

# Climate Change (Emissions Reduction Targets) (Scotland) Bill

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## Financial Memorandum

### Introduction

1. As required under Rule 9.3.2 of the Parliament’s Standing Orders, this Financial Memorandum is published to accompany the Climate Change (Emissions Reduction Targets) (Scotland) Bill (“the Bill”), introduced in the Scottish Parliament on 23 May 2018.

2. The following accompanying documents are published separately:

- Explanatory Notes (SP Bill 30–EN);
- Policy Memorandum (SP Bill 30–PM);
- statements on legislative competence by the Presiding Officer and the Scottish Government (SP Bill 30–LC).

3. This Financial Memorandum has been prepared by the Scottish Government to set out the costs associated with the measures introduced by the Bill. It does not form part of the Bill and has not been endorsed by the Parliament.

### Background

4. The primary objective of the Climate Change (Emissions Reduction Targets) (Scotland) Bill (the Bill) is to raise the ambition of the greenhouse gas (GHG) emissions reductions targets that are set out in the Climate Change (Scotland) Act 2009 (“the 2009 Act”) and associated regulations. The 2009 Act established Scotland as a world leader in tackling climate change. In response to the United Nations Framework Convention on Climate Change Paris Agreement, the Bill reaffirms the Scottish

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Government's commitment to remain at the forefront of global ambition. This is achieved by increasing the ambition of the emission targets in line with an appropriate contribution to limiting global temperature rises to 1.5 degrees Celsius above pre-industrial levels, and incorporating provisions that will require the Scottish Ministers to regularly review whether the time is right to specify a net-zero target year.

5. The secondary objective of the Bill is to improve transparency by:
- Measuring progress to targets without adjusting for the operation of emissions trading schemes;
  - Specifying all targets as percentage reductions from the baseline;
  - Aligning the levels of annual, interim and 2050 targets and ensuring they remain aligned (under the 2009 Act, there is both an interim and annual target for 2020, and they have diverged);
  - Changing the default position on the use of international offset credits so that they cannot be used without laying secondary legislation, as opposed to the current situation where future use is reviewed every five years;
  - Reducing the extent to which changes in emissions measurement science can influence whether a target is met or missed.

## Bill proposals

6. Scottish Ministers are committed to achieving net-zero emissions as soon as possible, and to putting a target year into legislation as soon as there is sufficient evidence that doing so would be credible. To reflect this, the Bill provides Ministers with a regulation-making power to specify a net-zero emissions target year and contains requirements for the Scottish Ministers to request regular independent advice from the Committee on Climate Change, taking account of the target-setting criteria in the Bill, on whether the net-zero emissions target year is achievable, and if so, what the earliest achievable year is. Although the Bill does not specify the year for this target (as the year will instead be specified later by regulations), it does require the Scottish Ministers to seek advice at least every five years from the relevant body on the earliest achievable year.

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7. The Bill also sets the following interim and 2050 emissions reduction targets<sup>1</sup>:

- A reduction of at least 56% by 2020;
- A reduction of at least 66% by 2030;
- A reduction of at least 78% by 2040;
- A reduction of at least 90% by 2050.

8. The Bill amends duties on the Scottish Ministers so that they must seek advice every five years from the “relevant body”, currently the Committee on Climate Change (CCC), that provides independent advice on target levels and related matters to Scottish Ministers, on the appropriateness of the interim, and 2050 targets.

9. Progress to targets after 2016 will, by default, be assessed in effect on the basis of actual net Scottish emissions, rather than those which have been adjusted to reflect the operation of the EU emissions trading scheme. The current adjustment under the 2009 Act creates confusion in assessing progress to targets.

10. All targets will be specified as percentage reductions from the baseline. Under the 2009 Act, interim targets are given as percentage reductions but annual targets are given in terms of megatonnes of carbon dioxide (CO<sub>2</sub>) equivalent, which creates confusion. In order to achieve and maintain consistency between annual targets and the interim and 2050 targets, the Bill provides for a mechanism to calculate the levels of annual targets by reference to the levels of the interim targets, the 2050 target and, once the year is specified, the net-zero emissions target.

