Explanatory Memorandum to The Climate Change (Wales) Regulations 2018

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1. **The Climate Change (Interim Emissions Targets) (Wales) Regulations 2018**
2. **The Climate Change (Carbon Budgets) (Wales) Regulations 2018**
3. **The Climate Change (International Aviation and International Shipping) (Wales) Regulations 2018**
4. **The Climate Change (Credit Limit) (Wales) Regulations 2018**
5. **The Carbon Accounting (Wales) Regulations 2018**

This Explanatory Memorandum has been prepared by the Economy, Skills and Natural Resources Group and is laid before the National Assembly for Wales in conjunction with the above subordinate legislation and in accordance with Standing Order 27.1.

Cabinet Secretary's declaration

In my view, this Explanatory Memorandum gives a fair and reasonable view of the expected impact of The Climate Change (Wales) Regulations 2018:

1. The Climate Change (Interim Emissions Targets) (Wales) Regulations 2018
2. The Climate Change (Carbon Budgets) (Wales) Regulations 2018
3. The Climate Change (International Aviation and International Shipping) (Wales) Regulations 2018
4. The Climate Change (Credit Limit) (Wales) Regulations 2018
5. The Carbon Accounting (Wales) Regulations 2018

I am satisfied that the benefits justify the likely costs.

Lesley Griffiths AM
Cabinet Secretary for Energy, Planning and Rural Affairs

6 November 2018

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Glossary

BEIS: UK Government Department for Business, Energy and Industrial Strategy
CCC: Committee on Climate Change
CCRA: UK Climate Change Risk Assessment
CDM: Clean Development Mechanism
CER: Certified Emissions Reduction
CO_2: Carbon dioxide
DECC: UK Government Department for Energy and Climate Change
EV: Electric vehicle
EU-ETS: European Union Emissions Trading System
FTR: Future Trends Report
GDP: Gross Domestic Product
GHGI: Greenhouse Gas Inventory
GVA: Gross Value Added
ICE: Internal Combustion Engine
NWEA: Net Welsh Emissions Account
PHEV: Plug-in Hybrid Electric Vehicle
PV: Present Value
RIA: Regulatory Impact Assessment
SoNaRR: State of Natural Resources Report
UNFCCC: United Nations Framework Convention on Climate Change

PART 1 – EXPLANATORY MEMORANDUM

1. Description

A suite of five regulations are covered within this Explanatory Memorandum and are referred to collectively as the Climate Change (Wales) Regulations 2018. Under Part 2 of the Environment (Wales) Act 2016 ("the Act") Wales committed to reducing emissions of greenhouse gases from Wales by at least 80% in 2050. These regulations establish a system of interim emissions targets and carbon budgeting to create an emissions reduction trajectory towards the 2050 target. They also set out how the Welsh Ministers can utilise international carbon credits and provide for how we will deal with emissions from international shipping and internal aviation in calculating our emissions.

2. Matters of special interest to the Constitutional and Legislative Affairs Committee

Under section 44(3) of the Act the Committee on Climate Change is appointed as an independent advisory body. Section 49 of the Act requires that before exercising any regulation-making power under Part 2 the Welsh Ministers first obtain advice from the advisory body and take that advice into account. Under section 49 (6) of the Act, if thereafter the Welsh Ministers propose making different provision from that recommended by the advisory body, they must also lay before the National Assembly a statement setting out the reasons why. The Welsh Ministers have obtained and accepted the advice of the advisory body in relation to the Climate Change (Wales) Regulations 2018 now laid before the Assembly.

The Carbon Accounting (Wales) Regulations 2018 utilise the UK Registry to host the Welsh credit account. The UK Registry is governed by Commission Regulation (EU) 389/2013 establishing a union registry pursuant to Directive 2003/87/EC establishing a system for greenhouse gas emissions trading within the European Union. In a Technical Note of 12 October 2018, the UK Government confirmed that in the event of 'no deal' there is a risk that the UK will not maintain access to the registries system, established under this EU legislation.[1] The UK Government is considering contingency measures for this scenario and will issue further advice later in 2018. The Welsh Ministers may need to amend the Carbon Accounting (Wales) Regulations 2018 to make alternative provision for registering and keeping track of carbon units held by the Welsh Ministers in those circumstances.

[1] https://www.gov.uk/government/publications/meeting-climate-change-requirements-if-theres-no-brexit-deal/meeting-climate-change-requirements-if-theres-no-brexit-deal#actions-for-businesses-and-other-stakeholders-1

3. Legislative background

The purpose of Part 2 of the Environment (Wales) Act 2016 is to require the Welsh Ministers to meet targets for reducing emissions of greenhouse gases from Wales.

Part 2 puts in place a statutory emissions reduction target that requires the Welsh Ministers to ensure that net emissions of greenhouse gases in Wales, for the year 2050, are at least 80% lower than the baseline.

Part 2 also requires that the Welsh Ministers, by regulations approved by the National Assembly, set interim emissions reduction targets for the years 2020, 2030 and 2040, and establish a system of 5 yearly carbon budgeting that together create an emissions reduction pathway to the 2050 target.

Part 2 also confers powers on the Welsh Ministers in relation to a number of regulations to support delivery of the Act, namely:

The Climate Change (Interim Emissions Targets) (Wales) Regulations 2018
Section 30 (1) requires the Welsh Ministers set emissions reduction targets for the years 2020, 2030 and 2040. Section 30(4) requires this to be done before the end of 2018.

The Climate Change (Carbon Budgets) (Wales) Regulations 2018
Section 31requires the Welsh Ministers create a system of 5 yearly carbon budgets. The first two budgetary periods for the time periods 2016–2020 and 2021–2025 must be set before the end of 2018.

The Climate Change (International Aviation and International Shipping) (Wales) Regulations 2018
Under section 35 the Welsh Ministers may make provision for how emissions of greenhouse gases from international aviation and international shipping count as Welsh emissions of the gas. These regulations make that provision.

The Climate Change (Credit Limit) (Wales) Regulations 2018
Section 33 provides that the Welsh Ministers must limit how many traded carbon units can be credited to the net Welsh emissions account in a given period. These regulations make that provision.

The Carbon Accounting (Wales) Regulations 2018

Section 36 provides that the Welsh Ministers may by regulations define what type of carbon unit may be utilised in the net Welsh emissions account and for how those units may be used in the account.

Procedures for laying regulations

The regulations are subject to the approval of the National Assembly for Wales via the affirmative procedure.

In accordance with Section 49, before laying draft regulations the Welsh Ministers are required to request and take into account the advice of the advisory body. By virtue of no declaration being made by Welsh Ministers appointing an advisory body, Section 44 by default appoints the Committee on Climate Change (CCC) to be our statutory advisory body. Where regulations make different provision to the advice provided by the CCC, the Welsh Ministers must lay a statement before the National Assembly setting out the reasons why.

The Climate Change (Wales) Regulations 2018 follow the advice of the advisory body. In its original advice, the CCC advised against placing a limit on the use of emissions credits in legislation to allow maximum flexibility for unforeseen circumstances. However, Section 33 of the Act requires Welsh Ministers to set a limit in regulations. Following further correspondence, the CCC confirmed it believes the proposed limit for the first carbon budget "would provide sufficient flexibility, whilst meeting [the] statutory duty under the Act." Although not required by the Act, the Decarbonisation Ministerial Task and Finish Group has committed to seeking the CCC's advice before using offset credits in relation to the first carbon budget or 2020 target.

In 2017, following calls for evidence, the CCC provided their advice to Welsh Ministers in two parts. The first report, 'Advice on the design of Welsh carbon targets', was published in April 2017. This report provided the advisory body's views on:

- How carbon units should be used in relation to the EU Emissions Trading System (EU-ETS) and the overall design of the Welsh targets, and
- The inclusion of emissions from international aviation and international shipping.

The second report, 'Building a low-carbon economy in Wales – Setting Welsh carbon targets', was published in December 2017. This report provided the advisory body's views on:

- The level of interim targets
- The level of the first two carbon budgets, and
- The limit for the use of offset credits.

In giving their advice on the level of the targets and budgets the CCC consider different emissions scenarios across all sectors of the economy.[2] The CCC developed 'Minimum' feasible emissions reduction scenarios for each sector that reflect Wales' contribution to the CCC's Central scenario for the UK and are consistent with the existing statutory UK carbon budgets. They also developed 'Maximum' reduction scenarios for each sector that reflect the CCC's assessment of Wales' greatest feasible emissions reduction to 2050.

The levels the CCC then recommended are based on a combination of the 'Minimum' and 'Maximum' sectoral scenarios to ensure an overall reduction of at least 80% in 2050. In creating the sectoral scenarios and reaching its recommended interim targets, the CCC generated estimates of annual emissions for a number of years. The CCC used these estimates to reach its recommended levels for the first two carbon budgets.

Well-being of Future Generations (Wales) Act 2015 and Prosperity for All

The Well-being of Future Generations (Wales) Act ensures we consider the social, cultural, economic and environmental impacts of our decisions, both now and long-term. The Act requires us, alongside other Welsh Public Bodies, to achieve seven well-being goals to ensure we are all working to the same purpose for the future generations of Wales. The goals are to create a prosperous Wales, a resilient Wales, a healthier Wales, a Wales of cohesive communities, a Wales of vibrant culture and Welsh language, and a globally responsible Wales. In order to ensure we maximise our contribution to all the well-being goals, twelve well-being objectives were set within our national strategy Prosperity for All, which are mapped across the goals. Under our responsibilities within the Act, we also need to ensure that our decisions and actions are undertaken following a 'sustainable development principle'. To show how we have applied this

[2] Power, buildings, industry, surface transport, aviation and shipping, agriculture, land use, land use change and forestry, waste and F-gases.

principle we need to ensure we consider the long-term impacts of decisions and how we prevent problems occurring, ensure integration, work in collaboration and involve interested parties.

In Wales, we recognise climate change as one of the biggest threats our future generations will face and understand the important role reducing emissions has in creating a more positive social, cultural, economic and environmental future for our country. In all decisions around the legislation we have ensured we applied the above ways of working and considered how the action can help both achieve our well-being objectives and contribute to the organisation's maximisation of the well-being goals. Our methodology and findings are explored within the 'Consultation' and 'Reducing the impacts of climate change' sections.

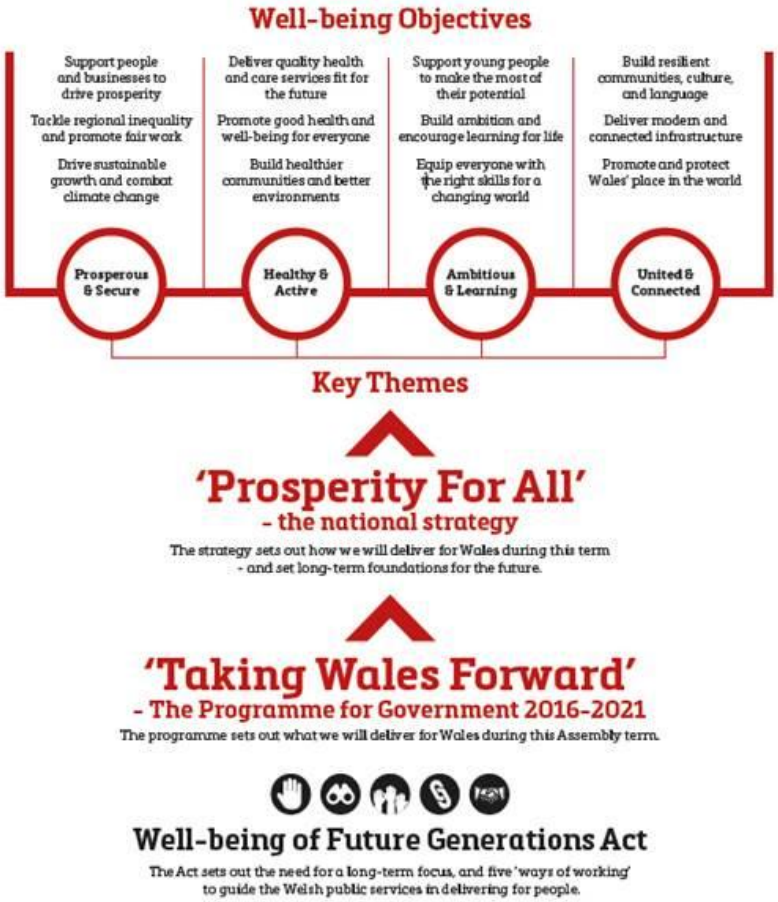

Figure 1: Welsh Government Well-being Objectives

4. Purpose and intended effect of the legislation

The Climate Change (Interim Emissions Targets) (Wales) Regulations 2018

Current

Until the Environment (Wales) Act 2016, Wales did not have a specific legislative framework for emissions reduction and therefore Wales has not had statutory targets.

