

Title: Credit limit of the third carbon budget IA No: DECC0230 Lead department or agency: Department of Energy and Climate Change Other departments or agencies: N/A	Impact Assessment (IA)			
	Date: 29th June 2016			
	Stage: Final			
	Source of intervention: Domestic			
	Type of measure: Secondary legislation			
Contact for enquiries: Joe Cranston-Turner joe.cranstonturner@decc.gsi.gov.uk				
Summary: Intervention and Options				RPC Opinion: Not applicable

Cost of Preferred (or more likely) Option				
Total Net Present Value	Business Net Present Value	Net cost to business per year (EANDCB in 2014 prices)	One-In, Three-Out	Business Impact Target Status
£0m	£0m	£0m	Not in scope	Non-regulatory provision

What is the problem under consideration? Why is government intervention necessary?

There is overwhelming scientific consensus that significant climate change, driven predominantly by man-made greenhouse gas (GHG) emissions, is happening. This is leading to rising temperatures and sea levels, causing extreme weather, damaging ecosystems and reducing the productivity of crops. Coordinated global action is needed to substantially reduce GHG emissions, which would not happen at sufficient scale without Government intervention, as climate change costs are not fully factored into private decisions. Without action there are risks to the UK's long-term economic security and prosperity. The Climate Change Act 2008 ("the Act") and the accompanying Impact Assessment provide the rationale for Government action to reduce UK emissions by at least 80% by 2050, relative to 1990 base emissions levels. The UK has also committed to the 2015 Paris Agreement which binds every country to the collective ambition to limit the global average temperature increase to well below two degrees.

What are the policy objectives and the intended effects?

The Act established a legal framework to cut GHG emissions in the UK. It requires the Government to set a series of five-year cumulative limits on net emissions, known as "carbon budgets". The third carbon budget covers the period 2018-2022. The Act also places a statutory duty on the Government to set a limit on the quantity of international carbon units ("credits") that can be used to meet a carbon budget. Credits can provide flexibility and manage uncertainty in historic and future emissions. Credits can also support cost-effective action to reduce GHG emissions in other countries. The policy decision set out here concerns the limit on credits for use in the third carbon budget period, and does not commit the UK to purchasing credits. The UK is current projected to be on track to meeting the third carbon budget.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

There is no alternative to the Act requirement of setting the credit limit for the third carbon budget. The third carbon budget is set at 2,544 million tonnes of carbon dioxide equivalent (MtCO_{2e}). Three options for the credit limit were considered:

- Option 1: 0 MtCO_{2e} (no flexibility, equivalent to 0% of the third carbon budget);
- Option 2: 55 MtCO_{2e} (limited flexibility, equivalent to around 2.2% of the third carbon budget, and equal to the credit limit adopted for the second carbon budget period, 2013-2017) – preferred option;
- Option 3: 90 MtCO_{2e} (greater flexibility, equivalent to around 3.5% of the third carbon budget).

Will the policy be reviewed? Evidence & assumptions will be refreshed when setting the sixth carbon budget.				
Does implementation go beyond minimum EU requirements?			N/A	
Are any of these organisations in scope?			Micro No	Small No
			Medium No	Large No
What is the CO ₂ equivalent change in greenhouse gas emissions? (Million tonnes CO ₂ equivalent)			Traded: 0	Non-traded: 0

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible Secretary of State: _____ **Amber Rudd** _____ Date: _____ **29.06.2016** _____

Summary: Analysis & Evidence

Policy Option 1

Description: Credit limit of 0 MtCO_{2e}

FULL ECONOMIC ASSESSMENT

Price Base Year 2015	PV Base Year 2016	Time Period Years 5	Net Benefit (Present Value (PV)) (£m)		
			Low: £0	High: £0	Best Estimate: £0

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	£0	£0	£0
High	£0	£0	£0
Best Estimate	£0	£0	£0

Description and scale of key monetised costs by 'main affected groups'

The setting of the credit limit will not itself lead to any direct costs to Government, business or consumers. This option does not allow the purchase of credits to help meet the third carbon budget, so no costs of purchasing credits would arise.

Other key non-monetised costs by 'main affected groups'

A credit limit of 0 MtCO_{2e} would provide no scope to manage the uncertainty in emissions projections and inventory updates through the purchase of credits, or any flexibility via the carbon budgets system to support action in other countries through global carbon markets. Unexpected changes to emissions trends or data could expose the UK to substantially greater costs.

BENEFITS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	£0	£0	£0
High	£0	£0	£0
Best Estimate	£0	£0	£0

Description and scale of key monetised benefits by 'main affected groups'

The setting of the credit limit will not itself lead to any benefits to Government, business or consumers. This option does not allow the purchase of credits to help meet the third carbon budget, so no benefits of purchasing credits would arise.

Other key non-monetised benefits by 'main affected groups'

A credit limit of 0 MtCO_{2e} would provide investors with a clearer signal that the Government will deliver emissions reductions through domestic measures. This could reduce perceived short-term policy risk to investments in low-carbon infrastructure and supply chains in the UK.

Key assumptions/sensitivities/risks	Discount rate (%)	3.5
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Central, high and low estimates of future emissions indicate that credits are unlikely to be needed to meet the third carbon budget. However, it's possible that a substantial change to the methodology underpinning the emissions inventory over the period 2018 to 2022, combined with unexpectedly high emissions relative to current central projections, could still lead to emissions being higher than the level of the third carbon budget. The cost and benefits of this option in this hypothetical scenario are presented in Box 1 in the evidence base.

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs: £0	Benefits: £0	Net: £0	

Summary: Analysis & Evidence

Policy Option 2

Description: Credit limit of 55 MtCO_{2e}

FULL ECONOMIC ASSESSMENT

Price Base Year 2015	PV Base Year 2016	Time Period Years 5	Net Benefit (Present Value (PV)) (£m)		
			Low: £0	High: £0	Best Estimate: £0

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	£0	£0	£0
High	£0	£0	£0
Best Estimate	£0	£0	£0

Description and scale of key monetised costs by 'main affected groups'

The setting of the credit limit will not lead to any direct costs to Government, business or consumers. If a subsequent decision to purchase credits was made, it would result in a financial cost to the UK (see box 2 for illustrative scenario).

Other key non-monetised costs by 'main affected groups'

The scope for the Government to use credits to meet the carbon budget could lead investors to expect that policy would target a slower rate of domestic emissions reduction in the near-term. This could affect investment decisions in low-carbon infrastructure and supply chains, although this impact is likely to be minimal. A limit of 55 MtCO_{2e} would have a lower risk around investment decisions compared to 90 MtCO_{2e} as it is equal to the second carbon budget credit limit and places a greater constraint than option 3 on the Government's ability to meet the carbon budget through credits.

BENEFITS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	£0	£0	£0
High	£0	£0	£0
Best Estimate	£0	£0	£0

Description and scale of key monetised benefits by 'main affected groups'

The setting of the credit limit will not itself lead to any benefits to Government, business or consumers as it does not commit the Government to purchasing any such credits. Were credits to be purchased, there could be an avoided cost of undertaking domestic emissions reductions.

Other key non-monetised benefits by 'main affected groups'

Setting a positive limit on the use of credits would provide the UK greater flexibility to meet the third carbon budget. Credits could manage the uncertainty in emissions projections and account for uncertain historic and future emissions. This could also increase long-term investor confidence by making the overall climate policy framework more resilient to unexpected changes in future emissions. A positive limit on the use of credits could signal the Government's continued support of global carbon markets. If credits were purchased, this would have a benefit of driving increased financial flows to low-carbon development projects that deliver cost-effective mitigation overseas.

Key assumptions/sensitivities/risks Discount rate (%) 3.5

Central, high and low estimates of future emissions indicate that credits are unlikely to be needed to meet the third carbon budget. However, it's possible that a substantial change to the methodology underpinning the emissions inventory over the period 2018 to 2022, combined with unexpectedly high emissions relative to current central projections, could still lead to emissions being higher than the level of the third carbon budget. The cost and benefits of this option in this hypothetical scenario are presented in box 1.

BUSINESS ASSESSMENT (Option 2)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs: £0	Benefits: £0	Net: £0	

Summary: Analysis & Evidence

Policy Option 3

Description: Credit limit of 90 MtCO_{2e}

FULL ECONOMIC ASSESSMENT

Price Base Year 2015	PV Base Year 2016	Time Period Years	Net Benefit (Present Value (PV)) (£m)		
			Low: £0	High: £0	Best Estimate: £0

COSTS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	£0	£0	£0
High	£0	£0	£0
Best Estimate	£0	£0	£0

Description and scale of key monetised costs by 'main affected groups'

The setting of the credit limit will not lead to any direct costs to Government, business or consumers. If a subsequent decision to purchase credits was made, it would result in a financial cost to the UK (see Box 2 for illustrative scenario).

Other key non-monetised costs by 'main affected groups'

The scope for the Government to use credits to meet the carbon budget could lead investors to expect that policy would target a slower rate of domestic emissions reduction in the near-term. This could affect investment decisions in low carbon infrastructure and supply chains, although this impact is likely to be minimal.

