 4.1 In this chapter we discuss how public spending data can be improved in the Scottish Government's climate change plans, assessments, and statistics. This should enable a more comprehensive assessment of how climate change will affect Scottish fiscal sustainability.
- 4.2 The Climate Change Plan and Scottish National Adaptation Plan should include clearly defined outcomes for adaptation and mitigation and each policy's cost. Planned spend on mitigation and adaptation should be published as part of the Climate Change Assessment alongside the Budget and in budget outturn data. Having clearly defined mitigation and adaptation plans, outcomes and costs would improve transparency and accountability. It would help Scottish policymakers make more informed choices and support long-term planning and decisions on prioritisation. With current data availability, we cannot make full projections of how climate change will affect funding, spending and fiscal sustainability. We suggest data improvements to support our future fiscal sustainability analysis.
- 4.3 Improved clarity on the planned climate change response and how the UK and Scottish Governments expect it to fall between the public and private sectors would be helpful. Knowing what role governments expect to take helps understand risks to fiscal sustainability.

Scottish Government Climate Change Plan

- 4.4 The Scottish Government will publish its third Climate Change Plan in 2024 with the final version being published by March 2025. The plan must outline which policies will be implemented to reduce Scottish emissions to meet targets over the next 15 years, consistent with reaching net zero in 2045. In 2022 the CCC recommended that Scottish Government produce a quantified plan for how its policies will achieve the emissions reduction for the 2030 target.¹⁰¹
- 4.5 Our future fiscal sustainability analysis would benefit from the Climate Change Plan setting out the costs associated with each policy or programme, indicating spend to make up for missed targets, and how costs will be shared by the public and private sectors. The Scottish Government is required to plan spending out to 2040.¹⁰² Setting out spending plans over future decades is difficult but indicative plans and costs for reaching the 2045 target would be helpful alongside more detailed spending plans for the medium term.

¹⁰¹ Climate Change Committee (2022) Progress in reducing emissions in Scotland 2022 Report to Parliament ([link](#))

¹⁰² Scottish Government (2023) Transport, Net Zero and Just Transition: FM letter to Cabinet Secretary ([link](#))

- 4.6 The Scottish Greenhouse Gas Statistics provide annual emissions data. The publication assesses whether reductions in GHG emissions have met targets.¹⁰³ The Scottish Government publishes a response to the Greenhouse Gas Statistics setting out policies to make up for missed net zero targets. This report should ideally also include the costings of these policies, so that we can understand the cost to the Scottish Budget of making up for missed targets and incorporate this into future analysis on fiscal sustainability and climate change.

Box 4.1: Data recommendation 1

The Climate Change Plan should set out planned policies to meet mitigation targets, the cost of each policy, and its effect on emissions. This should be done in a way which allows the spending on those policies and programmes to be identified in the Scottish Budget and ideally tracked consistently over time. This should identify the cost for Scottish Government and the private sector where appropriate.

Scottish National Adaptation Plan

- 4.7 The Scottish Government is consulting on its next Scottish National Adaptation Plan (2024-2029).¹⁰⁴ It presents five outcomes for adaptation and includes policy proposals under each of these as well as cross-cutting ones.
- 4.8 In their assessment of previous adaptation plans, the CCC found that it cannot assess progress in 12 out of 33 outcomes because of insufficient data, though it noted improvements in the development of a monitoring and evaluation framework in the draft Scottish National Adaptation Plan (2024-2029).¹⁰⁵ The CCC recommends it include quantified targets for resilience, link adaptation policies and outcomes, and include a monitoring and evaluation framework. We support these recommendations. We discuss in **Chapter 2** the difficulties in quantifying adaptation outcomes and costs. Where possible, the Scottish Government should indicate the overall investment required for each outcome area and the gap between its commitment and what is needed for a well-adapted Scotland.

Box 4.2: Data recommendation 2

The Scottish National Adaptation Plan should set out policies to meet adaptation outcomes and the cost of implementing each policy. This should identify the cost for Scottish Government and the private sector where appropriate. It should be done in a way which allows the spend on those policies and programmes to be identified in the Scottish Budget and ideally consistently tracked over time.