Purpose

The purpose of this regulation is to set decadal targets that represent a pathway to the 2050 target established in the Act. The Welsh Ministers must set each interim target at a level that they are satisfied is consistent with meeting the 2050 emissions target established in the Act. They must also have regard to the following:

- The most recent report under section 8 on the state of natural resources in relation to Wales
- The most recent future trends report under section 11 of the Well-being of Future Generations (Wales) Act 2015
- The most recent report (if any) under section 23 of that Act (Future Generations report)
- Scientific knowledge about climate change
- Technology relevant to climate change
- EU and international law and policy relating to climate change (including international agreements on measures designed to limit increases in global average temperatures)

Welsh Ministers must also obtain advice from the CCC and take it into account before making regulations setting the interim targets. In December 2017, the CCC provided their advice to Welsh Ministers on the recommended level of interim targets and the first two carbon budgets.[3]

In giving their advice on the level of the targets and budgets the CCC consider different emissions scenarios across all sectors of the economy.[4] The CCC developed 'Minimum' feasible emissions reduction scenarios for each sector that reflect Wales' contribution to the CCC's Central scenario for the UK and are consistent with the existing statutory UK carbon budgets. They also developed 'Maximum' reduction scenarios for each sector that reflect the CCC's assessment of Wales' greatest feasible emissions reduction to 2050. The levels the CCC then recommended are based on a combination of the 'Minimum' and 'Maximum' sectoral scenarios to ensure an overall reduction of at least 80% in 2050.

Having considered the CCC's advice along with other evidence, including modelling from our Wales 2050 Calculator and the Well-being of Future Generations 'Future Trends Report', the purpose of this regulation is to accept the CCC's recommendations by setting the following targets:

- a 2020 target for an emissions reduction of 27% on 1990 levels
- a 2030 target for an emissions reduction of 45% on 1990 levels
- a 2040 target for an emissions reduction of 67% on 1990 levels

[3] https://www.theccc.org.uk/publication/building-low-carbon-economy-wales-setting-welsh-carbon-targets/

[4] Power, buildings, industry, surface transport, aviation and shipping, agriculture, land use, land use change and forestry, waste and F-gases.

Following this pathway to 2050 provides the best balance between cost to the Welsh taxpayer and potential contribution to achieving our well-being goals and objectives. It allows for the most achievable low-carbon transition, given Wales' emissions profile.

This regulation must be set before the end of 2018.

Intended effect

The combination of targets and carbon budgets provides an effective response to limit global increases in temperature by setting out both a long-term pathway to 2050 (interim targets) and limiting the total cumulative emissions to the atmosphere in the intervening years (carbon budgets).

The Climate Change (Carbon Budgets) (Wales) Regulations 2018

Current

Until the Environment (Wales) Act 2016, Wales did not have a specific legislative framework for emissions reduction and therefore Wales has not had carbon budgets.

Purpose

A carbon budget sets a maximum limit on the total amount of Welsh emissions permitted over a 5-year budget period. The first budget period runs from 2016 to 2020, with subsequent budgets covering successive 5-year periods to 2050. The Welsh Ministers must set each carbon budget at a level that they are satisfied with meeting:

- The 2050 emissions target
- The interim target for any interim target year that falls within or after that budgetary period

They must also have regard to the following:

- The most recent report under section 8 on the state of natural resources in relation to Wales
- The most recent future trends report under section 11 of the Well-being of Future Generations (Wales) Act 2015
- The most recent report (if any) under section 23 of that Act (Future Generations report)
- Scientific knowledge about climate change
- Technology relevant to climate change
- EU and international law and policy relating to climate change (including international agreements on measures designed to limit increases in global average temperatures)

Welsh Ministers must also request advice from the CCC and take it into account before setting carbon budgets in regulations. In December 2017, the CCC provided their advice to Welsh Ministers on the recommended level of interim targets and the first two carbon budgets.[5] In creating the sectoral scenarios and reaching its recommended interim targets, the CCC generated estimates of annual emissions for a number of years. The CCC used these estimates to reach its recommended levels for the first two carbon budgets. Having accepted the CCC's recommended interim targets, the purpose of this regulation is to accept the CCC's recommended levels for the first two carbon budgets:

- First Carbon Budget (2016 – 2020): an average of 23% below 1990 emissions
- Second Carbon Budget (2021 – 2025): an average of 33% below 1990 emissions

[5] https://www.theccc.org.uk/publication/building-low-carbon-economy-wales-setting-welsh-carbon-targets/

This regulation must be set before the end of 2018.

Intended effect

The combination of both targets and carbon budgets provides an effective response to limit global increases in temperature by setting out both a long-term pathway to 2050 (interim targets) and limiting the total cumulative emissions to the atmosphere in the intervening years (carbon budgets).

The Climate Change (International Aviation and International Shipping) (Wales) Regulations 2018

Current

Until the Environment (Wales) Act 2016, Wales did not have a specific legislative framework for emissions reduction and therefore Wales has not had any statutory commitments relating to emissions from international aviation and shipping. Emissions from international aviation and shipping were not included in previous policy targets.

Global emissions of carbon dioxide from aviation and shipping are growing at a combined rate of 3-5 percent annually.[6] Direct emissions from aviation account for about 3% of the EU's total greenhouse gas emissions. A large majority of these emissions comes from international flights. Global maritime transport emits around 1000 million tonnes of CO_2 annually and is responsible for about 2.5% of global greenhouse gas emissions.[7]

Purpose

The purpose of the regulation is to include the Welsh share of emissions from international aviation and international shipping as part of our accounting framework through the NWEA.

Intended effect

Including these emissions within Wales' national emissions target has the following intended effect:

- Compliance with statutory advice. This approach would be in line with the CCC advice.
- Transparency. Demonstrating that Welsh Ministers are taking account of all emissions in Wales, including our contribution towards international aviation and international shipping emissions.
- Global responsibility. Reporting emissions from international aviation and international shipping demonstrates Welsh Ministers' support for curbing global emissions from these sources.

The intent of the regulation is to ensure that emissions arising from international aviation and international shipping in Wales are accounted for within the NWEA on the basis of bunker fuel sales. Estimates of bunker fuel sales for Wales are currently estimated within the National Atmospheric Emissions Inventory and the UK wide figures are reported to the UNFCCC as a memo item. Evidence suggests that bunker fuels sales is a good proxy for a country's share of international transport emissions.[8]

The intention of including these emissions within our account is to provide a clearer and more transparent approach to accounting for Welsh emissions and to support global efforts to reduce

[6] http://newsroom.unfccc.int/unfccc-newsroom/shipping-aviation-and-paris/
[7] http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Greenhouse-Gas-Studies-2014.aspx
[8] Chapter 2 of CCC (2012) Scope of carbon budgets – Statutory advice on inclusion of international aviation and shipping: https://www.theccc.org.uk/publication/international-aviation-shipping-review/

emissions in this sector. However, the CCC highlights that inclusion of these sources within our emissions targets does not automatically mean that strong carbon policies should be enacted at national level to limit them. They conclude that appropriate approaches to reducing international aviation and shipping emissions are at the global, or possibly EU, level rather than unilateral action at the country level. It is the intent of these regulations to encourage Wales to pursue cost-effective policies to reduce emissions in these sectors through appropriate international action and not necessarily through unilateral action in Wales.

The Climate Change (Credit Limit) (Wales) Regulations 2018

Current

Until the Environment (Wales) Act 2016, Wales did not have a specific legislative framework for emissions reduction targets and therefore we have not needed to use offsetting as a mechanism to comply with targets.

Purpose

The Act requires Welsh Ministers to set a limit on the total amount that the NWEA can be reduced through the use of carbon units. The Carbon Accounting (Wales) Regulations 2018 defines carbon units as the international offset credits generated through Certified Emission Reduction (CER). Offset credits provide a means by which Wales can invest in emission reduction activities overseas and use the emission reductions achieved to offset domestic emissions within the Welsh targets.

This regulation sets this limit on the use of carbon units for the first carbon budget period.

The level of permitted offsets provides a statement of the level to which Wales' targets are to be met through domestic action versus overseas offsetting. A limit is required in recognition of the need to ensure that business and wider sectors in Wales have certainty in the level of domestic emissions reduction to which we are committed.

Intended effect

This regulation is intended to set a limit on the use of offset credits for the first carbon budget, balancing issues of cost, clarity in domestic policy intent and the advice received from the CCC with the need to provide adequate flexibility to account for unexpected volatility in Welsh emissions.

In their 2017 advice the CCC recommended that any economy-wide use of offset credits to provide flexibility should be small. However, they recommended that additional flexibility is introduced to account specifically for significant unforeseen increases in industrial activity in Wales. The advice did not recommend placing a specific limit on the use of emissions credits in legislation because doing so would limit the flexibility to allow higher offset use in the case industrial emissions are significantly greater than anticipated.

However, Welsh Ministers have a statutory duty to set a specific limit on the use of offset credits in regulations. This regulation therefore sets a limit of 10% of the first carbon budget. This limit is expected to provide sufficient flexibility to account for industrial sector flexibility, based upon a historical assessment of variability in Welsh industrial sector emissions. Following further correspondence, the CCC confirmed it believes the proposed 10% limit for the first carbon budget "would provide sufficient flexibility, whilst meeting [the] statutory duty under the Act." Although not required by the Act, the Decarbonisation Ministerial Task and Finish Group has committed to seeking the CCC's advice before using offset credits in relation to the first carbon budget or 2020 target.

The Carbon Accounting (Wales) Regulations 2018

Current

Until the Environment (Wales) Act 2016, Wales did not have a specific legislative framework for emissions reduction, although we had two policy targets as described in the Climate Change Strategy for Wales 2010.[9] Part 2 of the Act sets the context for the operation of the NWEA and begins by including all emissions in Wales.

Purpose

This regulation sets out what is to be counted as a carbon credit (carbon unit) for the purposes of accounting and how they are to be administered.

Intended effect

The purpose of the regulation is to define the type of carbon unit which may be counted towards our targets and budgets. This will be used to determine compliance with the targets and budgets established by the Act. The regulation also aims to make the process of administering and using these carbon units robust and transparent by setting out formal administrative processes in relation to the government's purchase and use of carbon units, and how units are to be credited to the NWEA.

Carbon units

There are two main routes by which carbon units can currently be generated and which dominate global offsetting practice. They are:

- The Compliance Market: A regulated market defined by international rules and a legal framework set out by the United Nations Framework Convention on Climate Change (UNFCCC) under the Kyoto Protocol and/or the EU-ETS. This type of market includes Certified Emission Reduction (CER) units generated through the Clean Development Mechanism (CDM).
- The Voluntary Market (or non-Compliance Market): Credits on the voluntary market are typically not regulated by any formal legal frameworks and have been developed separately from government targets and policies.

The Act makes provision for Wales to create its own offsetting scheme, which could align with existing activity such as Wales for Africa.

Following the policy decisions around treatment of the EU-ETS (see The Carbon Accounting (Wales) Regulations 2018), the units designated in this regulation only permits CERs issued under Article 12 of the Kyoto Protocol to be credited to the NWEA.

Administration

The effectiveness of the offset schemes depends upon accurate record keeping. The EU legislated for this within the Registries Regulation. To ensure accurate accounting of carbon units, each member state operates a registry in the form of a standardised electronic database and also appoints a national administrator.

This regulation establishes a "Welsh credit account" through adapting the UK Registry, which is run by the Environment Agency. The Welsh credit account creates a formal transparent system in which carbon units must be held by the Welsh Ministers. The regulation provides a mechanism for returning carbon units which have been transferred into the credit account in error to the account from which they were originally transferred.

[9] https://gov.wales/topics/environmentcountryside/climatechange/emissions/climate-change-strategy-for-wales

The regulation also aims to provide Welsh Ministers with the power to delegate the functions of this regulation to another person to administer on behalf of the Welsh Ministers.