BENEFITS (£m)	Total Transition (Constant Price) Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	£0	£0	£0
High	£0	£0	£0
Best Estimate	£0	£0	£0

Description and scale of key monetised benefits by 'main affected groups'

The setting of the credit limit will not itself lead to any benefits to Government, business or consumers as it does not commit the Government to purchasing any such credits. Were credits to be purchased, there could be an avoided cost of undertaking domestic emissions reductions.

Other key non-monetised benefits by 'main affected groups'

Setting a positive limit on the use of credits would provide the UK greater flexibility to meet the third carbon budget. Credits could manage the uncertainty in emissions projections and account for uncertain historic and future emissions. This could also increase long-term investor confidence by making the overall climate policy framework more resilient to unexpected changes in future emissions. A positive limit on the use of credits could signal the Government's continued support of global carbon markets. If credits were purchased, this would have a benefit of driving increased financial flows to low-carbon development projects that deliver cost-effective mitigation overseas.

Key assumptions/sensitivities/risks

Discount rate (%)

3.5

Central, high and low estimates of future emissions indicate that credits are unlikely to be needed to meet the third carbon budget. However, it's possible that a substantial change to the methodology underpinning the emissions inventory over the period 2018 to 2022, combined with unexpectedly high emissions relative to current central projections, could still lead to emissions being higher than the level of the third carbon budget. The cost and benefits of this option in this hypothetical scenario are presented in Box 1 in the evidence base.

BUSINESS ASSESSMENT (Option 3)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs: £0	Benefits: £0	Net: £0	

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EXECUTIVE SUMMARY

1. The 2008 Climate Change Act ("the Act") requires the Government to place a limit on the quantity of international carbon units ("credits") that can be used to meet the third carbon budget. The third carbon budget sets a limit on the UK's net amount of greenhouse gas (GHG) emissions between 2018 and 2022. The level of the carbon budget is set at 2,544 million tonnes of carbon dioxide equivalent (MtCO_{2e}). In 2011, the Government set a credit limit of 55 MtCO_{2e} for the second carbon budget period covering 2013-2017. The credit limit for the first carbon budget period, covering 2008-2012, was 0 MtCO_{2e}.
2. The latest projections¹ indicate the UK is on track to meet the third carbon budget, and so the Government is not expected to need to use credits. However, emissions projections are based on economic and demographic factors which are difficult to predict, meaning there will always be uncertainty around the central projection of emissions. In addition, the projections do not take into account the impact of future changes in how emissions are measured and reported. These changes lead to revisions to the GHG emissions statistics. Future changes could mean actual emissions over the third carbon budget period will be outside the range of the UK's current emissions projections.
3. The uncertainty about future emissions creates a risk. Despite having implemented policies expected to be sufficient to meet the carbon budget, the UK may end up off-track due to external factors. In this situation, the Government may be forced to take urgent short-term action to reduce emissions in order to comply with the Act. This short-term action is likely to cost more than decarbonisation actions planned and implemented over a longer period and may not be consistent with long-term cost-effective emissions reductions. The option to use credits could reduce this additional cost and provide the Government with the flexibility to manage the uncertainty about future emissions.
4. The ability to purchase credits for the purpose of meeting carbon budgets could also enable the UK to support mitigation action in developing countries through its own climate targets. A purchase of credits could contribute to the development of a global carbon market, which could reduce the global cost of action on climate change. If credits were purchased, this would have the benefit of driving increased financial flows to low-carbon development projects that deliver cost-effective mitigation overseas.
5. Setting the limit may affect the expectations of investors and businesses. A higher credit limit could reduce short-term investor confidence in the UK low-carbon sector by signalling that policy interventions to reduce domestic emissions may not be as strong in the future. However, a higher limit could also increase long-term investor confidence by making the broader policy framework more resilient to unexpected changes in emissions data or projections.
6. In setting the limit, the Government is required to take into account advice from the Committee on Climate Change (CCC). The CCC has recommended that no credits be used to meet the third carbon budget, besides those associated with the operation of the

¹ Energy and Emissions Projections (Department of Energy and Climate Change (DECC), 2015)
<https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2015>

EU Emissions Trading System (EU ETS), which it recommend should not be covered by the credit limit.

7. The Government also needs to consider the UK's current obligations to reduce emissions under EU legislation, which currently affect the number of credits it can use to offset domestic emissions reductions undertaken to comply with carbon budgets. It is estimated that under current obligations the UK could be able to use 83-89 MtCO₂e worth of non-EU credits to comply with the third carbon budget, while also meeting EU targets under current commitments over the same period. However, EU legislation does not limit the number of EU credits that the UK can use
8. The existing evidence does not clearly point to a specific level for the credit limit. Three options for the credit limit are considered within this impact assessment:
 - **Option 1: 0 MtCO₂e** (no flexibility, a lower amount than the second carbon budget credit limit)
 - **Option 2: 55 MtCO₂e** (limited flexibility, same as the second carbon budget credit limit. Equivalent to around 2.2% of the third carbon budget level)
 - **Option 3: 90 MtCO₂e** (greater flexibility than the second carbon budget limit, and representing the maximum extent of year-on-year variation in recent projected emissions for any individual carbon budget period. Equivalent to around 3.5% of the third carbon budget level)
9. Option 1 is in line with the CCC's recommendation and the views of the Devolved Administrations, and could have a small positive impact on investor confidence in the short-term. However, it would also provide no flexibility to manage the uncertainty around future emissions. Were actual emissions to turn out significantly higher than currently projected, the Government would be unable to use credits to fill any shortfall. This may require alternative expensive and urgent domestic emissions reductions, which may not be consistent with long-term cost-effective emissions reductions. Options 2 and 3 both mitigate this risk, providing flexibility to manage the uncertainty about future emissions. According to existing projections, it is highly unlikely that the additional flexibility allowed under option 3 compared to option 2 would be needed in practice. Option 2 is in line with the credit limit for the second carbon budget, meaning relative to option 1 any additional negative impact on short-run investor confidence in the Government's commitment to domestic climate action would likely be minimal.

PART A: RATIONALE AND POLICY OBJECTIVE

Identification of problem

10. The 2008 Climate Change Act (“the Act”) places a statutory duty on the Government to set a limit on the quantity of international carbon units (“credits”) that the Government is able to use to meet a carbon budget.² A credit represents the reduction or avoidance of one tonne of carbon dioxide equivalent (tCO₂e) from the atmosphere³, and can have a financial value associated with it when traded.
11. The credit limit will define the maximum net number of credits that can be credited to the UK net carbon account (“NCA”) for each five-year carbon budget period (see paragraph 17 for more detail on the UK net carbon account). The credit limit must be set in secondary legislation 18 months before the start of each carbon budget period. For the third carbon budget, which covers the period 2018-2022, the limit must be set by 30 June 2016.

Policy Objective and rationale for intervention

12. Recent publications, in particular the latest assessment of the Intergovernmental Panel on Climate Change (IPCC AR5)⁴, reinforce the overwhelming scientific consensus that climate change is happening. Furthermore, human activity is extremely likely to be the predominant cause through emissions of greenhouse gases (GHGs). Climate change is leading to rising temperatures and sea levels, causing extreme weather events, damaging ecosystems and reducing the productivity of crops.
13. The impacts of climate change are likely to result in significant economic costs to society. In the absence of Government intervention, these costs will not be factored into consumption and production decisions made by organisations and individuals. By intervening to constrain or internalise the costs of production of GHGs, Government intervention can reduce the overall costs associated with climate change and increase UK and global welfare. The 2006 Stern Review⁵ estimated that the cost of inaction on climate change would significantly outweigh the expected cost of coordinated global mitigation action. Taking action to tackle climate change will help secure the UK’s long-term economic security and prosperity.
14. The Act established a legal framework to cut GHG emissions in the UK by setting a limit for the Government on the net amount of emissions legally allowed to be produced. The framework requires setting a series of five-year carbon budgets leading up to 2050, when the Act requires UK emissions to be at least 80% below the carbon budgets base emissions level⁶ (“the 2050 target”).

² Section 11 of the Climate Change Act 2008 sets out the requirements to set a carbon unit limit for each carbon budget. <http://www.legislation.gov.uk/ukpga/2008/27/section/11>

³ For example if an overseas project planted trees which removed carbon from the atmosphere an equal number of carbon units could be generated. These carbon units could be used by the UK in place of domestic action to reduce emissions.

⁴ Fifth Assessment Report, Intergovernmental Panel on Climate Change (2014), <https://www.ipcc.ch/report/ar5/>

⁵ Stern, N. (2006); ‘The economics of climate change: the Stern review’; Cambridge University Press, Cambridge. http://webarchive.nationalarchives.gov.uk/20100407172811/http://www.hm-treasury.gov.uk/stern_review_report.htm

⁶ Under the Kyoto Protocol, the UK uses 1990 as the base year for carbon dioxide, methane and nitrous oxide emissions, and 1995 as the base year for the fluorinated gases (or F-gases: hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride).