¹⁰³ Scottish Government (2023) Scottish Greenhouse Gas Statistics 2021 ([link](#))

¹⁰⁴ Scottish Government (2024) Draft Scottish National Adaptation Plan (2024-2029) ([link](#))

¹⁰⁵ Climate Change Committee (2023) Adapting to Climate Change Progress in Scotland ([link](#))

Scottish Budget Climate Change Assessment

- 4.9 Since 2022-23, the Scottish Budget has had an annex initially called Carbon Assessment, and more recently Climate Change Assessment, which looks at whether capital spending within portfolios (Level 4) supports climate change objectives. In the 2024-25 Budget the analysis was extended to include resource spending.¹⁰⁶
- 4.10 The Climate Change Assessment classifies each line of level four Scottish Government spending as:¹⁰⁷
- Positive, neutral or negative, whether spending is assigned to a category that contributes to or against climate objectives.
 - High or low, the extent to which spending impacts Scottish Government climate objectives.
- 4.11 This is a broad brush means of classifying spending and the majority of spend is described as neutral. For example, all spending on public health is classified as neutral, while all spending on railways is positive and all spending on roads is negative.
- 4.12 The categorisation of contributing to climate objectives does not make clear whether spending affects mitigation or adaptation objectives, or both. When the analysis was extended to all include resource spending in 2024-25, the same classification was given to all spending on resource and capital in each Level 4 line of Budget spending plans. The taxonomy does not quantify the extent the public spending is contributing to reaching net zero by 2045 or to meeting outcomes for adaptation.
- 4.13 Classifying spend as supporting mitigation or adaptation is complex. We encourage the Scottish Government to continue with the improvements it has made in this area. As part of the Joint Budget Review process, in 2022 the Fraser of Allander Institute reviewed how Scottish Government assesses emissions associated with its spending decisions and made recommendations for improvement. There is capacity for greater transparency and understanding of the climate impact of public spending and tracking spend on climate goals is a new challenge for governments. The Green Finance Institute has advised the UK Government to deliver a green taxonomy for identifying whether investment in different areas supports climate change objectives.

Box 4.3: Data recommendation 3

As part of its Climate Change Assessment of the Scottish Budget, the Scottish Government should continue to improve their analysis, showing whether spend supports mitigation, adaptation, or both.

The Climate Change Assessment looks at the budget as introduced. The analysis should be updated with outturn spending amounts.

¹⁰⁶ Scottish Government (2023) Annex J Climate Change Assessment of the Budget ([link](#))

¹⁰⁷ The report does not include grants to local government in this assessment, as Scottish Government does not control the emissions associated with local government spending.

It should be possible to identify from the Climate Change Assessment whether the costed policy commitments in the Climate Change Plan and Scottish National Adaptation Plan are being delivered, both during the budgetary period and once actual spending is known after the year has ended.

Other organisations

4.14 We have benefited from data and analysis from the OBR and the CCC for this report. We note the OBR's dependence on the quality of climate change related spending data published by the UK Government. We note the importance of both the CCC's and OBR's data and analysis for our fiscal sustainability analysis.

Climate Change Committee

4.15 In their Sixth Carbon Budget the CCC set out pathways for the UK as a whole from which we extracted emissions and costs trajectories for Scotland.¹⁰⁸ For the Seventh Carbon Budget, their methodology commits to producing specific pathways for Scotland.¹⁰⁹ The CCC will consider options for Scotland to go further in emissions reductions in areas within devolved responsibility and the implications should there be delays in action, including from the UK Government.

4.16 The CCC has indicated that the fourth Climate Change Risk Assessment (CCRA4) will aim to carry out further cost-benefit analysis for adaptation actions. The CCC's adaptation progress monitoring is continuing to develop indicators for monitoring adaptation.¹¹⁰

4.17 We welcome the CCC's efforts to include pathways for the devolved administrations as part of the Seventh Carbon Budget and to estimate costs of climate change adaptation.