Crediting the Net Welsh Emissions Account (NWEA)

The regulation specifies the conditions that need to be met in order for a carbon unit to be credited to the NWEA. This includes a requirement that to be credited a carbon unit must be cancelled to ensure it is no longer available to offset further emissions. The regulation also specifies that Welsh Ministers must not use carbon units that have to their knowledge been used previously to offset emissions elsewhere and should therefore have previously been cancelled.

The regulation requires Welsh Ministers to maintain a register of all transactions containing information about the carbon units credited to the NWEA.

5. Consultation

As required by the Act, the Welsh Ministers asked the CCC to provide advice to inform the development of these regulations. The CCC ran public Calls for evidence, as well as stakeholder events that were supported by the Welsh Government, to capture the views of organisations and individuals on matters relevant to the Regulations. The CCC provided its advice in two parts:

CCC advice Part 1: Advice on the design of Welsh carbon targets. This advice focused on defining the NWEA, including the approach to offsetting and international aviation and shipping (published April 2017).

The Call for evidence ran from 16 December 2016 until 6 February 2017.[10] It set out a number of questions on the following topics:

- Form of emissions targets and carbon accounting framework
- Role for emissions trading and implications for the competitiveness of Welsh industry
- Scope of emissions targets

The Welsh Government and CCC ran a stakeholder event to publicise the Call for evidence on 26 January 2017 with representatives from private industry, academia and the public sector. There were 11 formal responses to the Call for evidence.[11]

CCC advice Part 2: Building a low-carbon economy in Wales – Setting Welsh carbon targets. This advice focused on setting the level of interim targets and carbon budgets (published December 2017).

The Call for evidence ran from 6 July 2017 until 11 September 2017.[12] It set out a number of questions on the following topics:

- Climate science and international circumstances
- The path to 2050
- Emissions targets and action
- Wider considerations

[10] https://www.theccc.org.uk/2016/12/16/call-for-evidence-welsh-carbon-budgets/
[11] https://www.theccc.org.uk/2017/03/09/responses-to-the-environment-wales-act-consultation/
[12] https://www.theccc.org.uk/welsh-carbon-budget-call-for-evidence/

The Welsh Government and CCC ran two stakeholder events during the period: one in Cardiff on 6 July 2017 and one in Deganwy on 13 July 2017, with around 50 delegates attending in total. There were 15 formal responses to the Call for evidence.[13]

Cabinet agreed with the CCC's advice and the Cabinet Secretary for Energy, Planning and Rural Affairs issued two Written Statements to that effect.[14] The advice did not recommend placing a specific limit on the use of emissions credits in legislation because doing so would limit the flexibility to allow higher offset use in the case industrial emissions are significantly greater than anticipated. However, Welsh Ministers have a statutory duty to set a specific limit on the use of offset credits in regulations. Following further correspondence, the CCC confirmed it believes the proposed 10% limit for the first carbon budget "would provide sufficient flexibility, whilst meeting [the] statutory duty under the Act."

[13] https://www.theccc.org.uk/publication/building-low-carbon-economy-wales-setting-welsh-carbon-targets/
[14] https://gov.wales/about/cabinet/cabinetstatements/2017/carbonbudgetingframework and https://gov.wales/about/cabinet/cabinetstatements/2018/emissionsreductionandcarbonbudgets

Part 2 – Regulatory Impact Assessment

Introduction

As set out above, the role of the regulations is to set the emissions accounting framework, including the definition and limit on the use of carbon units, the approach to international aviation and international shipping emissions and the levels of the interim targets and first two carbon budgets. The regulations do not set the policy action to meet the targets or budgets, the detail of which will be set out in subsequent reports. The report which sets out the policies to meet the first carbon budget will be published in March 2019.

Background

The Act requires that for the year 2050, Wales achieves at least an 80% reduction in the NWEA compared to 1990 levels. However, the Act provides that a number of details regarding the coverage and operation of the NWEA, and the levels of interim targets and carbon budgets are set in regulations. The following provides details of the evidence and options considered for each regulation in reaching the final decision.

The Climate Change (Interim Emissions Targets) (Wales) Regulations 2018

This regulation sets interim emissions reduction targets for the years 2020, 2030 and 2040.

The Act requires that for the year 2050, Wales achieves at least an 80% reduction in the NWEA compared to 1990 levels. The Act requires Welsh Ministers to set a level for the interim targets at 2020, 2030 and 2040 and the first two carbon budgets (2016-2020 and 2021-2025). Section 32 of the Act requires the interim emissions reduction targets to be set at a level which is consistent with meeting the 2050 target. Welsh Ministers must have also regard to a number of matters when setting the targets, including scientific knowledge, technology, international agreements on climate change, the most recent Future Trends and Future Generations Reports, the most recent State of Natural Resources Report and advice from the CCC.

We have considered a number of pathways to ensure the interim targets and the first two carbon budgets are set at a level that will enable us to achieve our 80% reduction target in 2050. In order to analyse and model the most achievable pathway to at least 80% emission reduction in 2050 and therefore identify the costs and impacts, high-level assumptions have been made around policy interventions and the sectors in which they will occur. These have been based upon:

- Advice from the CCC
- The Well-being of Future Generations ‘Future Trends Report’
- The Natural Resources Wales ‘State of Natural Resources Report’ (SoNaRR)
- Scottish and UK climate change policies and international evidence on climate change
- Our Wales 2050 Calculator modelling
- Costs explored within the Stern review
- Costing modelling from external contractors and consideration of existing costing on climate change mitigation
- Modelling of impacts mapped to our well-being objectives and the well-being goals as set out by the Well-being of Future Generations Act (2015)
- Evidence of impacts of climate change mitigation elsewhere

Options

These regulations set the strategic decarbonisation framework and the detailed impacts and costs of delivering the required emission reductions will not be known until the portfolio of policies are developed. However, the evidence above allows us to consider the costs and high-level impacts of potential interventions around the pathways. The monetisation of emissions reduction measures is provided as an illustration only and is based on knowledge of theoretically achievable options, which are assumed to be deliverable from a technical perspective. There is a high degree of uncertainty around resulting electricity demand changes, the costs and availability of emissions reductions technologies and energy prices.

The costs and impacts explored within this assessment are therefore based on assumptions and potential inventions within high emitting sectors in Wales outlined in National Atmospheric Emissions Inventory and not necessarily the actual costs and impacts or the interventions we may follow.

The costs and benefits for each of the provisions set out in this RIA have been assessed relative to a baseline "business as usual" option (Option 1), based on an extrapolation of the historic trend of Welsh emissions from 1990 to 2014. It is not a 'do nothing' pathway but rather maintains the existing level of action in Wales and the UK onwards to 2050. It is not a legally viable option as it does not deliver the 80% target. Nonetheless we have included this to provide a baseline against which to assess the other options.

- **Option 1:** Baseline – no further policies (not legally viable)
- **Option 2:** A pathway modelled through the Wales 2050 Calculator based on advice from the CCC designed to achieve their 80% pathway
- **Option 3:** A pathway modelled through the Wales 2050 Calculator based upon advice from the CCC on what would be the maximum technically feasible pathway
- **Option 4:** A pathway created through the Wales 2050 Calculator model which provides an alternative route to deliver the 2050 target

In addition to quantified costs and benefits, other impacts of the potential pathways have been analysed using the policy intervention assumptions. In line with our responsibilities under the Well-being of Future Generations Act (Wales) 2015, we have considered the social, cultural, economic and environmental impacts of the potential actions, and opportunities to maximise value in the context of our well-being goals and objectives.

The RIA has been informed by work undertaken by independent consultants. The consultants' performed an assessment of the potential costs and benefits for setting the regulations. They also developed a methodology for considering and analysing the other impacts of options and opportunities to maximise value in the context on the well-being goals. The costs and benefits have been considered alongside evidence of other cost estimates, such as Scottish and UK Government costings, the Stern Review and CCC advice.

Advice from the Committee on Climate Change (CCC)

In December 2017, the CCC provided their advice to Welsh Ministers on the recommended level of interim targets and the first two carbon budgets.[15] The CCC recommended that we adopt a flexible percentage-based target approach because percentage reduction targets will generally be more robust to changes in the greenhouse gas emissions inventory. It suggested that this could be done by defining the budget as: "an average percentage reduction to be achieved across the five year period, based on 1990 levels".

[15] https://www.theccc.org.uk/publication/building-low-carbon-economy-wales-setting-welsh-carbon-targets/

In preparing their advice the CCC developed one main emissions reduction pathway (the Wales 80% pathway). This was aimed at achieving the statutory 2050 target of at least an 80% reduction in 2050 and was based on cost-effectiveness where possible.

The CCC also explored a range of other pathways that delivered between 76% and 85% reduction in 2050. The reduction of 76% in 2050 is the CCC's assessment of Wales's contribution to meeting a cost-effective 80% reduction across the UK but would not allow us to meet our legislative 80% target. The 85% reduction in 2050 is the maximum reduction potential identified for Wales.

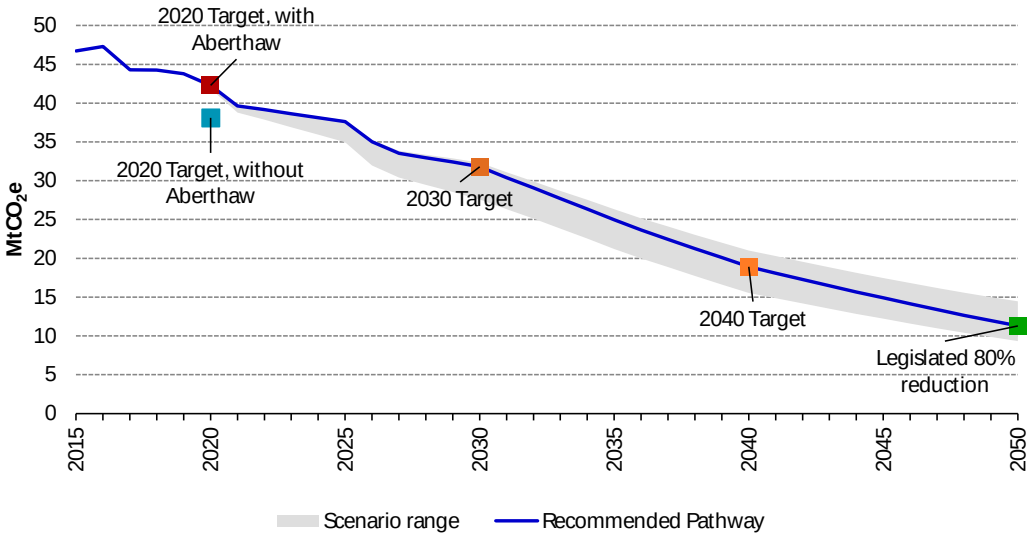

Figure 2: The CCC's 80% pathway and range

Evidence considered

Well-being of Future Generations Future Trends report

The recommended pathway for Wales promotes a range of policies and activities which are required to counter the negative trends highlighted by the FTR, such as supporting the transition to a low carbon industrial sector and the rollout of low emission transport and heat. It encourages policies which capitalise on some of the opportunities identified, such as the untapped growth potential to generate energy.

In addition to supporting the recommended pathway for Wales, the findings of the FTR will also be a useful tool for policy makers and Ministers in developing the policies and proposals for each carbon budget period.

State of Natural Resources Report (SoNARR)

The SoNaRR categorises variability and change in climate as a direct driver of change, which has had significant impact on the state of our natural resources. The SoNaRR highlights the risks and opportunities related to the changing climate, with the risks significantly outweighing the opportunities, and re-enforces the fundamental reason why the emissions reduction provisions are included in the Act.

International and scientific evidence on climate change

The Paris Agreement's central aim is to strengthen the global response to the threat of climate change by keeping average global temperature rise this century well below 2 degrees Celsius

above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. In the setting of interim targets and carbon budgets, Welsh Ministers must have regard to "EU and international law and policy relating to climate change (including international agreements on measures designed to limit increases in global average temperatures)".