15. The UK measures progress against carbon budgets through the net carbon account, which takes account of both net domestic emissions, as defined by the Carbon Accounting Regulations (“CARs”, see below), and the total sales and purchases of eligible credits. Credits can play an important role in: mitigating against the impacts of unforeseen circumstances; providing flexibility in how carbon budgets are met; and allowing the UK to contribute to global emissions abatement beyond action undertaken domestically. Buying credits can also support the development of the global carbon market, encouraging more cost-effective GHG emission abatement at an international level. The Act itself does not place an explicit restriction on the use of credits to meet carbon budgets; instead, the Act requires a limit on credits to be set through secondary legislation.
16. In setting the credit limit the Government aims to provide flexibility to manage the risks of not meeting the carbon budgets, and to have the flexibility to support an effective global response to climate change by financing mitigation action in developing countries. The limit will also be considered in the context of the wider legislative and policy framework, including the impact on investor expectations around the decarbonisation of the UK economy in line with the 2050 target.

To ensure consistency with our international obligations, the same base year for each greenhouse gas is used under the Climate Change Act.

PART B: CONTEXT

The third carbon budget

17. A carbon budget limits the total quantity of net emissions that the UK can emit over a five-year period. The third carbon budget is set at **2,544 million tonnes of carbon dioxide equivalent (MtCO₂e)**. UK performance against the legislated carbon budgets is measured through the UK net carbon account,⁷ currently comprising three elements:
- (i) net UK emissions within the traded sector, which refers to emissions from installations within scope of the EU Emissions Trading System (EU ETS). The traded sector therefore primarily covers emissions in the power sector and heavy industry;
 - (ii) domestic emissions within the non-traded sector, which covers emissions from across the whole economy, where these emissions do not fall under the EU ETS. This primarily includes transport, waste, agriculture, forestry, domestic and commercial use of heating fuels, and some industry sectors; and
 - (iii) the net number of eligible credits traded (which is the number sold minus the number purchased).
18. The level of emissions in the net carbon account from the traded sector is currently defined by the UK's share of the EU ETS cap. This is equal to the total number of emissions allowances (EU ETS Allowances (EUAs)) allocated to UK installations plus the UK Government's auction rights. It is not known exactly what this will be for the third carbon budget. This carbon budget was set using the assumption that the traded sector cap would be 985 MtCO₂e. In the absence of the information needed to calculate a new traded share⁸, this impact assessment uses the same assumption. Under the current CARs, UK EU ETS participants can buy or sell EUAs, without directly affecting emissions in the net carbon account⁹.
19. The CARs for the third carbon budget, to be put in place before the 2017 Annual Statement of Emissions due in March 2019, will define which type of credits can be used in the net carbon account. This Impact Assessment uses the assumption that eligible credits will include those currently permitted under existing regulations covering the second carbon budget period (2013-2017)¹⁰, plus those units that the Government has already committed to including in the updated CARs. These units include those created by the Kyoto Protocol mechanisms and the EU emissions accounting framework,¹¹ although the trading of units within the EU ETS does not directly affect the UK net carbon

⁷ The net UK carbon account is how the UK assesses compliance with carbon budgets. It is calculated by taking net UK emissions for a given period and adjusting to account for the amount of international carbon units which have been bought by Government and others to offset UK emissions ("credits"), and UK carbon units which have been disposed of to a third party ("debits").

⁸ For the period up to 2020, the UK allocation of auction rights are currently determined a year in advance. In addition, the cap for the period to 2021-2022 will depend on the final rules of the EU ETS in Phase IV, which will not be agreed until 2017.

⁹ This means that UK territorial emissions in the traded sector may be higher or lower than the UK's share of the EU ETS cap, but this difference will not affect compliance with the third carbon budget.

¹⁰ <http://www.legislation.gov.uk/ukxi/2015/775/contents/made>

¹¹ The Kyoto Protocol units include AAUs (Assign Amount Units), CERs (Certified Emissions Reductions), ERUs (Emission Reduction Units) and RUs (Reduction Units). The EU accounting framework units include EUAs (EU Allowances, the unit traded under the ETS) and AEAs (Annual Emission Allocations), the annual emissions limits under the ESD).

account. It is possible that other types of credits could be included in the CARs. For example, credits from new market mechanisms set up under the Paris Agreement.

20. The carbon budget accounting rules allow the possibility for the UK to borrow up to 1% against the next budget: up to **19.5 MtCO₂e** from the fourth carbon budget could be used to cover higher emissions in the third carbon budget. If this borrowing were to occur, net allowable emissions during the fourth carbon budget period would be reduced by the same amount.
21. The carbon budget accounting rules also allow for the possibility of carrying forward (banking) any overachievement (i.e. the quantity by which emissions are reduced below the carbon budget level) in previous carbon budgets and counting this towards emissions reductions in the subsequent carbon budget. A decision to carry forward overachievement can only be taken after taking account of advice from the CCC and consultation with the Devolved National Administrations (Governments of Scotland, Wales and the Northern Ireland Executive).
22. The third carbon budget period runs until the end of 2022. The end of carbon budget statement, which sets out the final position for the carbon budget, must be published by 31 May 2024. This statement will set out whether any borrowing, banking or use of credits is to be counted towards the final level of the carbon budget.

Current Projections

23. Current central projections indicate that the UK is on track to overachieve the second carbon budget by **60 MtCO₂e**, with a range of 44 MtCO₂e to 75 MtCO₂e.¹² However, the final position for the second carbon budget will not be known until May 2019 and up to this point projections will be subject to change. Statistical revisions may also be made to recorded GHG emissions. This could lead to the overachievement of the second carbon budget being higher or lower. The uncertainty of emissions projections and the risk this creates in terms of missing emissions targets is explored further in section C.

Committee on Climate Change's recommendation and views of the Devolved Administrations

24. Under the Act, the CCC is required to provide advice on the use of credits, and the Government must take this into account. The CCC has recommended that there should be no use of credits to meet the third carbon budget other than those traded under the EU ETS¹³ and that the third carbon budget should be met through domestic action alone.
25. The UK Government sought representations from the Devolved Administrations on the recommended level for third carbon budget credit limit. The representations of the Devolved Administrations have been taken into consideration alongside the recommendations of the CCC.
26. The Scottish Government agreed with the CCC's recommendation that there should be no use of credits to meet the third carbon budget. It is the view of Scottish Ministers that expenditure on carbon credits (outside of the EU ETS) should be avoided wherever

¹² <https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2015>

¹³ <https://documents.theccc.org.uk/wp-content/uploads/2016/02/Letter-use-of-offset-credits-to-meet-the-third-carbon-budget.pdf>

possible, in favour of actions and investment focussed on directly reducing domestic emissions. Scottish ministers see the signals sent by UK Government around its domestic climate policy as being of paramount concern. The Welsh Government does not have any objection to the UK Government adhering to the CCC's advice. Northern Ireland agreed with the CCC recommendation, referring to the flexibility offered by the current projected over-performance, and that a zero credit limit clearly reinforces the message that the UK will meet its GHG emission reduction commitments and is the positive signal investors seek.

Relationship with the UK's current EU targets

27. Under current UK commitments the EU's energy and climate legislation will place a limit on the UK's GHG emissions and affect the number of credits the UK could use in place of domestic action. Under agreed EU legislation the UK currently has annual emissions limits for the non-traded sector (NTS) up to 2020.¹⁴ Based on current EU-wide agreements, the UK will also have limits for its NTS to 2030, under the "Effort Sharing Decision" legislation for 2021 to 2030.
28. The level of the third carbon budget is estimated to be tighter than the UK's current equivalent EU target over that same period and the difference between the two could theoretically be met through international (non-EU) credits. According to recent analysis, this difference is estimated at around 83-89MtCO₂e, however estimating of the difference between the third carbon budget and the UK's EU non-traded cap under current commitments is subject to some uncertainty, and the actual level could be different.
29. For the period up to 2020, the UK is currently permitted to use international (non-EU) credits equivalent to 3% of its 2005 emissions per year to meet its existing EU targets for the non-traded sector. However, unlike the pre-2020 target, the EU post-2020 annual caps will need to be delivered through EU domestic action only (i.e. without the use of international credits), because the current agreed EU-wide target does not permit international (non-EU) credits to be used for compliance purposes.
30. Under the EU's 2020 Effort Sharing Decision, the UK also currently has flexibility to meet a part of its non-traded target by purchasing over-achievement from other member states through transferring Annual Emission Allocations (AEAs, a type of EU credit)¹⁵. Member States are able to sell all AEA units in surplus to their allocations (following annual compliance checks). There are no limits on how many AEA units Member States can buy in order to reach their Effort Sharing Decision targets to 2020 but it is difficult to predict the future supply of such credits that will be available.
31. Finally, the EU targets and the carbon budgets have a slightly different scope in terms of the gases covered. Emissions from soils and forestry, also known as Land Use, Land Use Change and Forestry (LULUCF) are counted towards the UK's carbon budgets but are not currently counted towards current EU targets for 2020. This means that if the UK's emissions from LULUCF were to become a net source of emissions, the UK could use international non-EU credits equal to the size of its LULUCF emissions to comply

¹⁴ This is referred to as the Effort Share Decision target.