OBR

4.18 The OBR published a discussion paper on next steps for climate change analysis in 2023. It is considering further analysis to estimate climate change related damage and adaptation costs.¹¹¹ It highlighted the work would help policymakers understand choices and trade-offs involved in pursuing different climate change strategies. We welcome the OBR's work in this area.

UK Government

4.19 The UK Government has identified spending allocations on mitigation in the 2021 Spending Review which covers up to 2024-25. However it has not published fully costed plans for reaching net zero by 2050 or indicated likely long-term future investment in adaptation. We welcome future indications from the UK Government of their climate change plans and intended public investment.

¹⁰⁸ Climate Change Committee (2020) Sixth Carbon Budget ([link](#))

¹⁰⁹ Climate Change Committee (2023) Proposed methodology for the Seventh Carbon Budget advice ([link](#))

¹¹⁰ Climate Change Committee (2023) 2023 – gearing up for the next cycle ([link](#))

¹¹¹ OBR (2023) Discussion paper No.4: Next steps for climate change analysis ([link](#))

Annex A

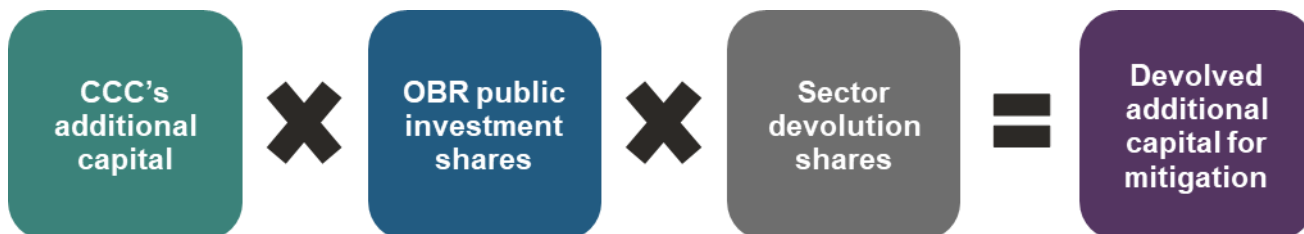
Methodology

Overview

- A.1 In this annex we describe the methodology used to produce the estimated costs of mitigation activities in **Chapter 3**.
- A.2 To calculate the additional capital cost that may affect the Scottish Budget, we start with the Climate Change Committee's (CCC) estimate from the Sixth Carbon Budget under the balanced pathway scenario of the whole economy additional cost to meet net zero broken down by sector.¹¹² We then apply the public shares estimates for these climate change sectors used by the OBR in its 2021 Fiscal risks report for the UK to calculate shares of total public sector spending in Scotland.¹¹³ We apply our own assumptions on which of the CCC's sectors are devolved to reach an estimated overall cost to the devolved public finances. Additional capital is explained later in the **Data Used** section.

Figure A.1: Calculation of mitigation costs

We calculate devolved additional capital spend to meet net zero using CCC total economy spending, and assumptions on the share of spending by the devolved public sector



Description of Figure A.1: Infographic showing how the devolved additional capital investment for mitigation is calculated. The whole-economy mitigation costs from the Climate Change Committee data are multiplied by the OBR assumed public investment shares and then multiplied again by the assumed our devolution shares.

Source: Scottish Fiscal Commission

- A.3 We repeat this process with the rest of the UK, estimating spending in England, Wales and Northern Ireland. We compare against the rest of the UK rather than England as the CCC's Sixth Carbon Budget produces UK, Scotland, Northern Ireland and Wales splits of the data. For the most robust results, we decided it was best to only remove Scotland and compare it against the remaining spending.
- A.4 We compare expected spending in Scotland and the rest of the UK on a per person basis by dividing the total spending by the relevant population size. The cost per person will vary due to the change in population sizes. We have used the population estimates from our 2023 fiscal sustainability paper so that we capture population change in our comparison.¹¹⁴

¹¹² Climate Change Committee (2020) Sixth Carbon Budget ([link](#))

¹¹³ OBR (2021) Fiscal risks report – July 2021 ([link](#))

¹¹⁴ Scottish Fiscal Commission (2023) Fiscal Sustainability Report ([link](#))