On the basis that each nation in the world has an equal per capita share of the remaining global carbon budget, it is possible to estimate the UK and Welsh contribution to a 1.5°C future. For the UK, the CCC concluded that the aims of the Paris Agreement would entail a steeper downward path (86-96% below 1990 levels) than implied by the current UK 2050 target, which was set on the basis of achieving a 2 degrees Celsius goal. For Wales, the range of per-capita emissions levels for 1.5°C would imply reductions of between 92% and 98% by 2050.

However, the CCC concluded the current legislated requirement for a reduction in Welsh emissions of at least 80% in 2050 is more stretching than the equivalent reduction at UK level (as a share of a UK 80% target Wales would contribute a 76% reduction) and close to the maximum feasible reduction identified in their scenarios. For these reasons, its assessment is that it is not sensible to plan for Welsh emissions on a production basis reaching as low a per-capita level by 2050 as those for the UK as a whole.

Furthermore, the current Welsh target specifies a reduction of "at least 80%", and therefore does not preclude going beyond 80%. This approach is consistent with the ratchet mechanism introduced by the Paris Agreement to encourage greater action over time. The EU (on behalf of Wales, the UK and the other EU nations) has currently pledged to reduce its emissions by at least 40% below 1990 levels by 2030. In comparison, the CCC has recommended that Wales sets a 2030 target of -45%.

The CCC also concluded that once the evidence base has been strengthened with regard to the implications of the Paris Agreement for the levels of domestic targets, the Committee could provide further advice on whether to increase the legislated 2050 ambition. The recent Intergovernmental Panel on Climate Change (IPCC) Special Report on Global Warming of 1.5°C was published on 8 October 2018 and contains the most up-to-date assessment of the science on impacts relating to global warming of 1.5°C and associated greenhouse gas emissions pathways.[16] This report is the best assessment of all currently available knowledge on the subject. The report found that the world is already 1°C warmer than in pre-industrial times, with many regions experiencing even greater warming, and that at current rates of warming we would reach 1.5°C by around 2040, which would result in serious negative impacts for humans and the environment. We have issued a joint letter with the UK Government and Scottish Government to the CCC, seeking its advice to understand the impact of the IPCC report on long-term targets in the UK.[17]

Technology relevant to climate change

The technology choices are system-wide, covering all parts of the economy and all greenhouse gas emissions. The scientific and engineering realities which underpin these choices, including what is physically and technically possible in each sector, are considered throughout the evidence base. However, there are uncertainties when looking to the future.

Knowledge of technology underpins the assessment of feasible emissions reductions, and plausible pathway scenarios. The cost-benefit analysis presented depends on estimates of the

[16] http://report.ipcc.ch/sr15/pdf/sr15_spm_final.pdf
[17] https://www.gov.uk/government/publications/uk-climate-targets-request-for-advice-from-the-committee-on-climate-change

costs and availability of different technologies. The analysis of emissions pathways to 2050 presented highlights the critical role of uncertainty around key emission reductions technologies.

Economic outlook

The UK has recorded steady Gross Domestic Product (GDP) growth in recent quarters as the recovery from the recent economic downturn continues. However, according to the World Bank's Global Economic Prospects report, after reaching 3.1 percent in both 2017 and 2018, global growth is expected to decelerate over the next two years.[18] Growth in emerging market and developing economies is projected to plateau, reaching 4.7 percent in 2019 and 2020, up from 4.5 percent in 2018.[19]

The Office for Budget Responsibility projects UK growth of 1.5% in 2018, slowing a little more in 2019, then picking up modestly over the subsequent three years, meaning over the next five years an average growth of 1.4%.[20] Annual growth at this level would remain below historic trends.

Cost and benefit estimates

Costs

As with all costs, there will always be uncertainty when looking at the long-term and across different sectors. However, the CCC has provided estimates on the cost of reducing emissions to the Welsh economy. In summary, they estimate that the total cost of following their 80% carbon emissions reduction pathway is around £30bn, over the period to 2050 and compared to a pathway where no new policies are implemented. This cost will not be borne exclusively by the Welsh Government, as this estimate refers to the costs of decarbonising to society as a whole. In reality the costs will be split between the UK Government, the Welsh Government, businesses, public sector and people in Wales.

A review of cost estimates from other sources concluded that when costs are expressed as a percentage of GDP, they appear to be consistent. It is estimated that the UK can implement an affordable (approximately 1% of GDP) 35-year transition to a low carbon energy system by developing, commercialising and integrating known but currently underdeveloped solutions.[21] The Scottish Government estimates the cost of an 80% emission reduction of Scottish emissions to amount to around 2% of Scottish GDP.[22] These estimates are in line with the Stern Review, which estimated the annual cost of climate change mitigation to the global economy is in the region of -1% (net gains) to 3.5% of annual global GDP by 2050, whereas unabated climate change could cost the world at least 5% of GDP and if more dramatic predictions come to pass, the cost could be more than 20% of GDP.[23]

Benefits

The UK Government has a set of carbon values, provided as part of HM Treasury's Green Book, which are designed for use in policy appraisal and evaluation. These are known as the BEIS carbon value.[24] The carbon value attempts to monetise the benefits gained from reduced greenhouse gas emissions and energy use. The CCC used the BEIS carbon value to provide an

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[18] http://www.worldbank.org/en/publication/global-economic-prospects
[19] http://www.worldbank.org/en/publication/global-economic-prospects
[20] http://obr.uk/efo/economic-fiscal-outlook-march-2018/
[21] https://s3-eu-west-1.amazonaws.com/assets.eti.co.uk/legacyUploads/2015/02/Targets-technologies-infrastructure-and-investments-preparing-the-UK-for-the-energy-transition.pdf
[22] Scottish Government Draft Climate change plan (2017, p24) available at https://www.gov.scot/Resource/0051/00513102.pdf
[23] Stern Review (2006) http://webarchive.nationalarchives.gov.uk/+/http:/www.hm-treasury.gov.uk/media/4/3/Executive_Summary.pdf
[24] https://www.gov.uk/government/collections/carbon-valuation--2

estimate of the benefits gained by following their 80% reduction scenario. It estimates these to be that Wales' contribution to global carbon emissions reduction worth is valued at £1.0bn per year by 2030.

The CCC analysis shows that by 2030 the value of the greenhouse gas emission reduction under the Wales 80% scenario (£1.0bn or 1.6% of Welsh GDP) would outweigh the costs of the abatement measures (£898m, 1.4% of GDP).[25] Once the abatement measures that lead to cost savings are also factored in (£137m or 0.2% of GDP), the Wales 80% scenario delivers a significant net benefit in 2030 (approximately £250m or 0.4% of GDP).

The CCC has been unable to estimate the benefit beyond 2030 but point out that the BEIS carbon values increase over time and by 2050 the value per tonne of abatement is nearly three times that in 2030. By contrast the average costs of abatement fall between 2030 and 2050, making the net benefit larger in 2050 than in 2030.

Whilst there are many benefits to emissions reduction that can be quantified and have a monetary value attributed to them, there are some that are more difficult to give monetary value but are equally as important. There are long-established links between action to reduce emissions and health, air quality and the environment. The Well-being of Future Generations (Wales) Act 2015 requires us to consider these in greater detail (see Reducing the impacts of climate change).

Comparison of options

Wales 2050 Calculator

The Wales 2050 Calculator was developed by Cardiff University on our behalf to model greenhouse gas emissions in Wales. It is a bespoke modelling tool for Wales based on a structure and methodology established by the former UK Government Department for Economy and Climate Change (DECC) with input from a wide range of experts and adapted to reflect the situation in Wales. The structure and methodology has been used to model UK emissions and has formed the basis for a range of international models at national and sub-national level including Wallonia in Belgium, China, South Korea, Taiwan, India South Africa, Japan and Bangladesh.

Its purpose is to facilitate policy development by modelling a range of choices, reflecting actions which impact on emissions, across the economy with outputs demonstrating the resultant change in emissions over time to 2050. For each choice, four trajectories have been developed, ranging from little or no effort (Level 1) to ambitious changes that push towards the physical or technical limits of what can be achieved (Level 4). The assumptions behind these trajectories are explained. The start date applied to the model is 2010, reflecting data availability in areas such as data on building conditions in Wales. Where available, more recent data has been applied to 2015, such as data on energy infrastructure in Wales. In displaying the results, the 2015 estimates of baseline data are used (1990/1995).

The interactivity of the tool allowed for significant input from policy areas across the Welsh Government in its development. The Calculator can, therefore, be used to model the emissions impact of different combinations of changes in the energy supply sector, energy using sectors, other sources of emissions such as agriculture and carbon stores.

Using technical information provided by the CCC we were able to produce a pathway akin to the CCC's for comparative purposes.

[25] Based on 2017 data for GDP

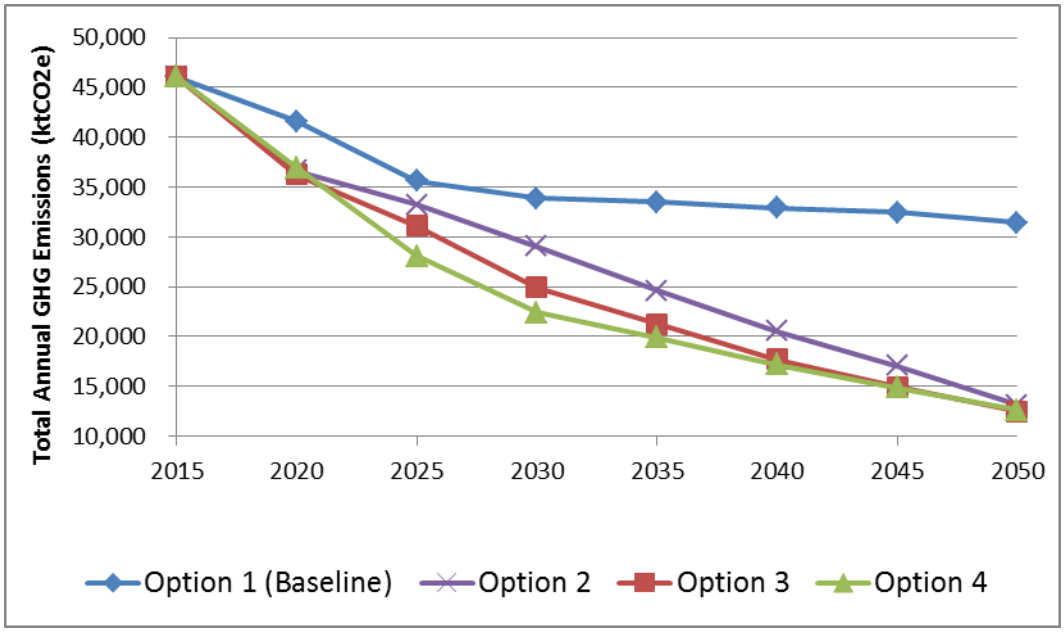

Figure 3: Comparison of predicted emission levels under the four options

Pathway costs methodology

The costs of each pathway have been estimated using a costing model developed specifically for Wales (and based on the Cardiff University Welsh 2050 calculator and outputs). The costs reflect the total costs of emission reduction. The abatement costs for all of the individual measures are aggregated to produce a cost for the sectoral scenario, and then to the economy-wide level. This approach to calculating abatement costs is consistent with HM Treasury's Green Book and DECC's supplementary guidance.

The benefits of each pathway take account of the traded and non-traded value of carbon and are estimated based on reduction. The approach follows the HM Treasury Green Book methodology. The monetary benefits are subtracted from the costs to give the net benefits (or costs) of each pathway.

There are some limitations to estimating pathway costs and benefits, including:

- The portfolio of policies to deliver the interim targets and budget levels is unknown at this stage.
- The monetisation of emissions reduction measures is provided as an illustration only, and is based on knowledge of theoretically achievable options, which are assumed to be deliverable from a technical perspective.
- There is a high degree of uncertainty around resulting electricity demand changes, the costs and availability of emissions reductions technologies and energy prices going out to 2050.
- There are uncertainties when comparing and contrasting different models, which are based on different assumptions and scenarios.
- There are major uncertainties when looking at long-term pathways as there will be changing technologies, costs, actions, markets. These all make it hard to accurately assess costs.