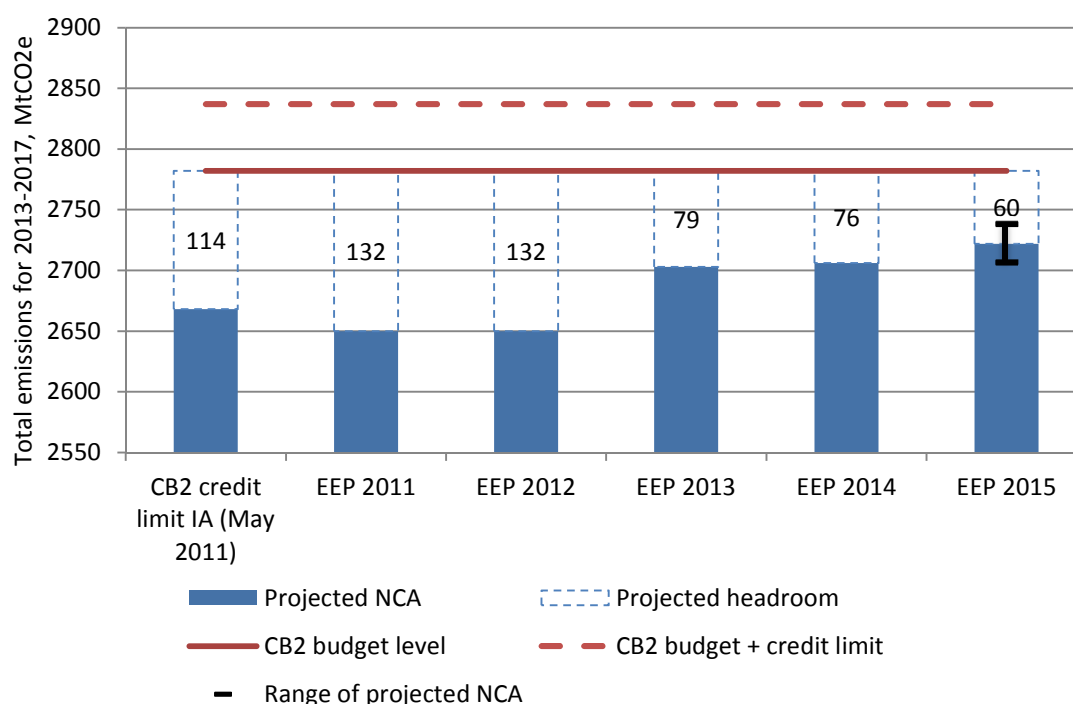
¹⁵ The scope for using this flexibility after 2020 will only be known once the 2030 Effort Share Decision legislation has been passed.

with the third carbon budget, in addition to those that would be currently permitted under EU legislation. The latest emissions projections indicate this will not happen; over the third carbon budget period UK LULUCF emissions are projected to be -18 MtCO_{2e}¹⁶.

Review of the second carbon budget credit limit¹⁷

32. In 2011 the Government set the credit limit for the second carbon budget at 55 MtCO_{2e}. The second carbon budget period ends in 2017 and the final statement of emissions for the period will not be made until May 2019. It is therefore not possible to fully assess at this time whether the second carbon budget credit limit level is adequate or proportionate, although it is possible to review any changes in circumstances since the limit was set.
33. When the second carbon budget credit limit was set, the Impact Assessment¹⁸ estimated that emissions would be around 114 MtCO_{2e} below the level required to meet the second carbon budget. Figure 1 shows how this estimated over performance has changed over the five subsequent updates to the emissions projections.

Figure 1: Projected performance against the second carbon budget, 2011 to 2015



34. The greatest change was between the 2012 and 2013 projections, largely driven by an update to the United Nations Framework Convention on Climate Change (UNFCCC) guidance on the global warming potential of non-CO₂ gases. The latest projection¹⁹

¹⁶ 2015 DECC Energy and Emissions Projections

¹⁷ The impact assessment for the second carbon budget credit limit included a commitment to review the second carbon budget credit limit ahead of setting the credit limit for the third carbon budget.

¹⁸ *Setting the limit on the use of international carbon units for the second carbon budget period (2013-2017)*, Department of Energy and Climate Change, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48089/1777-ia-2nd-carbon-budget-period.pdf

¹⁹ 2015 DECC Energy and Emissions Projections, <https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2015>

suggests the second carbon budget will be overachieved by 60 MtCO₂e (with a range of 44-75 MtCO₂e).

35. Combined with the credit limit of 55 MtCO₂e, the total headroom for emissions during the second carbon budget period is 115 MtCO₂e, based on 2015 central projections. This suggests that the second carbon budget credit limit is highly likely to be adequate to manage the risk of unanticipated non-compliance, despite the projected level of overachievement nearly halving since the limit was set. However, a final assessment will not be possible until the carbon budget is closed in 2019.
36. The government is also not aware of evidence that suggests any widespread negative impact on investor confidence resulting from the setting of the second carbon budget credit limit at 55MtCO₂e.

PART C: ASSESSMENT OF OPTIONS

Description of options

- **Option 1:** 0 MtCO_{2e} - no flexibility (Committee on Climate Change (CCC) recommendation): the Government would be unable to count credits towards the third carbon budget. The carbon budget would have to be met through domestic emissions reductions or banking and borrowing emissions from other carbon budget periods.
- **Option 2:** 55 MtCO_{2e} (around 2.2% of the third carbon budget) - limited flexibility: 55 MtCO_{2e} is the same as the second carbon budget credit limit. This option is likely to allow sufficient flexibility to manage current uncertainty around third carbon budget period emissions through credits.
- **Option 3:** 90 MtCO_{2e} (around 3.5% of the third carbon budget) – high flexibility. This limit is sufficiently high that, the UK is not expected to be constrained in the amount of carbon units it can purchase and count towards the third carbon budget. However, our projections are uncertain. A credit limit of 90 MtCO_{2e} would provide enough flexibility to cover the largest year-on-year revision to projected emissions for any carbon budget period.

37. The options for the third carbon budget credit limit all exclude any net use of credits which would result from the operation of the European Union Emissions Trading System (EU ETS). In line with the first and second carbon budgets' credit limits (and consistent with the latest carbon accounting regulations covering the second carbon budget period), any crediting and debiting of carbon units which results from the EU ETS are assumed not to count towards the credit limit. Otherwise the credit limit would conflict with the UK's ability to continue with its current carbon accounting approach into 2018-2022 for the traded sector.

Identification of impacts

38. There are three main impacts of setting the credit limit:

- (i) The impact on the cost of complying with the third carbon budget;
- (ii) The impact on investor confidence in current and future government climate policy; and
- (iii) The impact on the global carbon market.

Cost of complying with the third carbon budget

39. The latest greenhouse gas (GHG) emissions projections indicate the UK is on track to meet the third carbon budget, although there is uncertainty about what UK emissions will actually be. Uncertainty in the emissions projections or future revisions to emissions statistics could lead to the UK unexpectedly missing the carbon budget, or having to undertake potentially costly abatement at short notice. The option to purchase credits provides flexibility to manage this risk (in addition to the option of banking or borrowing from other carbon budgets). If the Government did choose to purchase international credits to avoid having to take urgent domestic abatement, this could result in a short-

term cost saving to the UK. However, there may be longer-term cost implications of emissions reductions to 2050.

40. The section below describes the degree of uncertainty about future emissions, caused by both:
- (i) uncertainty in the emissions projections; and
 - (ii) uncertainty in how emissions statistics will be revised in the future (which is not reflected in the emissions projections range).

Risk of missing the target: Uncertainty in emissions projections

41. The 2015 Department of Energy and Climate Change (DECC) Energy and Emissions Projections²⁰ (EEP) suggest the risk of not meeting the third carbon budget is low. However, emissions projections are based on a range of uncertain variables which are fully or partly outside the Government’s control. These include annual temperature variations, economic growth, demographic changes, international energy prices and technology costs, among others. The projections are based on statistical relationships between GHG emissions and these variables observed in historical data. However, inherent uncertainty, including how the relationship between emissions levels and these drivers may change over time, means that emissions could well be higher or lower than the central estimates in our projections.
42. The 2015 EEP illustrates some of this uncertainty through the use of Monte Carlo simulations, which use different distributions of some key variables to provide a range for the projections. This analysis provides an indication of the impact of uncertainty in fossil fuel prices, economic growth, temperature, policy delivery, power station capital costs, non-CO₂ emissions, and Land Use, Land Use Change and Forestry (LULUCF) emissions and removals. Table 1 below shows the emissions range over the third carbon budget period within which 95% of these simulated scenarios resulted.
43. In Table 1 **the difference between the higher and the central estimate is 47 MtCO₂e**. One way of managing the impact of these higher emissions levels could be through the purchase of credits although, even if emissions were at this higher end, the UK would still comply with its carbon budget without the need for credit purchases. Of the 1,000 simulations run, 1.3% led to a net carbon account higher than the level of the third carbon budget.

Table 1: Comparison of DECC Emissions Projections with the third carbon budget

GHG emissions (MtCO₂e)		Total net carbon account emissions (non-traded emissions and UK share of ETS cap)	Non-traded sector emissions	Headroom
2015	Lower projection	2,444	1,459	100

²⁰ <https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2015>

Emissions Projections	Central projection	2,493	1,508	51
	Higher projection	2,540	1,555	4
The third carbon budget level		2,544	1,559²¹	-

44. The ranges presented in Table 1 shows the potential impact of some known uncertainties on the modelled emissions projections. However, there are further uncertainties that cannot be quantified, but which could lead to UK emissions being higher or lower than projected. These include changes over time to the way in which emissions are produced, for example, because of new technologies or changing consumer preferences.