Data used

Climate Change Committee's Sixth Carbon Budget

Pathways to net zero

A.5 We used the balanced, headwinds and tailwinds emissions pathway scenarios to compare against the Scottish Government's 2030 target. We look at these pathways to highlight the difference in possible routes to net zero. The balanced pathway is the CCC's central scenario, allowing the UK to achieve net zero by 2050. The headwinds pathway scenario represents additional costs to meeting the targets, while the tailwinds pathway assumes faster investment in carbon removals. To fully understand the detail behind the pathways we refer readers to the CCC's Sixth Carbon Budget.¹¹⁵

Removals assumption

A.6 These different pathway scenarios have varying levels of removals activity. The Sixth Carbon Budget does not attribute any of the removals sector to the devolved countries. We have added a Scottish population share of the UK-wide removals to these pathways to represent that some of the emissions will be offset by removals in Scotland by 2050.

Additional capital investment

A.7 When looking at costs we have used additional capital investment based on the CCC balanced pathway scenario. The capital investment is the in-year cost of purchasing the capital needed to reach net zero above the baseline spending in 2020. This does not include the operational costs or savings that may be a result of the investment as the OBR did in their 2021 Fiscal risks report.¹¹⁶ We used a more simplistic approach to avoid making additional assumptions about future savings and to focus the analysis on the potential pressures for the Scottish Government finances. Comparing the OBR's total economy cost for the UK (£1,408 billion) to our estimate of the total UK economy additional capital measure (£1,390 billion) shows similar totals. We would not expect our conclusions on fiscal sustainability for Scottish Government to differ substantially by considering operational costs or future savings. We have estimated costs in 2024 prices using our December 2023 GDP deflators.¹¹⁷

A.8 We note that the data in the Annex J Climate Change Assessment to the Scottish Budget is not comparable with the additional capital investment used in our analysis in **Chapter 3**.¹¹⁸ The spend described as positive-high in the Climate Change Assessment covers both resource and capital spending, and include general spending on mitigation and adaptation, whereas our analysis are based only on CCC's additional capital spending for mitigation. The additional capital measure captures spend needed for net zero above policies included in their baseline emission pathway.

A.9 We have adjusted the cost of Land Use, Land Use Change and Forestry (LULUCF) from the CCC's Sixth Carbon Budget. We have been advised by the CCC to update the share of LULUCF costs assigned to Scotland to 30 per cent. It is described as 70 per cent in the CCC dataset but investigation into the calculations has identified an error in the formula to derive the aggregate

¹¹⁵ Climate Change Committee (2020) Sixth Carbon Budget ([link](#))

¹¹⁶ OBR (2021) Fiscal risks report – July 2021 ([link](#))

¹¹⁷ Scottish Fiscal Commission (2023) Scotland's Economic and Fiscal Forecasts – December 2023 ([link](#))

¹¹⁸ Scottish Government (2023) Annex J Climate Change Assessment of the Budget ([link](#))

additional investment costs. All underpinning assumptions regarding land use measures remain correct. We have not adjusted any other cost measures.

A.10 Due to this error we are only able to present findings on how additional capital investments will affect Scottish fiscal sustainability for the balanced pathway scenario because we do not have the equivalent re-estimation for the tailwind or headwind pathway scenarios.

OBR Public investment shares

A.11 We have used the public shares of investment by sector as presented in the OBR’s 2021 Fiscal risks report.¹¹⁹ These were created soon after the launch of the Sixth Carbon Budget and are applied to the same sectors we are examining. Note that the sectors were grouped differently in the OBR’s report.

A.12 The public investment shares can be found in Figure A.2. We apply the same public share of investment to both Scotland and the rest of the UK. As we use the same shares for both, any change in assumption changes the scale of investment but not the difference between Scotland and the rest of the UK.