Main affected groups

Given the above are the direct costs and benefits from Options 1-4 and given the length of time and uncertainties, it is unclear where costs will fall. We expect the costs to be borne by:

- Welsh Government
- UK Government
- Local government
- Consumers

Costs may fall on the specific sectors implementing the measures, namely:

- Energy sector (including fossil fuels and renewables)
- Transport sector (including passenger and trade aviation and shipping)
- Agriculture and livestock (for example through reduced fertilizer use, manure management)
- Other industry (for example through improved energy efficiency in sectors such as metals, minerals , chemicals, electronics, food and drink, automotive, paper and pulp)
- Waste

Changes in energy generation and a switch to ultra low emissions vehicles, may lead to costs for consumers. These are likely to arise through payment for services (transport, energy) or as part of the expected retirement rate of vehicles. Improvements in energy efficiency should lower emissions and reduce energy bills for businesses and consumers. However, the initial costs here are likely to be borne by the UK and Welsh Governments.

The benefits are indirect benefits, linked to the reduction in emissions and based on the value of carbon across traded and non-traded emissions. This is based on the new methodology adopted by UK Government in 2009, and updated in 2018, and following a target-consistent approach. The values are based on estimates of the abatement costs that will need to be incurred in order to meet specific emissions reduction targets. Other key non-monetised benefits by 'main affected groups' are included under Reducing the impacts of climate change.

Pathways costs analysis

The direct costs (point estimates, Present Value, £2017) are presented below. Included in the table are the actual cost estimates, the approximate additional costs (taking No Policy Intervention to be the baseline) and the annualised additional cost estimate. The final column represents the annual costs of the options versus estimates of the Welsh Gross Value Added (GVA).[26] The annualised costs of Option 2 are estimated to represent around 2% of the GVA for Wales, Option 3 around 3%, while the annualised related costs for Option 4 are estimated to represent around 9% of GVA.

Option	Direct costs (PV, £2017)	Additional costs (PV, £2017)	Annualised additional costs (PV, £2017, pa)	Annualised additional costs as a % of 2017 GVA
Option 1 (Baseline – no further policies)	£208bn	-	-	-
Option 2	£258bn	£50bn	£1.5bn	2%
Option 3	£272bn	£64bn	£1.9bn	3%
Option 4	£396bn	£188bn	£5.7bn	9%

Table 1: Summary of costs[27]

[26] Based on the most recent and provisional figure of £59,585m for Welsh GVA (2016) and assuming that the same percentage increase than for the UK applies from 2016 to 2017 (a 3.8% increase).

[27] Additional costs are any costs incurred as a result of deviating from the policy choices adopted in Option 1 (Baseline – no further policies).

Sector analysis

Option 1: Baseline – no further policies

Capital and operating costs amount to £208bn across the time horizon (2017-2050).

Sectors	Cost[28] (PV, £2017bn)	% of total cost
Power	£19bn	9%
Transport	£163bn	78%
Buildings	£25bn	12%
Agriculture and Livestock	>£1bn	>1%
Industry	>£1bn	>1%
Waste	£1bn	>1%
TOTAL	**£208bn**	

Table 2: Sector costs for Option 1

Options 2-4

An additional £50bn, £64bn and £188bn are incurred in the Option 2, 3 and 4 pathways respectively.

Sectors	Option 2	Option 3	Option 4
Power	£35bn	£40bn	£81bn
Transport	£12bn	£13bn	£89bn
Buildings	£2bn	£5bn	£3bn
Agriculture and Livestock	£1bn	£1bn	£2bn
Industry	£1bn	£5bn	£13bn
Waste	0bn	0bn	0bn
TOTAL	**£50bn**	**£64bn**	**£188bn**

Table 3: Sector costs for Options 2-4

Power

The power sector is forecast to account for over 50% of the costs for the Option 2 and 3 pathways, as well as 43% of the option 4 costs. The roll-out of renewable technology in all three pathways is projected to have a significant impact on cost. In Option 2 around two thirds of all electricity generation costs are attributed to renewables. Wind technologies are the single most costly in the pathway, closely followed by nuclear, solar photovoltaic and hydro.

The additional costs under Option 3 are attributed to the costs of tidal and wave technologies. Tidal and wave generation does not feature in Option 2, whereas in Option 3 these technologies becomes the second most prominent by 2050, as measured by installed capacity.

The additional costs under Option 4 are largely driven by a rapid roll-out of nuclear, substantially larger than in the other options and additional investment in renewable technology. This roll-out of renewable electricity generation is projected to have a substantial impact on aggregate capacity. Peak energy supply is expected to increase as a result, creating a need for additional infrastructure in the grid, further increasing costs.

Transport

Options 2 and 3 assume a steady decline of the Internal Combustion Engine (ICE) vehicle fleet, with active ICE cars approximately halving by 2035 and continuing to decline to 12,000 vehicle units by 2050. ICE vehicles are modelled to be replaced by a combination of Plug-in Hybrid Electric Vehicles (PHEV) and Electric Vehicles (EVs).

[28] Figures rounded to the nearest £1billion, totals may not sum due to rounding.

Meanwhile there are forecast to be far greater additional costs in Option 4. This envisages an increase in the fleet of Hydrogen Fuel Cell vehicles from near-zero levels in the initial period to nearly a million vehicles by 2050. The cost of expanding public transport in all options is forecast to be relatively low, with the largest expense being attributed to rail.

Buildings
In Options 2-4 the additional costs are largely attributable to air-source heat pumps and ground-source heat pumps. The differences in the costs are attributable to the scale of installations, with Options 3 and 4 assuming a greater number of heat pumps than Option 2. Options 3 and 4 assume the same number of heat pumps; the higher costs in Option 3 is attributed to the cost of cooling technologies. Option 4 assumes no new installations of cooling technology such as air conditioning, whereas Options 2 and 3 assume costs in this area.

Agriculture and Livestock
Costs in the Agriculture and Livestock sector are largely made up of bioenergy fuel costs. Options 2 and 3 are identical: no bio-crop production is assumed and bioenergy fuel costs are split between straw, wood waste and manure fuel costs. There are some small abatement costs attached to reduced enteric, manure and soil emissions but these are negligible compare to the bioenergy fuel costs. The additional costs in Option 4 result from a greater reduction in the application of nitrogen fertiliser and greater changes of land management.

Industry
In the Industry sector, the cost estimate is derived from the capital and operating costs of implementing improved energy efficiency technologies. The cost estimates are roughly proportional to the size of each industry, with the metals industry and the food and drink manufacturing industry accounting for around a third of total direct costs across the Industry sector.

Under Option 3 costs are estimated at £4bn higher than Option 2, with most of these costs attributed to increased implementation of energy efficiency technology. Under Option 4 total direct costs are even higher due to an even greater implementation of energy efficiency technology. In addition to the energy efficiency costs, Carbon Capture Storage costs are also estimated to be £1bn higher in Option 4 than in Options 2 and 3.

Waste
Since no new plant installations are specified in any of the pathways after 2015, there are no costs additional to the baseline in Options 2-4.

Pathway benefits
The benefits represent the economic benefits of reduced mitigation as a result of compliance with the targets. Three sets of benefits are provided based on the Low, Central and High price of carbon. The discount rate is the reduced declining long-term discount rate from the HM Treasury Green Book (3.0% for years 0 to 30, then 2.57% for years 31 to 75). Due to the fact that the pathways under Options 2-4 achieve similar levels of emission reduction, the benefits are of comparable magnitude and are identical when all rounded to the nearest billion. Other non-economic benefits are expected but are not assessed here in monetary terms.

There will be benefits under Option 1 via the already agreed set of policies resulting in emissions reduction up to 2050. These will be related to UK Government policies in non-devolved areas and other market trends, such as the use of electric cars and/or efficiency gains reducing demand for energy for both industry and households.

Table 4 shows the estimated benefits and shows that under the Central estimate the benefits are £18 billion, using the reduced discount rate. Because the pathway analysis does not take account of the future impacts in Wales of the UK Government Clean Growth Strategy, the High estimate may be a better reflection of the real benefits of each option.

Estimate	Option 1 (Baseline – no further policies)	Options 2, 3 and 4
Low	£9bn	£19bn
Central	£18bn	£38bn
High	£27bn	£58bn

Table 4: Benefits under the four options – Reduction in CO_2e emissions (PV, £2017)

Differences in the modelling approach between CCC and the Wales 2050 Calculator

In providing advice to Wales on setting interim targets and carbon budgets, the CCC include their analysis of the costs and benefits associated with following an 80% emission reduction pathway to 2050. To inform the development of this RIA, test the CCC analysis and reduce uncertainty we commissioned independent research into the costs and benefits of delivering the 80% pathway. This analysis uses an alternative costing methodology.

Methodology	CCC	RIA
Cost	£30bn	£50bn
Benefit	>£30bn[29]	£10-£31bn
Result	Net benefit	Net cost

Table 5: Comparison of total costs and benefits from alternative methodologies

The CCC estimate the total cost to society of following the 80% pathway is around £30bn, compared to a pathway where no new policies are implemented. However, the CCC estimates the benefits of reducing greenhouse gas emissions will outweigh the costs, resulting in a net benefit.[30]

In comparison, the independent analysis estimates a higher total cost to society of £50bn for delivering the 80% pathway. It is also less optimistic with regards to the benefits, suggesting a net cost between £19bn and £40bn. For illustrative purposes, this is equivalent to 1% to 2% of GDP, or £193 to £391 per head each year in today's terms.

Whilst the estimates appear to be significantly different, both fall within the range of other literature in this area such as the Stern review and figures published by the UK and Scottish Governments, all estimating the costs of mitigating climate change will fall between -1% and 3.5% of GDP. The following section explores in greater detail the reasons for the differences.

Differences in methodological approaches

In 2015 the CCC provided the UK Government with advice on setting the fifth UK carbon budget. When providing advice to us, the CCC costs were calculated by adapting UK cost estimates for Wales. The model used to produce this RIA, known as the Wales 2050 Calculator, is structured and based on the framework set out by the Department of Energy and Climate Change (DECC) in the UK 2050 Calculator.

[29] The CCC does not calculate the cumulative total benefits throughout the time-horizon and have just calculated the value of the benefits in 2030 (£1bn). This is greater than their cost estimate for 2030 (£898m). This allows them to make the conclusion that the pathway delivers a net benefit to Welsh society because the value of carbon abatement per tonne increases over time, whilst the yearly cost of abatement per tonne falls between 2030 and 2050.

[30] Benefits relate to the monetised value of carbon emissions that are not omitted as a result of following the pathway instead of the baseline and do not include wider wellbeing benefits such as impacts on fuel poverty, air quality, active travel, and natural capital.

Power sector
Emissions in the power sector occur from burning fossil fuels for energy generation. Wales is also a net exporter of energy; this means Welsh emissions from power are disproportionate to the amount of energy we consume. In order to reduce emissions in Wales, the amount of energy generated from burning fossil fuels must be reduced. This energy would need to be replaced with energy generated from low carbon sources to ensure we maintain supply to homes and businesses.

The CCC model assumes costs incurred in the power sector to be a percentage of the total UK cost, based on our share of electricity consumption in the UK system. The justification is that Wales is part of the wider power system in UK, within which it is relatively unimportant whether low-carbon generation occurs in Wales or England.

The Wales 2050 Calculator assumes Wales will continue to be a net exporter of energy. Furthermore, instead of assuming Wales will bear a share of the whole UK costs, the model considers the whole capital and operating costs of producing power within Wales.

Inclusion of international aviation and shipping costs
The CCC did not include the cost of reducing emissions from international aviation and international shipping. These costs are included in the Wales 2050 Calculator.

Behaviour change
The CCC pathway assumes behaviour change will lead to reduced emissions, particularly in the transport sector. Behaviour change in the CCC model such as “eco driving” leads to a reduction in emissions for very little cost. However, behaviour change could not be incorporated into the Wales 2050 Calculator and this leads to greater costs.

Discounting
In their report the CCC expresses costs and benefits in £2016 prices and does not apply a discount rate. The RIA applies the reduced long-term discount rate from the HM Treasury Green Book to the costs and benefits and expresses them in £2017 prices. The effect of discounting will reduce the value of the costs and benefits in the RIA analysis compared to the CCC analysis. Whilst the reduced costs are offset by the factors discussed above, the lack of discounting helps explain the difference in the estimated benefits the pathway will provide.