Risk of missing the target: Uncertainty from revisions to emissions statistics

45. The GHG emissions statistics²² are regularly updated to incorporate methodological improvements or Inter-governmental Panel on Climate Change (IPCC) guidance on reporting emissions. Methodological changes and improvements can arise from responding to recommendations made by UNFCCC expert reviewers, revisions to input data (such as UK energy statistics), or incorporation of new scientific research.

46. These changes typically affect only a small percentage of the total emissions each year, although the cumulative impact of changes over time can be substantial. Each year the UK publishes a revised assessment of historic emissions inventory for the period 1990 to present, reflecting changes to the underpinning estimation methodologies²³. To give a sense of scale of these annual updates, Figure 2 shows how the GHG emissions inventory data on emissions for the period 2005 to 2012 has changed with each subsequent update.

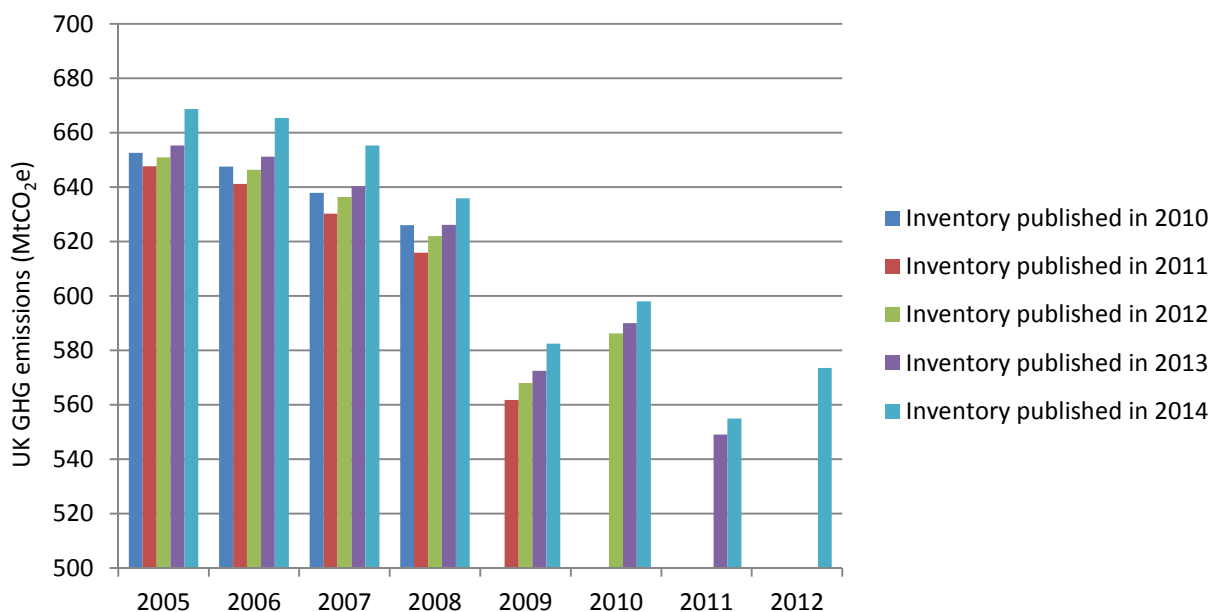
47. These annual updates therefore introduce another important source of uncertainty for estimates of future emissions and for carbon budget accounting. Given these revisions are due to changes in statistical methodologies that can't be modelled or easily anticipated, the variation in inventory emissions is not captured within the EEP confidence interval given in Table 1.

²¹ Allowance intended when setting the level of the third carbon budget, based on a UK share of the EU ETS of 985 MtCO₂e

²² <https://www.gov.uk/government/collections/uk-greenhouse-gas-emissions-statistics>

²³ The production of the GHG emissions inventory takes just over a year and so each publication contains emission data for the years 1990 until two years before the publication year.

Figure 2: UK GHG emissions from 2005 to 2012, based on statistics published between 2010 and 2014



Source: Greenhouse gas emissions national statistics, DECC

48. It difficult to assess how much uncertainty statistical revisions create or their impact on the risks on non-compliance with the third carbon budget. The recent trend has mainly been for historical emissions inventory estimates to be revised up, although there is a chance future inventory estimates could also be revised down.
49. Emissions data for the individual years 2008 to 2012 have had upwards annual revisions of between 6 to 21 MtCO₂e. Since emissions data for 2008 was first published, up until the final statement of account for the first carbon budget period was published in 2014, the combined impact on reported emissions over the carbon budget period due to changes to the inventory was +48 MtCO₂e²⁴.
50. It is possible that during the third carbon budget period the UNFCCC will update the global warming potentials (the values used to convert emissions of non-CO₂ gases into CO₂ equivalent emissions) or the international guidelines used for reporting GHG emissions. This could lead to larger than usual revisions to historical emissions.
- 51. We do not have sufficient data to provide a statistically robust estimate of the risk that future revisions to GHG statistics pose to the Government meeting the third carbon budget.** It is therefore not possible to provide a quantified range for this risk, which could be compared against the credit limit options.
52. Looking beyond the third carbon budget, projected emissions for the fourth carbon budget were revised by 82 MtCO₂e between 2013 and 2014, driven partly by revised assumptions around population growth, new data on UK energy balances, and revisions

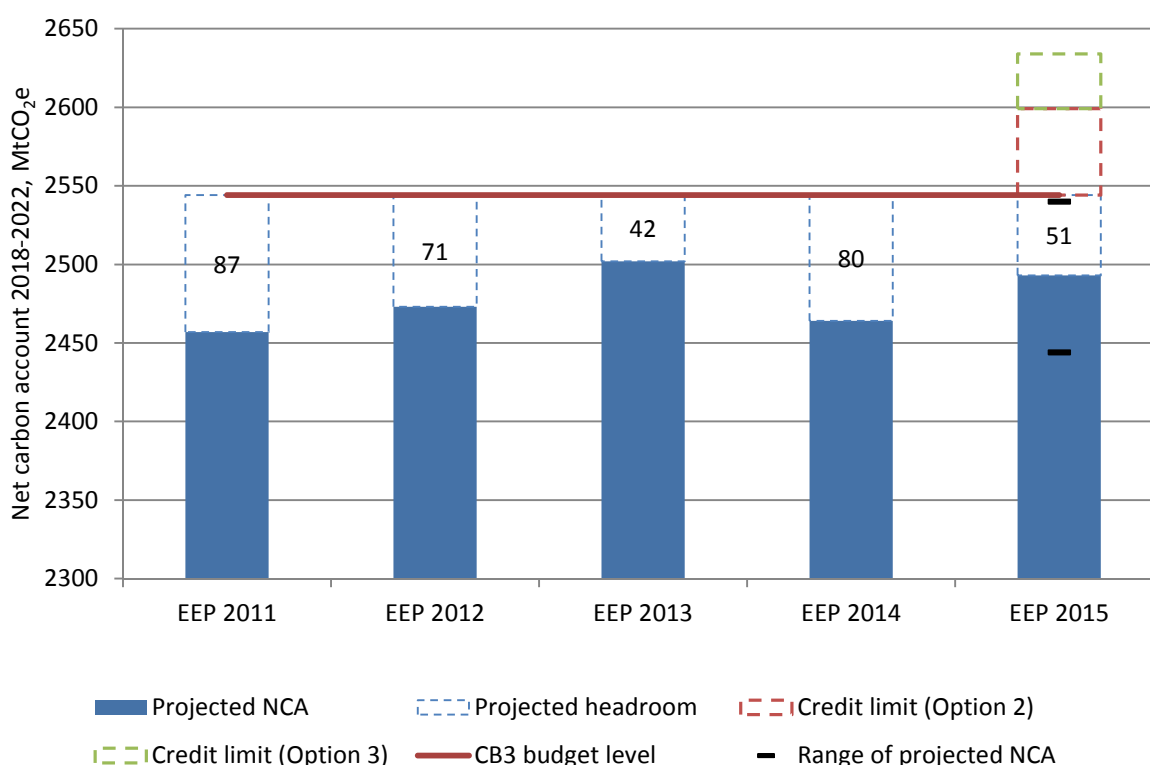
²⁴ This is the difference between the first inventory published for each year, and the final inventory used for setting the third carbon budget.

to estimates of land use, land use change and forestry (LULUCF) emissions. This is the largest recent revision to projected emissions for any carbon budget period.

Impact of credit limit on the cost of complying with the third carbon budget

53. The current projections indicate that the third carbon budget will be met and the risk of emissions exceeding the budget is low. Figure 3 shows how projected performance against the budget has changed between 2011 and 2015 as well as the additional flexibility that would be provided by credit limit under Options 2 and 3.

Figure 3: Projected emissions headroom against the third carbon budget, 2011 to 2015



54. According to latest published projections, the scope for banking and borrowing between carbon budget periods could provide an additional flexibility of 63 MtCO₂e to 94 MtCO₂e (with a central estimate of 79 MtCO₂e). However, most of this is dependent on the level of overachievement of the second carbon budget, which could be different to current projections and will not be known for certain until May 2019.