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<sup>1</sup> The basket of greenhouse gas emissions covered consists of carbon dioxide, methane, nitrous oxide, and the four F-gases (hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride). These gases are weighted by Global Warming Potential, so that total greenhouse gas emissions can be reported on a consistent basis. The Global Warming Potentials are based on international reporting standards, as set by the Intergovernmental Panel on Climate Change. The Baseline Period for reporting against Climate Change Targets is 1990 for carbon dioxide carbon dioxide, methane, nitrous oxide; and 1995 for the four F-gases.

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11. The Bill establishes a default position that targets must be met through domestic effort alone. Under the 2009 Act, limits on the extent to which international offsetting credits can be used to measure progress to targets must be set through secondary legislation every five years. The Bill establishes that after 2016 no international offsetting credits can be used to measure progress to targets, unless secondary legislation is passed by the Scottish Parliament.

12. All targets are to be reported with reference to the scientific measurement methods that were in place when advice on the level of the target was last received from the relevant body. This will reduce the risk of targets being met or missed as a consequence of changes in measurement science, as opposed to policy action or inaction.

13. The Bill rationalises the annual reports required under existing sections 33 and 34 of the 2009 Act (which are to be substituted with new provisions by the Bill) so that the reporting requirement applies more generally to the emissions reductions target for each target year and the reports contain information of direct relevance to the achievement of those targets. It requires that a report is laid in Parliament as soon as reasonably practicable, once the information required for the report is available.

14. The Bill refers to climate change plans (“Climate Change Plans”), rather than “reports on proposals and policies” as is currently the case. Annual reporting against targets will be supplemented by annual reporting on progress against the proposals and policies set out in the most recently published Climate Change Plan. The Bill requires these reports to be laid annually by 31 October, or as soon as reasonably practicable thereafter.

15. The Bill requires that the first Climate Change Plan under the Bill must be introduced within five years of new section 35 of the 2009 Act coming into force, with subsequent Plans at least every five years thereafter. It requires that each such Plan should cover a period of 15 years, although the Scottish Ministers may vary the length of this period either way by a period of five years so that it ends in the same year as an interim target, the 2050 target or the net-zero emissions target year. The Bill also extends the current time the Parliament has to scrutinise a draft of each Plan from 60 days to 90 days, including 60 days on which the Parliament is not dissolved or in recess.

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16. Further detail on the changes made by the Bill and on the policy objectives expected to be achieved can be found in the Explanatory Notes and the Policy Memorandum referred to above.

## Costs overview

17. The Bill raises the ambition of the 2050 target from an 80% reduction in greenhouse gas emissions from the baseline to a 90% reduction. The current situation whereby plans for delivery of the targets must be set out in Climate Change Plans will remain the case, and as such the Bill does not specify how the targets must be achieved. Future Governments will decide what actions to take to deliver the targets, the costs of which will be affected by future scientific understanding and the availability of technology. It is therefore not possible to describe with accuracy what the cost of achieving higher targets will be.

18. The Financial Memorandum for the Climate Change (Scotland) Bill (which became the 2009 Act) in relation to the parts amended by this Bill, included high level global and UK estimates of the cost of mitigating climate change compared to the cost of global inaction; bottom-up estimates of the cost of action that would be required in five key areas; and administrative cost estimates related to Scottish Government staff time in fulfilling duties such as reporting.

19. A similar approach is taken here, and the following costs are set out: high level global estimates of the cost of mitigating climate change compared to the cost of global inaction; estimates of the whole system costs for Scotland; and estimated changes in administrative costs resulting from the changes to duties. The whole system costs are estimated using the TIMES model, which was not available in 2008 and is preferable to the bottom-up estimates for key areas.

## Review of global assessments of the cost of climate change action

20. The Scottish Government commissioned, through ClimateXChange, a synthesis of key global assessments of the costs of climate change action.<sup>2</sup>

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<sup>2</sup> <http://www.climateexchange.org.uk/reducing-emissions/international-assessments-economic-impacts-climate-change/>

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This review looked at both the costs of the damages that will occur if climate change is not mitigated, and the costs of action to mitigate climate change.