Well-being

In addition to exploring the monetised benefits and carbon value savings, we procured a methodology that would explore the social, cultural, economic and environmental impacts of potential interventions under the options to meet our requirements under the Well-being of Future Generations Act (Wales) 2015. The method considers changes that the interventions within the options may bring and maps them against impacts (or benefits and dis-benefits). The changes and impacts were created by considering the well-being goals and our well-being objectives.

Changes	Emissions of GHGs	Damage to buildings (due to acid deposition)	Soiling of buildings (due to particulates)	Productivity	Freight and trade	Waste disposal (disposal method or quantity)	Administrative costs to businesses	Energy bills (residential and commercial)	Earnings (households)	Pay gap (gender or skills linked)	Congestion (transport)	Connectedness (through transport or digital form)	Energy exports	Energy security (supply interruptions)	Crop yields	Forestry growth (area or logging)
Job security				D					D							
Number of jobs	W			D			W	W	D							
Management of land and assets	**D**	W	W	W											D	**D**
Traditions and culture																
Energy generation from renewables	D	W	W					D					D	D		
Demand for energy	D	W	W			W		D					W	D		
Business survival rates				W	W	W										
Output from industry sectors	W	W	W	D	W	W		W								
Use of minerals																
Access to good quality housing	W							D								
Social support networks												D				
Provision of greenspace/recreational areas	W															
Noise				D												
Waste generation and management	D			W		D	W									
Biodiversity and ecosystems															W	
Air quality		D	D												D	D
Water quality															W	W
Soil quality				W											D	D
Use of water resources															W	W
Carbon sequestration and storage	D															
Light pollution	W															
Access to appropriately skilled employment				D					W	D						
Investment in cleaner technologies	D	W	W			W	W							W		
Support for business innovation				D		W		D								
Business support networks (know how)				D			D	W								
Support for research & development	W			D				W								
Use of the Welsh language							W					D				
Vulnerability of communities																
Community cohesion																
Connections to the wider world	W				W						W	D				
Movement of goods into and out of Wales	W	W	W		D						W					
Protection of heritage and cultural environment		D	D													
Access to digital services				D				W				D			W	
Access to transport	W			D	W				W	W	D	D				
Sustainable management of risks				W		W	W						W	W	W	W
Resilient energy infrastructure				D				W				W	W	D		
Resilient transport infrastructure				D	W						W	W				
Resilient telecommunications infrastructure				D								W				
Access to digital connectivity on the move				D								D			W	W
Integrated transport networks (including green infrastructure)	W			W	W						D	D				
Air travel	**D**	W	W	W	D						W	D				
Family cohesion									**W**	**W**						
Skills development				**D**					**D**	**D**		**W**				
Involvement in local decisions												**W**				

Changes	Carbon sequestration	Biodiversity and resilient ecosystems	Mineral resources	Water resources	Water quality	Heritage sites	Landscape character	Recreation and tourism (quality or quantity)	Mental health	Physical health (from physical activity)	Respiratory illnesses	Sense of belonging	Sense of identity	Erosion damages (affecting land use)	Flood damages	Wind damages (from extreme events)
Job security									D			D	D			
Number of jobs									W			W	W			
Management of land and assets	D	D	W	W	W		D					W	W	**D**	**D**	**D**
Traditions and culture						**D**	W	W	W			**D**	**D**			
Energy generation from renewables		W	W	W			D				W	D				
Demand for energy			W	W							W					
Business survival rates																
Output from industry sectors			W	W												
Use of minerals		W	D				D									
Access to good quality housing									D		D	W				
Social support networks									D			D	D			
Provision of greenspace/recreational areas	W	W			W		D	D	D	D					W	
Noise								W	D							
Waste generation and management																
Biodiversity and ecosystems	W	D			W		W	W						W	W	W
Air quality		W						W		W	D					
Water quality		W			D		W	W								
Soil quality	W	W			W											
Use of water resources		W		D												
Carbon sequestration and storage	D	W														
Light pollution		W					W	W	D							
Access to appropriately skilled employment									W			W	D			
Investment in cleaner technologies																
Support for business innovation																
Business support networks (know how)																
Support for research & development																
Use of the Welsh language									W			D	D			
Vulnerability of communities									W			D		W	W	W
Community cohesion									W			D				
Connections to the wider world								W								
Movement of goods into and out of Wales																
Protection of heritage and cultural environment		W				D	W	D				W	W			
Access to digital services									W			W	W			
Access to transport								W	W	W						
Sustainable management of risks		W							W	W	W	W		D	D	D
Resilient energy infrastructure														D	D	D
Resilient transport infrastructure								W						D	D	D
Resilient telecommunications infrastructure														D	D	D
Access to digital connectivity on the move						W		W	W	W		W				
Integrated transport networks (including green infrastructure)	W	W		W	W	W	D	W	W	D	W	W	W			
Air travel											W					
Family cohesion								**W**	**D**			**D**	**D**			
Skills development									**D**				**D**			
Involvement in local decisions		**W**			**W**	**W**	**W**		**D**			**D**	**W**			

Figure 4: Map of changes and impacts (D=Direct; W=Wider)

A matrix tool was developed to aid analysis. This records a description of changes that are expected to occur for each potential intervention and an assessment of whether the change is expected to be positive, negative or neutral. Where the intervention could result in negative and positive change, both are recorded.

The Climate Change (Wales) Regulations do not define the policies to deliver emissions reduction. This will be done through a report for each carbon budget period. There is also uncertainty with regards future technologies and UK Government policies. Therefore, the rate and scale of the impacts can not be explored to a quantifiable level.

Positive impacts	Negative impacts
No positive wider benefits expected	No negative wider impacts expected
Very low – unlikely to be noticeable additional positive impacts (benefits)	Very low – unlikely to be noticeable additional negative impacts (dis-benefits)
Low – positive impacts (benefits) noticeable but not significant	Low – negative impacts (dis-benefits) noticeable but not significant
Moderate – positive impacts (benefits) noticeable but on smaller scale than direct benefits	Moderate – negative impacts (dis-benefits) noticeable but on smaller scale than direct negative impacts (dis-benefits)
High – positive impacts (benefits) noticeable and may be on similar scale to direct benefits	High – negative impacts (dis-benefits) noticeable and may be on similar scale to direct negative impacts (dis-benefits)

Table 6: Rating of impacts used in matrix

Figures 5-7 provide a summary of impacts per option. They show the ratings that have been assigned to each option by benefit, positive and negative. All options have the same impacts and can deliver the same wider benefits, but they will have different levels of impact relative to the scale and rate of intervention.

There are minimal differences in the impacts between the options. However, Option 2 has the fewest ‘moderate’ ratings in terms of positive impacts, whilst Option 4 has the highest number of ‘high’ ratings. This suggests that Option 4 will deliver the greatest positive wider impacts for the overall period to 2050.

Option 4 has more ‘very low’ negative impacts, while Option 2 has more ‘low’ impacts. The difference between Options 2 and 3 is very small. We need to consider the cost, rate of intervention, monetised benefits, wider scientific evidence and potential impact of the rate of decarbonisation when making the decision on our preferred option.