55. If no credits are needed to meet the budget the credit limit would have no direct impact on the cost of meeting the budget. According to current projections, credits are not expected to be needed. Therefore, the expected impact of all the options considered on the cost of complying with the third carbon budget is zero.

56. However, it's possible that a substantial change to the emissions inventory over the period 2018 to 2024, combined with unexpectedly high emissions relative to EEP central projections, could still lead to emissions exceeding the carbon budget level (even with use of the existing banking and borrowing flexibilities). In such a scenario, having the ability to buy credits could reduce the cost of complying with the carbon budget. Box 1 sets out an example scenario that demonstrates the potential impact on the cost of

compliance of different credit limit options, under different emissions assumptions. The costs of credits and of undertaking domestic emissions abatement are highly uncertain, so this analysis presents an illustration only of the potential benefit of having flexibility to purchase credits.

57. If the UK were unable to purchase credits, the Climate Change Act (“the Act”) would require the Government to implement urgent short-term action or borrow from the next carbon budget. It’s likely this would be substantially more costly and economically disruptive compared to emissions reduction policies planned and implemented over a longer period. It would mean prioritising measures that delivered reduction quickly over those that were more cost-effective in the long run. Businesses and consumers would have less time to adjust to changes in policy, and the sudden change could damage investor confidence the UK’s wider energy and climate policy framework. The requirement to take urgent action in the short-term might also increase the cost of decarbonisation in the long run by locking in investments in short-term solutions. In the extreme case, there may not be time for the Government to undertake sufficient action at all (for example, if there were a substantial revision to historical emissions data).
58. Were Government to purchase credits to meet the shortfall, this would generate a cost to the UK equal to the cost of the required credits. Credit prices during the third carbon budget period are highly uncertain. The two carbon crediting mechanisms, the Clean Development Mechanism (CDM)²⁵ and the Joint Implementation (JI)²⁶ regulated under the Kyoto Protocol, are likely to end in 2020 or cease to issue credits to new projects. The Paris Agreement has provided for the development of both a new international crediting mechanism and guidance to enable countries to trade emissions reductions. However, there remains considerable uncertainty over the future size and shape of the carbon market in terms of the countries using credits to meet their targets, the types of credit which will be permissible, and how emissions reductions will be accounted for in the new agreement.
59. The price of CDM units (Certified Emission Reductions, or CERs) peaked at almost \$30/tCO₂e in 2008, was largely stable within a \$5-\$10/tCO₂e range in the period 2009-2011, and then fell to around \$0.4/tCO₂e (equivalent to around £0.3/tCO₂e), where it has remained since late 2012. These variations were driven by the fall in demand from the EU due to the recession, oversupply, and changes in EU policy on the use of credits in the EU ETS (which reduced demand for credits). Although it is not known exactly how the credit market will develop, it is likely that the ending of the Kyoto Protocol mechanisms and/or restrictions on the use of the Kyoto Protocol units after 2020 would reduce the current oversupply and result in an increase in credit prices. Therefore, current market prices could be a reasonable guide for the cost of credits purchased up until 2020, but not after.
60. Credit prices after 2020 will depend on: the level of action taken by other countries to reduce their emissions, the state of the global carbon market, and the type of credits purchased. We have used DECC’s Global Carbon Finance (GLOCAF) model to produce

²⁵ http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php

²⁶ http://unfccc.int/kyoto_protocol/mechanisms/joint_implementation/items/1674.php

scenarios reflecting different levels of global ambition and participation in carbon markets. More details on the GLOCAF model can be found in Annex 2.

61. The illustrative scenario in Box 1 uses a credit price range in 2022 of £5/tCO_{2e} to £50/tCO_{2e} (2015 prices). The top end of the range is based on a scenario in which countries increase the ambition of current targets to a level consistent with the well below 2°C goal, and the market anticipates this will lead to a significantly tighter carbon market in the future (and so reacts by increasing demand for credits in the short-term and with the result that prices increase). The low end of the range reflects a scenario in which the market prices carbon on the expectation that countries deliver at least stretching end of the range implied by the national commitments submitted to the UNFCCC in the lead up to Paris.

Box 1: Illustrative scenario analysis of impact of credit limit on cost of meeting the third carbon budget

If the UK were to end up off-track for the third carbon budget towards the end of the carbon budget period due to a combination of actual emissions being higher than projected and revisions to GHG statistics increasing reported emissions in the earlier years of the budget period, it would face two options to meet the budget:

- 1) Take urgent action to reduce domestic emissions

It's likely that taking urgent action to reduce domestic emissions would cost more than if action was planned more systematically over a longer period. However, there would still be a benefit to the UK as there would be a reduction in actual UK emissions providing a contribution to meeting the UK's target for emissions to be at least 80% below the 1990 carbon budgets 1990 base emissions levels ("the 2050 target")²⁷.

To illustrate this we have used the central value of non-traded GHG savings in 2022 to represent the social benefit of the carbon saved (£69/tCO_{2e}) but the high value to represent the net social economic cost of delivering it (£104/tCO_{2e})²⁸. The difference between the two (£35/tCO_{2e}) represents the additional cost to UK society of having to take action at short notice.

- 2) Purchasing credits to make up the shortfall

The assumed cost of credits post-2020 is between £5/tCO_{2e} and £50/tCO_{2e}. There would be no direct carbon benefit to the UK as the credit purchase would mean emissions reductions would still be needed in the future to meet the 2050 target.

Illustrative scenario

The table below presents the cost of complying with the carbon budget under each option in two hypothetical scenarios (a 25 MtCO_{2e} shortfall and 75 MtCO_{2e} shortfall) in which the UK was not on track to meet the third carbon budget.

²⁷ This value is approximated by assessing the marginal cost of reducing global emissions on a pathway that is likely to achieve the 2°C warming objective. Further details are available in the 2009 Review of carbon valuation available here: <https://www.gov.uk/government/collections/carbon-valuation--2>. The Government is currently undertaking a review of its approach to carbon valuation, which it plans to publish in conjunction with the Government's emissions reduction plan.

²⁸ The value of non-traded GHG savings can be found in the *Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal*. <https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal>.

If the cost of credits is lower than the additional cost of having to take the urgent mitigation action, it is assumed the UK would purchase credits up to the limit that has been set.

However, if the credit price is higher than the additional cost of domestic action, domestic action would be more cost effective and it is assumed there would be no credit purchase. The range of benefit of the option to purchase credits in Table 2 reflects the range of possible international credits prices.

Table 2: Value of credit purchase option in different scenarios Net Present Value (NPV) (2018-2022, £m, 2015 prices)

Scenario Shortfall from meeting the third carbon budget (MtCO _{2e})	Net cost of meeting shortfall through urgent domestic action (PV £m 2015) <ul style="list-style-type: none"> • Cost of action: £104/tCO_{2e} • Benefit of action: £69/tCO_{2e} • Net cost: £35/tCO_{2e} 	Potential net benefit from credit purchase <ul style="list-style-type: none"> • Cost of credits purchased: £5-50/tCO_{2e} • Potential avoided net cost of urgent action: £35/tCO_{2e} • Potential net benefit from credit purchase: £0-30/tCO_{2e} 		
		Option 1 (0 MtCO _{2e})	Option 2 (55 MtCO _{2e})	Option 3 (90 MtCO _{2e})
Scenario 1: 25 MtCO _{2e}	-710	0	0 to 600	0 to 600
Scenario 2: 75 MtCO _{2e}	-2,120	0	0 to 1,330	0 to 1,810

For Option 1 (credit limit of zero) the cost is based on taking domestic action only; no credit purchase is possible. For Options 2 and 3, the cost of domestic action could be avoided by buying credits instead, by an assumed margin of up to £35/tCO_{2e}. If the price of credits was at the high end of the range, there would be no benefit of having this option as credits would be more expensive than domestic action.

This analysis shows that:

- The cost of additional urgent domestic action places an upper limit on how much a shortfall would cost for all the options.
- For options 2 and 3, the net costs could potentially be lower, if credit prices are lower than the cost of domestic action.
- The potential cost reduction under options 2 and 3 are the same in scenario 1, because the credit limit under both options is large enough to cover the shortfall. For these options the potential cost savings could be up to around £660m. There is no potential reduction in costs under Option 1 as no credit purchase is allowed.
- However, for scenario 2 the credit limit in Option 2 would not be large enough and so some domestic action would be required in addition to the purchase of credits. The cost could be reduced by up to £1,330m in Option 2 and by up to £1,810m under option 3. As in Scenario 1, there would be no potential for cost reductions as no purchase of international credits would be permitted.

Note: this scenario analysis is to illustrate the potential value of having the option to buy credits. It is not a full cost-benefit analysis of the option of buying credits instead of taking

domestic action. The net cost of domestic action is represented through an assumed carbon value, which illustratively reflects the net social cost of abatement. This is the sum of all social costs (for example additional capital costs of low carbon technologies) less the sum of all social benefits (for example air quality improvements and energy savings). It therefore does not directly reflect the specific costs and benefits of the emissions abatement actions that could be chosen, as these actions are unknown.