21. Both sets of cost estimates are inherently uncertain. The damages from climate change not being mitigated need to be understood as ranges of probabilities, which make estimating the costs particularly difficult. The costs of mitigating climate change need to be understood in relation to the costs of the damages, noting that there is a balance between the two: the more that is invested in effective mitigation, the less likely it is that expensive damages will occur. The total cost of climate change to an economy is the sum of mitigation costs, adaptation costs, and the costs of damages.

22. To some extent, these costs can be traded off against each other; increasing the levels of mitigation and adaptation will reduce damages, and *vice versa*. However, this is only true to a certain extent: beyond certain levels of warming, damages may escalate to levels where mitigation and adaptation expenditure may provide little protection.

23. The damages that are likely to occur from not mitigating climate change effectively result from the biophysical impacts of climate change, such as changes to atmospheric temperatures, ocean temperatures, sea levels, ocean acidity, water cycles, carbon cycles, and other earth systems. The rate at which these systems will change is uncertain, with the possibility that tipping points might be exceeded above which some processes start to further accelerate warming rates.

24. These physical impacts in turn cause human and economic impacts through multiple channels such as crop yields, storm damages, flood and drought impacts, health impacts and reduced productivity. Estimating these economic impacts is inherently uncertain, and some indirect impacts are harder to measure because their effects are diffused across the economy, or relate to non-financial impacts.

25. Emerging research indicates that there may in fact be ways in which climate change can reduce economic growth rates, as opposed to creating instantaneous damages in a particular year. Taken together, this means that not all analyses considered in the review include the same set of impacts, leading to considerable variation in estimates of climate damages, even when the same degree of warming is assumed.

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26. Assessing the literature is further complicated by the range of methodologies used, assumptions made, time periods considered and units by which costs are expressed in. For ease of comparison, the figures quoted here are those given in terms of impact on GDP, assuming that GDP growth rates remain constant.

27. The review finds that, amongst studies looking at the impact of global warming of between 2.5 to 3 degrees higher than pre-industrial levels, and presenting the results in terms of GDP, the mean (average) estimate of costs is 2.2% of GDP. The median (middle value of the range) is 1.5%, and the 10<sup>th</sup> and 90<sup>th</sup> percentiles are 0.0% and 3.5% respectively. There are no estimates specifically for Scotland.

28. In contrast, the review finds that in studies exploring the costs of climate change mitigation in terms of GDP, the cost of keeping global warming to less than 2 degrees, with a probability of 50%, is between 1.5 and 5% of GDP. Median abatement costs for pursuing global efforts to limit warming to 1.5°C above pre-industrial levels were put at 3.4% of GDP by 2050, with an upper estimate of 6.2%.

29. Commenting on the respective ranges of the estimated costs of damages and mitigation, the review states that “there is a considerable risk of much higher-than-expected damages which would justify the cost of ambitious abatement action.” Finally, the review concludes: “Broadly speaking, in narrow cost/benefit terms, limiting warming to 1.5°C will incur higher costs and produce relatively lower marginal gains when compared to limiting to below 2°C. However, the state of knowledge is not strong enough (and may never be strong enough) to determine more precisely where the ‘optimal’ level of mitigation lies.”

## Times modelling

30. The Scottish TIMES model is a high-level strategic model, covering the Scottish energy system (which includes Residential and Non-Domestic Buildings, Electricity Generation and Transport), as well as “non-energy” sectors, including Agriculture, Land Use, Land Use Change and Forestry, and Waste. The Scottish TIMES model, at its simplest, is a diagnostic tool to help understand the key inter-relationships across systems.

31. The Scottish TIMES model has been used to support the development of the Scottish Energy Strategy and the Climate Change Plan 2018-2032.

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Scottish TIMES has therefore been used to assess the high level cost implications of moving from an 80% to 90% Greenhouse Gas reduction target in 2050 based on the current information available on sector projections and technology cost profiles.

32. Scottish TIMES analysis indicates that the cost of moving from an 80% to 90% Greenhouse Gas reduction target is estimated to result in an additional system cost of approximately £13 billion over the period 2030-2050 (costs are discounted and in 2017 prices<sup>3</sup>). Prior to 2030, the estimated system cost of an 80% and 90% ambition are broadly aligned.