Figure 5: Wider impacts of Option 2

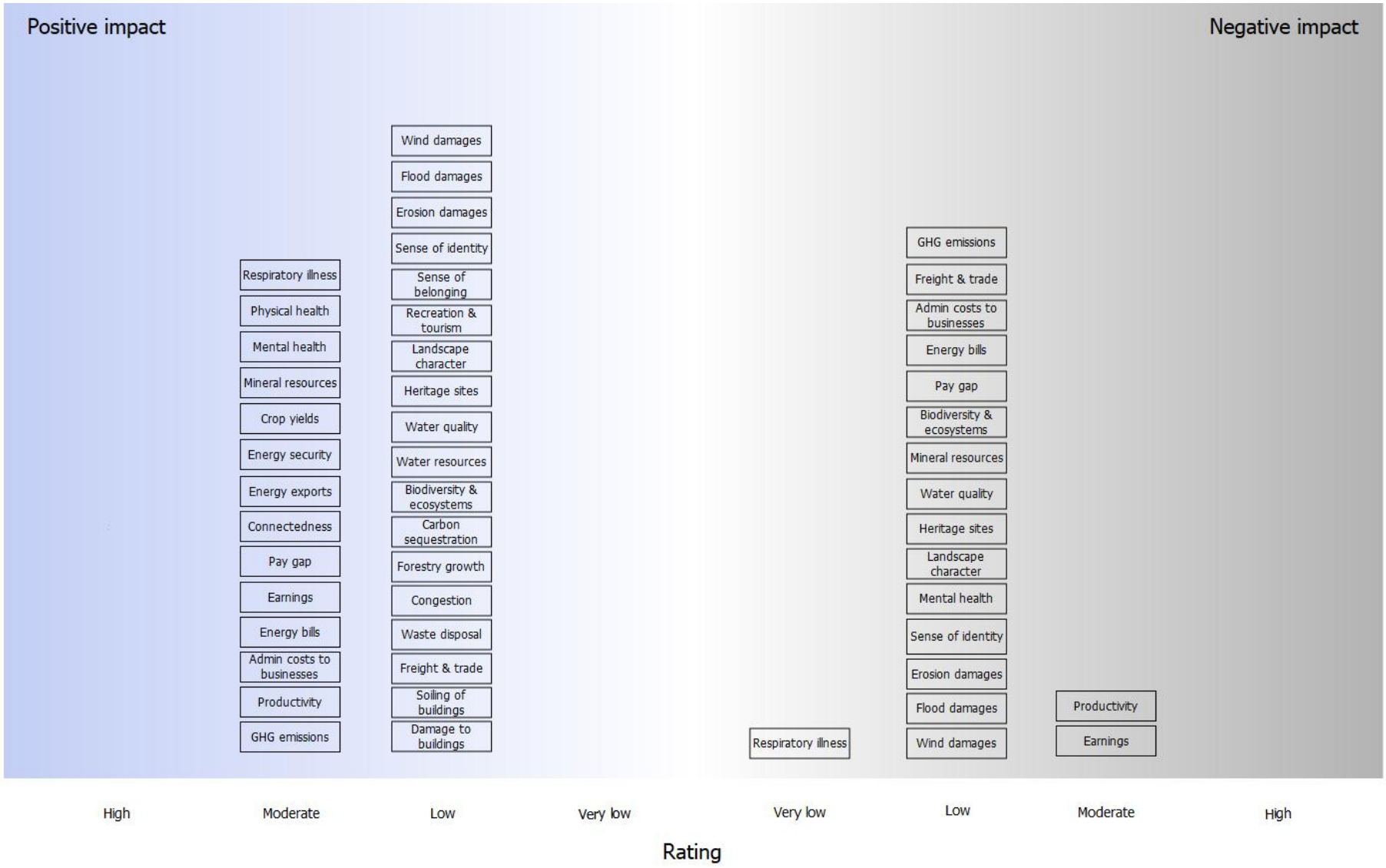

Figure 6: Wider impacts of Option 3

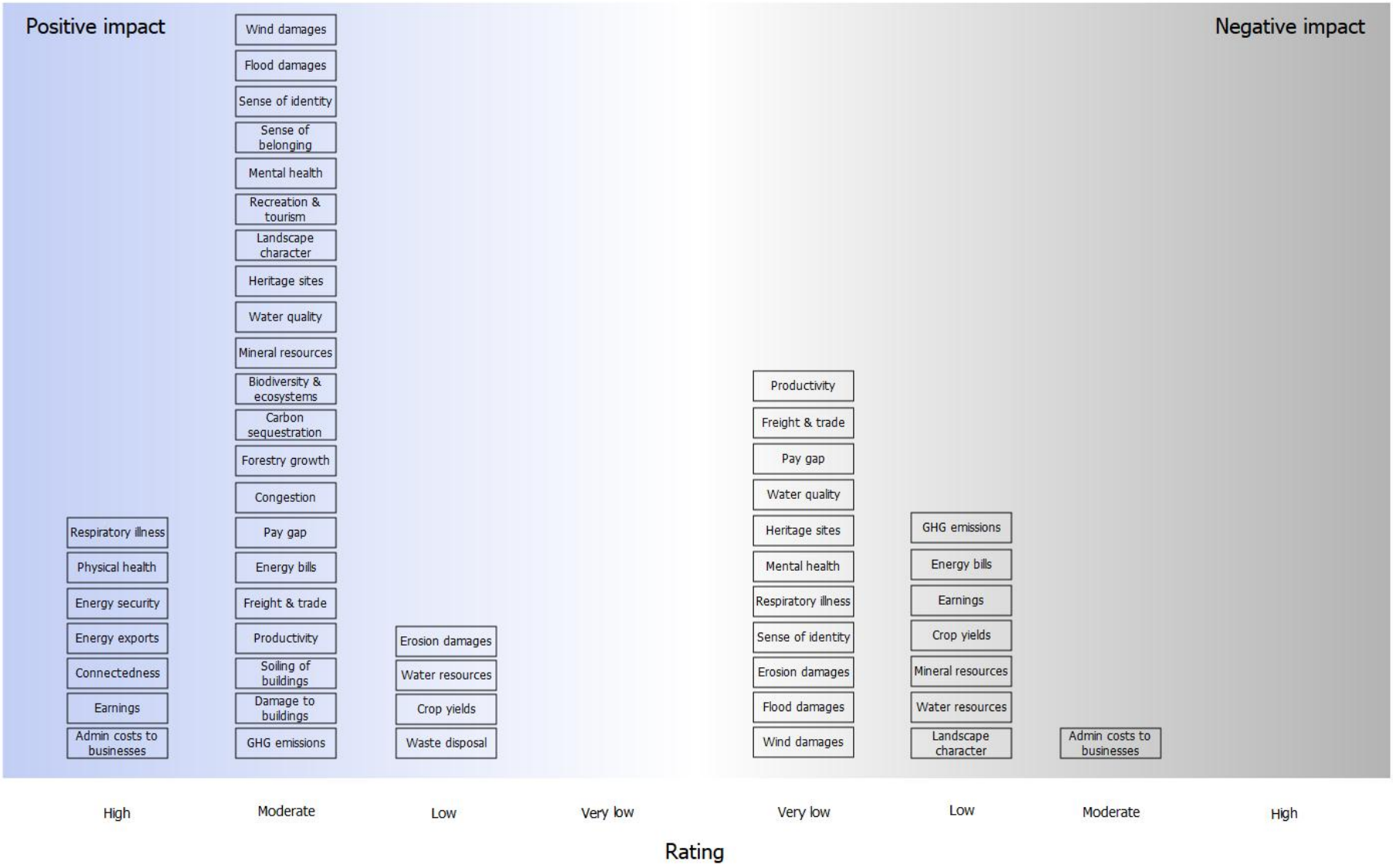

Figure 7: Wider impacts of Option 4

Considering the options against our well-being goals

Figures 8-11 show that there are only small differences between the options when they are analysed in terms of their impact on the well-being goals. The options consistently contribute to the same well-being goals. It is the scale of intervention under each option that is different.

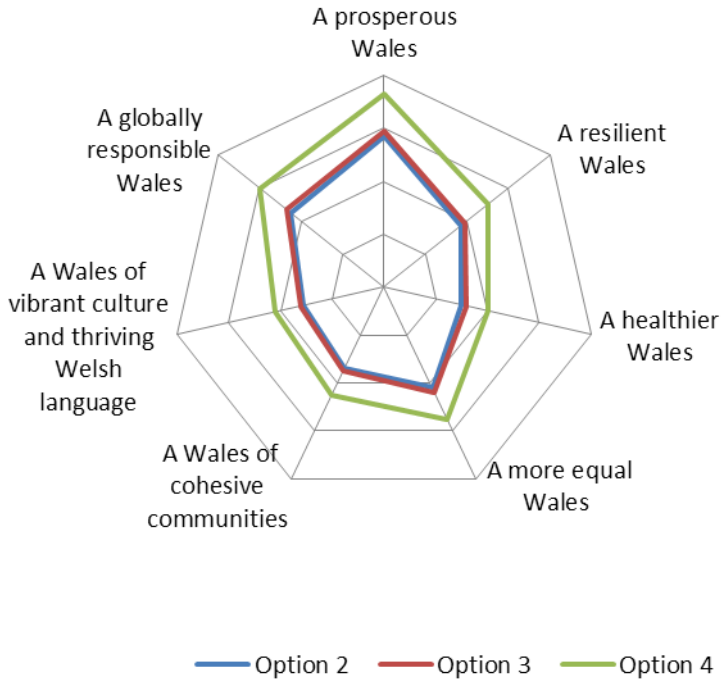

Figure 8: The direct positive impacts of the options on the well-being goals

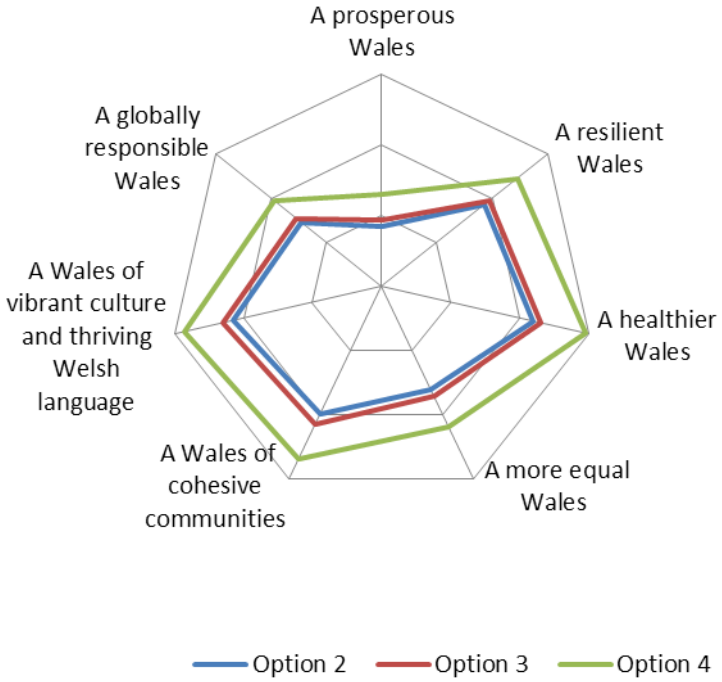

Figure 9: The wider positive impacts of the options on the well-being goals

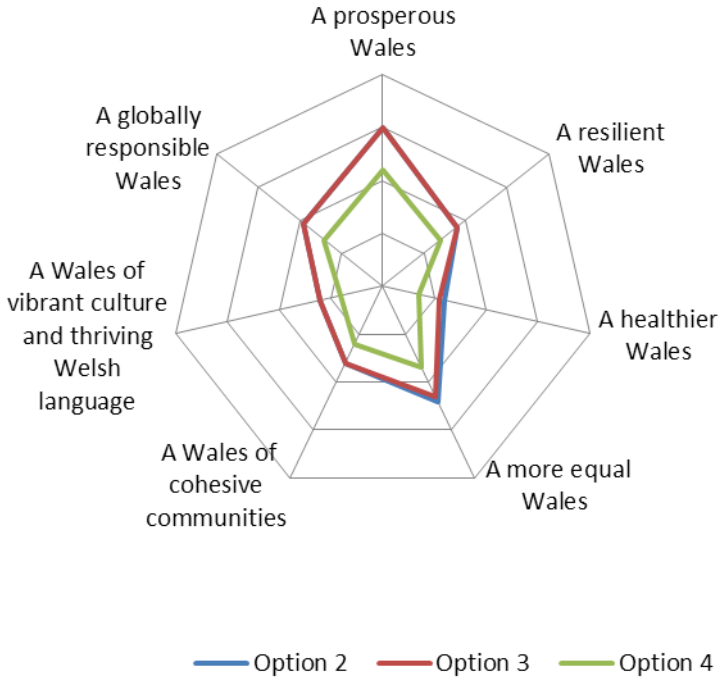

Figure 10: The direct negative impacts of the options on the well-being goals

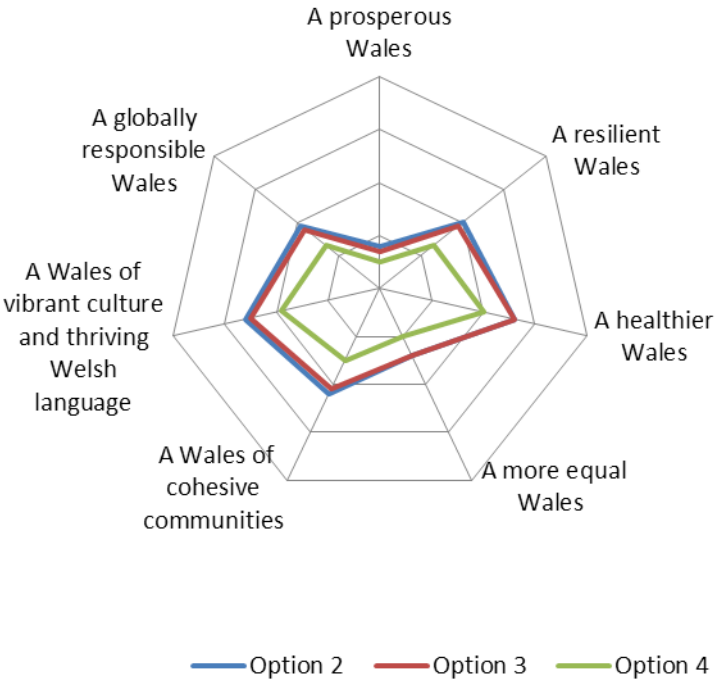

Figure 11: The wider negative impacts of the options on the well-being goals

Considering the options against our well-being objectives

We have also mapped the options directly and indirectly against our well-being objectives (Figures 12–15). Again, there are small differences between the options. It can be seen that the options contribute to all of the objectives. Having said that, they maximise on some more than others, particularly those which sit within the Prosperous and Secure theme.

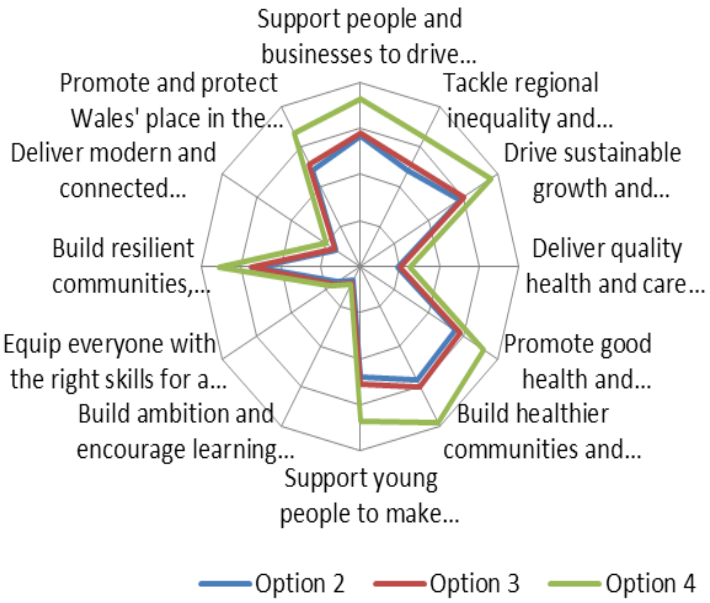

Figure 22: The direct positive impacts of the options on our well-being objectives

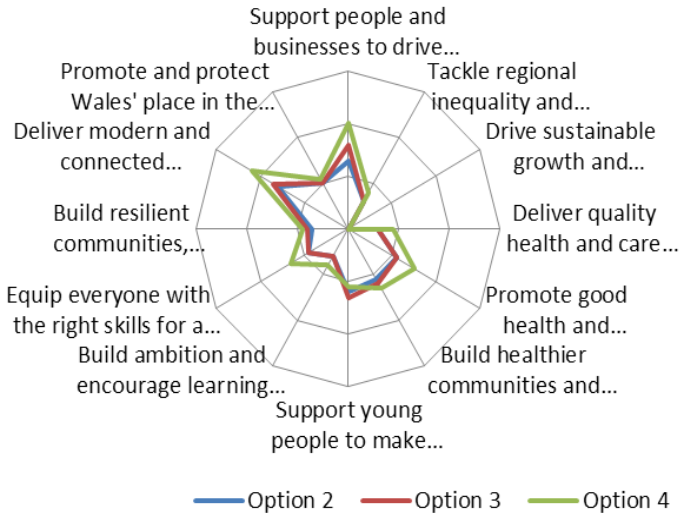

Figure 33: The wider positive impacts of the options on our well-being objectives