Investor confidence in current and future Government policy

62. The setting of the credit limit provides a signal to investors in the UK around the long term commitment of the Government to implementing decarbonisation policies to reduce domestic emissions. A higher credit limit (which provides the Government with the option of not bringing about as much domestic abatement) could be interpreted by investors as a signal that future climate policy on domestic reductions would be weaker. In theory this could impact the level of investment in UK low carbon industries and supply chains, and increase the cost of capital for low carbon investments (due to higher perceived policy risk).
63. Investor expectations about future policy, however, will be determined by a wide range of factors, including the wider energy and climate policy framework, of which the third carbon budget credit limit is only one component. Anecdotal evidence suggests specific decarbonisation delivery policies provide a much stronger signal to investors than carbon budget credit limits. In addition, having a policy framework that is more resilient to unexpected changes (such as unexpectedly high emissions) could provide greater confidence to investors. By providing more scope for the Government to manage the uncertainties in future emissions, a higher credit limit could give additional assurance that policies would not be changed at short notice. If the Government were forced to take urgent action to reduce emissions, or were at risk of missing a carbon budget, this could have a lasting negative impact on investor confidence.

Impact on the global carbon market and support for mitigation action in other countries

64. The development of an effective global carbon market is likely to help reduce the costs of global action to reduce carbon emissions, due to differences in mitigation costs between countries. Carbon trading can reduce the overall global cost of decarbonisation as it will be cheaper for some countries to purchase credits rather than undertaking domestic abatement, and for countries with low costs of abatement there will be a financial advantage in undertaking low cost emissions reductions beyond their own national targets, and selling the resulting credits. A positive credit limit would also provide the UK with the option of supporting emissions reductions in developing countries through the carbon budgets framework. If used, credits would lead to financial flows to low carbon development projects that deliver cost-effective mitigation, and help to develop a global market for carbon that would likely reduce the cost of meeting the goals of the Paris Agreement. Box 2 presents an illustrative scenario to show what the cost of a credit purchase could be.

65. The academic literature suggests that the development and use of effective carbon markets could substantially reduce the global costs of reducing GHG emissions, by channelling finance to the most cost-effective opportunities to reduce emissions. The level of cost saving will depend on the exact distribution of global commitments (relative to the distribution of low cost mitigation opportunities) and the design of the market mechanisms. A review of the literature by the World Bank suggested that a global carbon market could reduce the global costs of meeting the long-term climate target **by between 6% and 67%**.²⁹

Box 2: Illustrative scenario analysis of cost of using credit to support mitigation overseas

If the UK were to choose to support mitigation action in other countries through the purchase of credits, the total cost would depend on the number of credits purchased and their price. As mentioned in paragraph 58 there is considerable uncertainty around what credit prices will be, in particular in the period after 2020 when the Kyoto Protocol ends. The implementation of the Paris Agreement may lead to the development of new crediting mechanism or other type of market mechanism that could be used to support mitigation actions in other countries.

These scenarios look at two possible outcomes to provide an illustration of the range cost of purchasing credits under each credit limit option. Credits are assumed to be purchased in 2022. Credits are assumed to cost between £5/t and £50/t, based on the Global Carbon Finance (GLOCAF) analysis discussed in paragraph 60. In all scenarios the maximum number of credits possible is assumed to be purchased.

Table 3: Cost of credit purchase in credit price scenarios

<i>Cost of maximum allowable purchase PV (£m, 2015)</i>	Maximum number of credits purchases allowable		
	Option 1 (0 MtCO_{2e})	Option 2 (55 MtCO_{2e})	Option 3 (90 MtCO_{2e})
Credit purchase in 2022 (£5/tCO _{2e})	No credits purchased	£0-£220	£0-£370
Credit purchase in 2022 (£50/tCO _{2e})		£0-£2,240	£0-£3,660

This analysis is not a full cost-benefit analysis of the option of buying credits, as it does not take into account any impacts on the future costs and benefits of reducing emissions. There will be a wider set of issues that the UK would consider when deciding whether to buy international carbon credits.

²⁹ Alexandre Kossoy, Grzegorz Peszko, Klaus Oppermann, Nicolai Prytz, Noémie Klein, Kornelis Blok, Long Lam, Lindee Ong, Bram Borkent. 2015. *State and Trends of Carbon Pricing 2015*, World Bank, Washington, DC. <http://www.worldbank.org/content/dam/Worldbank/document/Climate/State-and-Trend-Report-2015.pdf>

Assessment of costs to business

66. Setting the credit limit for the third carbon budget, as required under the Act, is a public sector regulation, and will not lead to any direct costs on business. In the unlikely event that emissions are higher than expected, and exceeded the carbon budget by more than the limit set, extra domestic abatement would be required which could result in additional costs to businesses (and which purchasing credits would help avoid or reduce). As such, any potential cost to business would be a result of subsequent decisions on undertaking extra domestic abatement, rather than as a result of the statutory instrument setting the credit limit itself. As appropriate, these decisions would be accompanied with their own Impact Assessments.

Assessment of options

67. This Impact Assessment uses a multi-criteria assessment of the options, in line with Government guidance³⁰. The guidance states that appraisals should be proportionate to the scale of impacts and the level of uncertainty around them, as well as the available data and resources. Any preferred option will depend on the specific weighting attached to the various criteria. The option adopted is option 2, a credit limit of 55 MtCO₂e. Table 4 presents an assessment of how the impacts differ between the options.

68. Option 1 is in line the Committee on Climate Change's (CCC) recommendation and the views of the Devolved Administrations, and could have a small positive impact on investor confidence in the short term. However, it would also provide no flexibility to manage the uncertainty about future emissions. Were actual emissions to turn out significantly higher than currently projected, the Government would be unable to use credits to fill any shortfall, which may as an alternative require expensive and urgent domestic emissions reductions. Options 2 and 3 both mitigate this risk, providing flexibility to manage the uncertainty about future emissions. According to existing projections though, it is highly unlikely that the additional flexibility allowed under option 3 compared with option 2 would be needed in practice. Option 2 is in line with the credit limit for the second carbon budget period. This means that while option 2 provides some limited flexibility to use credits to meet the third carbon budget, any negative impact on short-run investor confidence in the Government's commitment to domestic climate relative to option 1 would likely be minimal.

³⁰ <https://www.gov.uk/government/collections/impact-assessments-guidance-for-government-departments>

Table 4: Qualitative assessment of options

	Option 1 – No flexibility (a credit limit of 0 MtCO ₂ e)	Option 2 – Limited flexibility (a credit limit of 55 MtCO ₂ e)	Option 3 – Full flexibility (a credit limit of 90 MtCO ₂ e)
Cost of complying with the third carbon budget given uncertainty around GHG emissions	Would provide no scope to manage the uncertainty in emissions projections and inventory updates through the purchase of credits. Unexpected changes to emission trends or data could expose the UK to substantially greater costs.	Would likely provide adequate flexibility to manage uncertainty in emissions projections and inventory updates through credit purchases, given past performance of the emissions projections and the range of changes in emissions inventory updates.	Would be highly likely provide adequate flexibility to manage the uncertainty in emissions projections and inventory updates, given past performance of emissions projections and the range in inventory data updates.
Investor confidence in current and future Government climate policy	Short term: A zero credit limit would provide investors with a potentially stronger signal about the Government's commitment to deliver emission reductions thought domestic measure. This reduction in uncertainty could reduce perceived policy risk to investments in lower carbon infrastructure and supply chains. Long term: A zero credit limit would increase the risk that the Government might need to make policy changes at short notice (to deal with unexpectedly high emissions), or might be at risk of missing the budget. These changes to	Short term: The scope for the Government to use credits to meet the carbon budgets could lead investors to expect that policy would target a slower rate of domestic emissions reduction compared with Option 1. This could affect investment decisions in low carbon infrastructure and supply chains, although this impact is likely to be minimal, particularly since this option is equal to the credit limit for the second carbon budget period. A limit of 55 Mt would have a lower risk compared to 90 Mt as it is in line with the second carbon budget credit limit and places a greater constraint on the Government's ability to meet the carbon	Short term: Adopting a limit greater than that under the second carbon budget, the scope for the Government to use credits to meet the carbon budgets to this degree could lead investors to expect that policy would target a slower rate of domestic emissions reduction. This could affect investment decisions in low carbon infrastructure and supply chains. Long term: By providing greater flexibility than for options 1 and 2 to manage uncertainties about future emissions, this higher limit could help avoid the risk of damaging confidence in the carbon budgets framework if this

	<p>policy could reduce investors' confidence in the policy framework.</p>	<p>budget through credits.</p> <p>Long term: By providing the flexibility to manage uncertainties about future emissions, a higher limit would help avoid the risk of damaging confidence in the carbon budgets framework if this unanticipated short-term flexibility is needed.</p>	<p>unanticipated short-term flexibility is needed. However, probability of this risk materialising is judged to be low.</p>
<p>Impact on global carbon markets and action in other countries</p>	<p>Setting a zero limit on the use of credits would not provide any flexibility to support mitigation action in developing countries through the carbon budget framework.</p> <p>There is a small risk that setting such a limit could also be viewed as a lessening of the Government's commitment towards global carbon markets.</p>	<p>Setting a positive limit on the use of credits would provide limited flexibility to support action to reduce emissions in developing countries through the carbon budget framework, which could encourage the private sector investment in low carbon projects overseas.</p> <p>If credits were purchased, this would have a benefit of driving increased financial flows to low carbon development projects that deliver cost-effective mitigation overseas.</p>	<p>This option would provide greater flexibility to support emissions reductions in developing countries through the carbon budget framework than in options 1 and 2, which could encourage the private sector investment in low carbon projects overseas.</p> <p>If credits were purchased, this would have a benefit of driving increased financial flows to low carbon development projects that deliver cost-effective mitigation overseas.</p>

Annex 1: Assessment of Climate Change Act factors

69. The Climate Change Act 2008 provides direction on how the credit limit should be set, including a minimum set of factors that must be taken into account by the Secretary of State when making the decision. These factors are set out in section 10 (“Matters to be taken into account in connection with carbon budgets”) of the Act. The table below considers each of these factors in turn, and assesses the implications for the credit limit.