33. The average additional cost of the new target level over the period 2030 to 2040 is estimated to be £300m per annum, increasing to an average additional cost of £1 billion per annum in the period 2041-2050. The average annual cost increases in the period after 2040 as the cost of abating the remaining greenhouse gases in the system becomes more challenging.

34. The results from TIMES relate to the cost of technologies, processes and fuels that could be deployed to meet the Scottish emissions targets, and should therefore be considered as overall resource costs. Costs cannot be attributed to the Scottish Government, Local Authorities or other bodies, individuals and businesses as this will depend on the delivery mechanisms that are chosen to deliver the targets, which will be set out in future Climate Change Plans.

35. The pace at which the energy system changes (and has changed over the past decade and a half) as a result of changing market, policy, technological and regulatory drivers means forecasting the precise breakdown of the 2050 energy system is not possible.

## Costs on the Scottish administration

### Direct costs

36. The direct costs, and savings, for the Scottish Administration relate to the duties placed on the Scottish Ministers which are created or removed by

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<sup>3</sup> Discounting allows costs and benefits with different time spans to be compared on a common “present value” basis, and is a standard method for appraisal. 2017 prices do not include any future estimate of inflation.



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the Bill. The changes are relatively small and will be absorbed within existing budgets.

37. The Bill makes changes to the target framework under the 2009 Act, and the way in which the Scottish Ministers seek advice from the relevant body, publish any such advice and bring forward regulations to set or maintain targets. It also makes amendments relating to Parliamentary consideration of Climate Change Plans and puts in place a framework for timescales for when Climate Change Plans have to be produced. The cost implications of these changes are insignificant.

38. More significant changes in direct costs on the Scottish Government relate to reporting, though they are not considered material within the context of the Scottish Government's budget.

39. The Bill modifies the annual reporting requirements contained in sections 33 and 34 of the 2009 Act. Sections 16 and 17 of the Bill substitute those sections with new provisions which require the Scottish Ministers to lay a report on emissions reduction targets before the Scottish Parliament in respect of each target year and, by virtue of changes made by section 18 of the Bill, to make an associated statement to the Parliament. Section 19 of the Bill (in so far as it inserts section 35B into the 2009 Act) also requires the Scottish Ministers to lay reports in the Parliament on an annual basis which set out progress in respect of proposals and policies within each substantive chapter in the most recently published Climate Change Plan.

40. It is the intention of the Scottish Ministers to discharge the reporting requirements under new sections 33 and 34 of the 2009 (as amended by sections 16 and 17 of the Bill) by laying the annual Greenhouse Gas Emissions Statistics in the Parliament. This will result in an estimated saving of around £13,200 as there will no longer be a need to produce a separate report over and above the statistics bulletin, as currently occurs. The production of the progress reports required under new section 35B of the 2009 Act (inserted by section 19 of the Bill) is a new duty that will result in an estimated additional annual cost of £38,200.

41. The net effect of the changes in duties under the Bill is therefore estimated to be an annual cost of £25,000.

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## **Indirect costs**

42. As noted in the overview, the current situation whereby plans for delivery of the targets must be set out in Climate Change Plans will remain the case, and as such the Bill does not specify how the targets must be achieved. Future Governments will decide what actions to take to deliver the targets, the costs of which will be affected by future scientific understanding and the availability of technology. It is therefore not possible to describe with accuracy what the cost of achieving higher targets will be, much less where those costs will fall. Theoretically, depending on choices made by future governments about whether the action taken should be prompted by government spend, subsidy, or regulation (and if regulation, how that regulation is designed and the nature of the market in question), the potential indirect costs on the Scottish Administration could be all or none of the overall estimated system cost of £13 billion, covering the period 2030 to 2050.

43. For illustration, to achieve a 90% emissions reduction target by 2050 Scotland will need commercial-scale deployment of carbon capture and storage to begin in the 2030s. Studies indicate that the cost of industrial carbon capture and storage could be up to £330 per ton of CO<sub>2</sub> captured, depending on which industry and process it is being applied to. As the volume of emissions captured increases, more expensive processes need to be deployed, with removing the remaining emissions becoming more technically challenging. The capital cost of building a 1 GW (similar in scale to Peterhead) gas fired carbon capture and storage power station could be up to £2.7 billion.