Figure A.2 : Public investment share assumptions

| Per cent | 2020s | 2030s | 2040s |
|--|-------|-------|-------|
| Surface Transport | 17 | 20 | 18 |
| Fuel supply | 8 | 5 | 5 |
| Manufacturing and Construction | 55 | 43 | 31 |
| Residential Buildings | 44 | 44 | 44 |
| Non-residential Buildings | 43 | 42 | 43 |
| Electricity supply | 8 | 5 | 5 |
| Agriculture | 47 | 17 | 0 |
| Aviation | 47 | 17 | 0 |
| Shipping | 47 | 17 | 0 |
| Waste | 100 | 100 | 100 |
| Fluorinated Gases | 47 | 17 | 0 |
| Land Use, Land Use Change and Forestry | 100 | 100 | 100 |
| Removals | 93 | 76 | 59 |

Source: Scottish Fiscal Commission, OBR (2021) Fiscal risks report – July 2021 ([link](#)).

These are based on detailed workings shared with us by the OBR which were used to derive the public investment shares for their Central scenario and may not match their published figures.

Devolution shares

A.13 When assessing whether a sector is devolved or reserved for this analysis we made a binary choice as shown in figure A.3. Where the CCC have defined their sectors as mostly or partially devolved we have assumed 100 per cent of the public additional capital costs fall on the Scottish Government, and where they have considered a sector mostly reserved we have assumed 0 per cent of costs fall

¹¹⁹ OBR (2021) Fiscal risks report – July 2021 ([link](#))

on the Scottish Government.¹²⁰ This removes all sectors considered mostly reserved from the calculation of devolved public sector costs. We show which sectors are devolved and which are reserved in Figure A.3.

Figure A.3: Devolution assumptions

| Mostly or partially devolved | Mostly reserved |
|--|--|
| Agriculture, Buildings, Land Use, Land Use Change and Forestry, Surface Transport, Waste | Aviation, Electricity supply, Fuel Supply, Manufacturing and Construction, Removals, Shipping, Fluorinated Gases |

Source: Scottish Fiscal Commission, Climate Change Committee.

- A.14 Though we are aware that mostly or partially devolved sectors are not wholly reserved or devolved, we considered it reasonable that a significant share of the public investment in these sectors would be from the devolved government even if reserved regulatory power was used. We consider this valid because in areas deemed as devolved the Scottish Government can use public spending and in areas deemed as mostly reserved, the few aspects that are devolved do not typically involve substantial public spending. This illustrates where pressure may arise for the Scottish budget.
- A.15 We have conducted sensitivity analysis on whether the pressures on the Scottish Budget would be considerably different had we not used this binary approach. We found this did not affect our conclusions of where funding pressure would arise as described in **Chapter 3**.

¹²⁰ Climate Change Committee (2022) Progress in reducing emissions in Scotland – 2022 Report to Parliament ([link](#))

Additional information

Abbreviations

| | |
|---------------------|--|
| CCC | Climate Change Committee |
| CCRA | Climate Change Risk Assessment |
| GDP | Gross Domestic Product |
| GHG | Greenhouse gases |
| LULUCF | Land Use, Land Use Change and Forestry |
| MtCO ₂ e | Millions of tonnes of carbon dioxide equivalent |
| OBR | Office for Budget Responsibility |
| OECD | Office for Economic Cooperation and Development ¹²¹ |
| RGU | Robert Gordon University |

A full glossary of terms is available on our website:

<https://www.fiscalcommission.scot/explainers/glossary/>

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The SFC is committed to fulfilling our role as an Independent Fiscal Institution, in line with the principles set out by the Organisation for Economic Cooperation and Development (OECD).¹²¹

The SFC also seeks to adhere to the highest possible standards for analysis. While we do not produce official statistics, we voluntarily comply as far as possible with the UK Statistics Authority's Code of Practice for Statistics. Further details and our statement of voluntary compliance can be found on our website.¹²²

Correspondence and enquiries

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All charts and tables in this publication have also been made available in spreadsheet form on our website. For technical enquiries about the analysis and data presented in this paper please contact the responsible analyst:

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¹²¹ OECD (2014) Recommendation on Principles for Independent Fiscal Institutions ([link](#))

¹²² Scottish Fiscal Commission (2022) Compliance with the Code of Practice for Official Statistics ([link](#))

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