Section 10 factor	Implication for the third carbon budget credit limit	Assessment
Scientific knowledge about climate change	Does not point to a particular credit limit	Knowledge of climate science points towards delivering greater reductions in global emissions. However, the credit limit does not directly impact on the level of global emissions reductions, just how these reductions could be delivered.
Technology relevant to climate change	Mixed	Our emissions projections are uncertain. This partially reflects uncertainty in potential deployment and impact of low-carbon technology. A higher credit limit would mitigate such a risk. However, a higher credit limit could be seen by investors as a signal that policy support for domestic action, including support for specific technologies, would be lower, which could undermine confidence in investing in relevant technologies. But as set out above, this impact is expected to be negligible.
Economic circumstances	Does not point to a particular credit limit	The impact of the credit limit on the economy depends on whether credits would actually be used to meet the third carbon budget. On current projections the UK is on track for the third carbon budget, and so the choice of credit limit is expected to have no direct impact on economic circumstances or competitiveness.
Fiscal circumstances	Does not point to a particular credit limit	There is no fiscal impact of setting the credit limit. Fiscal costs would only materialise if the Government decided to purchase credits during the third carbon budget period.
Social circumstances	Does not point to a particular credit limit	Ultimately, the social impact of the credit limit, including the impact on fuel poverty, depends on whether credits are actually be used to meet the third carbon budget. On current projections, the UK is on track for the budget and so the choice of credit limit has no direct social impact.
Energy policy	Does not point to a particular credit limit	The impact on energy policy and supplies depends on whether credits would actually be used to meet the third carbon budget. On current projections, the UK is on track for the budget and so the choice of credit limit has no direct energy supply impact.
Differences between England, Scotland, Wales and Northern Ireland	Mixed	<p>The decision is not devolved. To set the credit limit is a reserved matter. The UK Government consulted the Devolved Administrations (DAs) before a decision on the third carbon budget credit limit was made, in accordance with the Act.</p> <p>The Scottish Government agreed with the Committee on Climate Change’s (CCC) recommendation that there</p>

		<p>should be no use of credits to meet the third carbon budget. The Northern Ireland Executive shared this view. The Welsh Government does not have any objection to the UK Government adhering to the CCC's advice.</p> <p>The impact on the DAs depends on whether credits would actually be used to meet the third carbon budget – on current projections the UK is on track for the third carbon budget and so the choice of credit limit has no direct impact.</p>
International and European circumstances	Does not point to a particular credit limit	A non-zero credit limit could signal our support to international credit markets and provide scope to support mitigation actions in other countries through the carbon budget framework. However, disagreeing with the CCC could also have a negative impact on the UK reputation if other countries interpreted it as a reduced commitment to domestic action on reducing emissions.
International aviation and shipping	Does not point to a particular credit limit	International aviation and shipping (“IAS”) emissions are currently not included within scope of the UK’s target to reduce emissions by 80% by 2050 relative to 1990’s base emissions level or carbon budgets. However, the Act states that in setting carbon budgets, the Government must take these emissions into account. The CCC considers that, in practice, the requirement to take IAS emissions into account when setting carbon budgets “means carbon budgets need to allow for emissions from IAS by ensuring that emissions from other sectors are at a level consistent with meeting the overall 2050 target when IAS emissions are included” and has made its recommendation on the level of the third carbon budget on this basis. The third carbon budget was set at the level recommended by the CCC, where this advice took into account IAS emissions. In considering options within this impact assessment for the third carbon budget credit limit, this has been undertaken in the context of complying with the level of this budget.

Annex 2: Overview of the Department of Energy and Climate Change’s Global Carbon Finance (GLOCAF) model

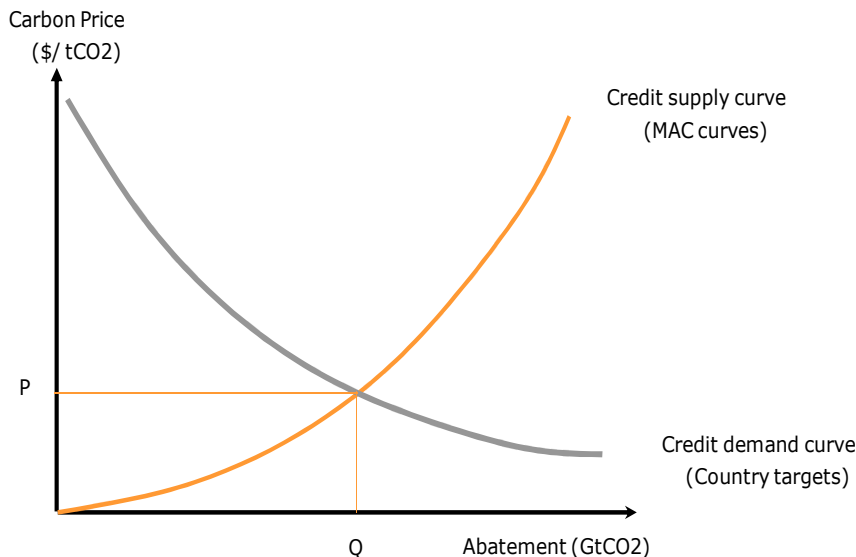
70. The credit price assumptions used in the illustrative scenarios are based on analysis conducted using the Department of Energy and Climate Change (“DECC”)’s GLOCAF model. The model allows the user to evaluate the impacts of different global emissions reduction targets and various specifications of the carbon market design. It covers the years 2020, 2025, 2030 and 2050.

71. In order to estimate of the carbon prices in difference scenarios, GLOCAF uses Business As Usual (BAU) emissions projection and Marginal Abatement Cost (MAC) curves for different regions and sectors. GLOCAF uses data from:

- (i) The POLES energy model: this is a partial equilibrium energy model, which takes into account the costs of different technologies as well as the potential demand feedback effects within the energy system.³¹
- (ii) IIASA’s G4M and GLOBIOM models for forestry sinks and related emissions. These are partial equilibrium models of the forest and land use sectors; they incorporate the opportunity costs of abatement from forestry and land use change.³²
- (iii) The IMAGE model for non- CO₂ emissions; this is also a partial equilibrium model.³³

72. All datasets are at a sectorial level, and apply to a number of regions. GLOCAF models 24 world regions and 27 sectors.

73. At the heart of GLOCAF is a model of the carbon market(s). It compares the supply of carbon abatement or carbon units (driven largely by MAC curves) to the demand for mitigation, (determined by the difference between BAU and regional targets). The model finds the market clearing carbon price where the demand for carbon permits matches their supply for each market. This is done through an iterative process around the carbon price, shown by the chart below.



³¹ <http://www.enerdata.net/enerdatauk/solutions/energy-models/poles-model.php>

³² <http://www.iiasa.ac.at/web/home/research/modelsData/Models--Tools--Data.en.html>

³³ <http://themasites.pbl.nl/models/image/index.php>Welcome to IMAGE 3.0 Documentation>

74. GLOCAF uses the market clearing carbon price to determine how much abatement each region and sector carries out and the associated incremental cost. Using the carbon price and associated trading of carbon permits GLOCAF also determines the resulting international financial flows.
75. There are a number of limitations of GLOCAF modelling:
- (i) In the absence of clear evidence on what global carbon market will look like post 2020, the credit prices have been based on the assumption of a fully efficient global market. In reality, a global carbon market is likely to develop more gradually through linking between regional markets. Such gradual development may mean that markets are collectively less effective than a global market at targeting least cost mitigation opportunities, and so credit prices could vary as a result of differences in geographical or sectoral scope.
 - (ii) GLOCAF assumes that countries will always choose least-cost mitigation options. This may not always happen in practice.
 - (iii) GLOCAF marginal abatement cost curves only include direct costs of mitigation, and exclude wider macro-economic effects such as impacts on economic growth.
 - (iv) GLOCAF only models specific years (2020, 2025, 2030 and 2050). This means that when dealing with carbon trading, GLOCAF is unable to directly model banking and borrowing of carbon credits from year to year.
 - (v) Although GLOCAF models most major emitting countries individually, it aggregates many smaller emitters into regions, meaning analysis was done at regional rather than country level in many cases.
76. These limitations mean that GLOCAF results should always be considered to be illustrative rather than as forecast of real world outcomes.