44. These costs could, in principle, fall to the Scottish Government, if the Government makes a decision to subsidise this directly. Alternatively a decision could be taken to require Local Authorities to ensure that any energy intensive activity in their area has carbon capture and storage in place, in which case the costs could, theoretically, fall to Local Government. And finally businesses could be required, through Government regulation, to install sufficient carbon capture or storage technology to remove emissions from their activities. In this case costs could, theoretically, be absorbed by the businesses, passed to consumers, or a combination of the two. In addition, EU or global carbon pricing could also impact who future costs may fall on, with the cost of the EU Emissions Trading Scheme currently falling on the business sector.

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45. The table below provides costs on the Scottish Government under five different scenarios, ranging from a scenario where the choices made by future Government's result in none of the costs falling on the Scottish Government, to a scenario where all the costs fall on the Scottish Government.

	Scenario 1 (0% of costs)	Scenario 2 (25% of costs)	Scenario 3 (50% of costs)	Scenario 4 (75% of costs)	Scenario 5 (100% of costs)
<b>Costs on Scottish Government 2031-2050 (£billion)</b>	<b>0</b>	<b>3</b>	<b>7</b>	<b>10</b>	<b>13</b>
Costs on Scottish Government 2031-2040 (£billion)	0	1	2	3	3
Costs on Scottish Government 2041-2050 (£billion)	0	2	5	7	10

## Costs on local authorities

46. As above, it is not possible to describe with accuracy what the cost of achieving higher targets will be, much less where those costs will fall. Theoretically, depending on choices made by future Governments, the potential cost on Local Authorities could be some proportion of the overall estimated system cost of £13 billion, covering the period 2030 to 2050. The table below provides costs on Local Authorities under five different scenarios, ranging from a scenario where the choices made by future Government's result in none of the costs falling on Local Authorities, to a scenario where all the costs fall on Local Authorities.

	Scenario 1 (0% of costs)	Scenario 2 (25% of costs)	Scenario 3 (50% of costs)	Scenario 4 (75% of costs)	Scenario 5 (100% of costs)

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<b>Costs on Local Government 2031-2050 (£billion)</b>	<b>0</b>	<b>3</b>	<b>7</b>	<b>10</b>	<b>13</b>
Costs on Local Government 2031-2040 (£billion)	0	1	2	3	3
Costs on Local Government 2041-2050 (£billion)	0	2	5	7	10

## Costs on other bodies, individuals and businesses

47. As above, it is not possible to describe with accuracy what the cost of achieving higher targets will be, much less where those costs will fall. Theoretically, depending on choices made by future Governments, the potential cost on other bodies, individuals and businesses could be some proportion of the overall estimated system cost of £13 billion, covering the period 2030 to 2050. The table below provides costs on other bodies, individuals and businesses under five different scenarios, ranging from a scenario where the choices made by future Government's result in none of the costs falling on other bodies, individuals and businesses, to a scenario where all the costs fall on other bodies, individuals and businesses.

	Scenario 1 (0% of costs)	Scenario 2 (25% of costs)	Scenario 3 (50% of costs)	Scenario 4 (75% of costs)	Scenario 5 (100% of costs)
<b>Costs on other bodies, individuals and businesses 2031-2050 (£billion)</b>	<b>0</b>	<b>3</b>	<b>7</b>	<b>10</b>	<b>13</b>
Costs on other bodies, individuals and businesses 2031-2040 (£billion)	0	1	2	3	3
Costs on other bodies, individuals	0	2	5	7	10

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and businesses 2041-2050 (£billion)					
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## Direct costs

48. Other direct costs that may fall outwith the Scottish Administration are to the CCC. The Committee is funded by the UK Government and devolved administrations and the Scottish Government currently contributes around £220,000 towards the cost of the CCC's core work, which is not expected to change significantly as a consequence of this Bill. The CCC also receives specific funds for additional advice and research not covered by core funding which is agreed as required.

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