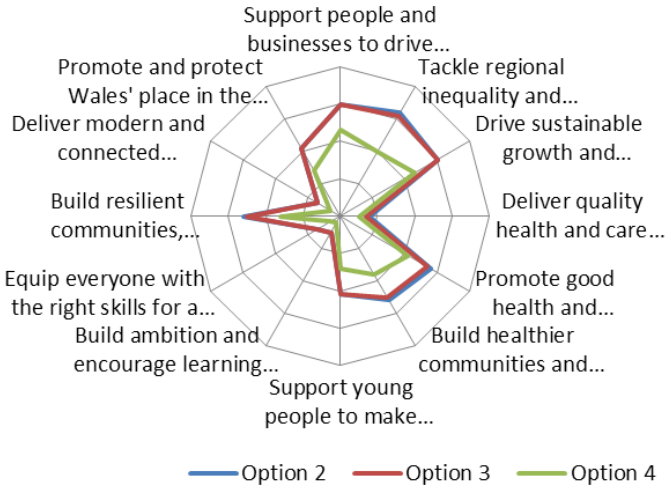

Figure 44: The direct negative impacts of the options on our well-being objectives

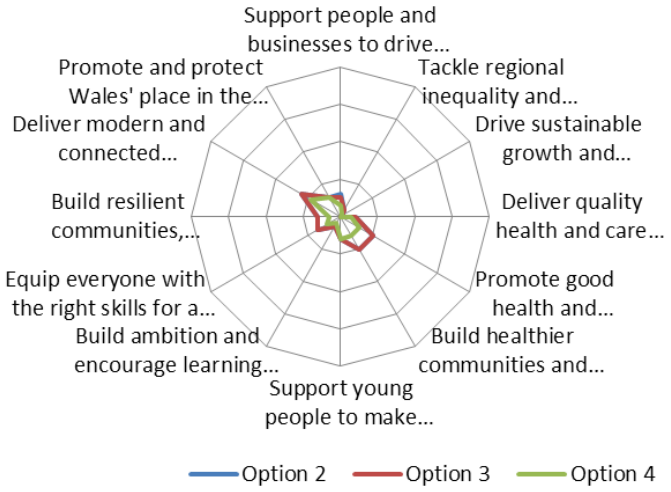

Figure 15: The wider negative impacts of the options on our well-being objectives

A 'whole impact' and well-being approach: Considering the rate of decarbonisation

The approach in the figures above considers the scale of interventions and not the rate of these inventions, or when they may occur. Rather, it looks at the pathways to 2050 as a whole. Along with our modelling evidence and CCC advice, this method gives a good indication that the potential inventions will enable us to achieve our legislative target and allow for wider positive impacts, which have the potential to be maximised further. This will be beneficial in policy development, to ensure that we consider how to maximise on the positive impacts and mitigate negative impacts of emissions reduction interventions.

The approach also provides a basis for analysing the impacts of our pathways in terms of well-being. However, an essential consideration for well-being analysis is to look at the timings of when the interventions would occur within the pathways and the rate at which we decarbonise. The Well-being of Future Generations (Wales) Act 2015 is clear that we should aim to achieve all goals and therefore adopting a 'whole impact' approach, which considers the social, cultural, environmental and economic costs, is critical. A description of the well-being goals is below.

Goal	Description of the goal
A prosperous Wales	An innovative, productive and low carbon society which recognises the limits of the global environment and therefore uses resources efficiently and proportionately (including acting on climate change); and which develops a skilled and well-educated population in an economy which generates wealth and provides employment opportunities, allowing people to take advantage of the wealth generated through securing decent work.
A resilient Wales	A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change (for example climate change).
A healthier Wales	A society in which people's physical and mental well-being is maximised and in which choices and behaviours that benefit future health are understood.
A more equal Wales	A society that enables people to fulfil their potential no matter what their background or circumstances (including their socio economic background and circumstances).
A Wales of cohesive communities	Attractive, viable, safe and well-connected communities.
A Wales of vibrant culture and thriving Welsh language	A society that promotes and protects culture, heritage and the Welsh language, and which encourages people to participate in the arts, and sports and recreation.
A globally responsible Wales	A globally responsible Wales. A nation which, when doing anything to improve the economic, social, environmental and cultural well-being of Wales, takes account of whether doing such a thing may make a positive contribution to global well-being.

Figure 16: Well-being goals

The rate at which the inventions occur is most important when considering the levels at which to set our interim targets and carbon budgets. While action to decarbonise quickly may initially seem to have the most positive effects on well-being globally and for future generations, we need to consider the implications further. Wales has a considerable industrial sector that provides much employment and makes a significant contribution to our economy. Taking a 'whole impact' approach, decarbonising these areas quickly, as suggested in Options 3 and 4, may result in some industries being unable to sustain themselves in the short-term. This may create a barrier to achieving ***a prosperous Wales*** and ***a more equal Wales,*** and the loss of jobs could impede ***a healthier Wales*** by affecting people's mental health.

Although action to decarbonise clearly helps to ensure we create and maintain ***a resilient Wales*** and ***a globally responsible Wales***, the rate at which we reduce our emissions could have a negative impact on global well-being. Not all industries in Wales can decarbonise at a rapid rate and this will require a transition process, which Option 2 allows and Options 3 and 4 do not. We can assume this will mean that some activities may cease, increasing the need for imports – potentially from countries which do not have low-carbon processes or statutory sustainable development principles in place. In this instance, imports and increased manufacturing elsewhere would increase emissions within other countries and therefore not contribute to global well-being.

Preferred option

Option	Delivers the 80% target?	Cost additional to baseline £2017)	Annualised as a % of 2017 GVA	Potential contribution to well-being goals and objectives
1	N			
2	Y	£50bn	2%	Significant
3	Y	£68bn	3%	Significant
4	Y	£188bn	9%	Very significant

Table 7: Comparison of options

Option 2 is our preferred option, which is modelled on the CCC's 80% pathway. It provides the best balance between cost to the Welsh taxpayer and potential contribution to achieving our well-being goals and objectives. It allows for the most achievable low-carbon transition, given Wales' emissions profile. Option 2 provides a trajectory for the interim targets, derived from the UKCCC advice and technical annex[31] and modelled through the Wales 2050 calculator:

- a 2020 target for an emissions reduction of 27% on 1990 levels
- a 2030 target for an emissions reduction of 45% on 1990 levels
- a 2040 target for an emissions reduction of 67% on 1990 levels

[31] https://www.theccc.org.uk/publication/building-low-carbon-economy-wales-setting-welsh-carbon-targets/

Costs of interim targets

An additional £50bn is forecast to be incurred by following Option 2 across the time horizon (2017-2050).

Sector	Interim Target 1 (2010-2020)	Interim Target 2 (2020-2030)	Interim Target 3 (2030-2040)	Interim Target 4 (2040-2050)
Power	£3bn	£17bn	£9bn	£7bn
Transport	-£1bn	£3bn	£5bn	£5bn
Buildings	£1bn	£1bn	>£1bn	>£1bn
Agriculture and Livestock	>£1bn	>£1bn	>£1bn	>£1bn
Industry	>£1bn	>£1bn	>£1bn	>£1bn
Waste	£0bn	£0bn	£0bn	£0bn
TOTAL	**£3bn**	**£21bn**	**£15bn**	**£12bn**

Table 8: Pathway costs for Option 2, additional to Option 1 (Baseline – no further policies)[32]

[32] Due to modelling reasons the 2020 interim target covers the period 2010 to 2020 so the totals do not sum to £50bn. Figures are rounded to the nearest billion.

The Climate Change (Carbon Budgets) (Wales) Regulations 2018

Option 2 and the CCC-modelled 80% pathway provide the following levels for Carbon Budgets 1 and 2:

- First Carbon Budget (2016–2020): an average of 23% below 1990 emissions
- Second Carbon Budget (2021–2025): an average of 33% below 1990 emissions

Expressing carbon budgets

Under the Act, the interim and 2050 targets are expressed as a percentage reduction below the 1990 baseline. In contrast, the Act does not specify how the carbon budgets must be expressed. The Greenhouse Gas Inventory (GHGI) provides annual emissions estimates and enables us to report performance against our carbon budgets and emission targets. The UK GHGI is produced in line with IPCC regulations and is required to follow international reporting practice set out by the UNFCCC.

A continuous improvement programme ensures the methodologies used to construct the GHGI are robust and reflect the most up-to-date scientific understanding of national emissions. With each annual release of the inventory improvements are applied to the full time-series back to 1990 to ensure a consistent methodology is used across the time-series. This means that the Wales GHGI can vary slightly with each new release of data. Generally large changes (>2-3%) to the time series are rare, but they are possible. However, improvements within an individual sector can have a more significant impact.

As such, the CCC has recommended that all targets under these regulations should be expressed relative to 1990 emission levels (i.e. as percentage reductions), rather than on an absolute (i.e. megatonne) basis. For the five-year carbon budgets, this would most simply be represented as the average reduction on 1990 base year emissions across the budget period. This approach will ensure the targets are less sensitive to changes in the emissions inventory than the use of absolute targets and will therefore be a more stable basis to drive policy action. Furthermore, using a single basis for targets avoids the potential for targets on different bases to become misaligned as a result of changes to the GHGI.

Costs associated with the first two carbon budgets

The portfolio of policies to deliver the budgets is unknown at this stage. The cost of emissions reduction measures is provided as an illustration only and is based on theoretically achievable options identified by the CCC, which are assumed to be deliverable from a technical perspective. The costs of delivering the first and second carbon budgets are estimated to be £2bn and £14bn respectively, compared to Option 1 (Baseline – no further policies).

Sector	Carbon Budget 1 (2016-2020)	Carbon Budget 2 (2020-2025)
Power	£3bn	£12bn
Transport	-£1bn	£1bn
Buildings	>£1bn	£1bn
Agriculture and Livestock	>£1bn	>£1bn
Industry	>£1bn	>£1bn
Waste	£0bn	£0bn
TOTAL	**£2bn**	**£14bn**

Table 9: Estimated costs per sector for the first and second carbon budgets under Option 2, additional to Option 1 (Baseline – no further policies)

The Climate Change (International Aviation and International Shipping) (Wales) Regulations 2018

An estimate for international aviation and international shipping, based on bunker-fuel sales in 2015, shows the sectors currently account for 2% of our total emissions. Of this 2%, international aviation accounts for 7% and international shipping accounts for 93%.

In order to meet the goal of keeping increases in global average temperature to well below 2 degrees Celsius, emissions from international aviation and international shipping will need to be tackled. The increase in global trade and passenger travel means emissions are likely to increase significantly over the coming years without intervention.

In response, two global initiatives have been established to tackle these emissions. The International Civil Aviation Organisation has developed a global market-based measure with the aim of achieving carbon-neutral growth from 2020. The International Maritime Organisation has adopted mandatory reporting of fuel oil consumption from large ships and approved a roadmap for developing a comprehensive strategy for reduction of emissions from ships.

The UK Government has elected not to include the emissions from this sector in the short-term while it monitors the development of the global agreements and in particular any internationally-agreed standard reporting or emissions attribution methodology. It may elect to reintroduce them at a later date. In the meantime, it has taken emissions from the sector into account by reducing the UK carbon budgets for other sectors in order to allow "headroom" for aviation and shipping emissions within its '80% in 2050' reduction trajectory.

We have a strong interest in this sector and it is an important contributor to the Welsh economy. We own Cardiff Airport and have established Enterprise Zones which promote the aviation and aerospace industry. Milford Haven is a key energy port, handling 62% of all Liquid Natural Gas imported into the UK. The oil refinery and fuel storage facilities at Milford Haven, which are dependent on the port, play an important role in securing supplies of road and aviation fuel across the UK.

Although the current contribution to overall emissions is small, this will increase over time if emissions from aviation and shipping don't decrease to the same extent as other sectors. While unilateral action within Wales may not be appropriate, inclusion of our contribution to this sector's emissions in the NWEA would demonstrate leadership and signal our support for global action in this area. Methods to control emissions from this sector may prove cost-effective in the medium term and may present opportunities to develop and test new low-carbon technologies in Wales.

There are two broad options (one including two sub-options) regarding the treatment of international aviation and international shipping in the NWEA:

- A: Include the emissions
- B: Exclude the emissions:
  - (Bi) and do not accommodate in the setting of targets and budgets
  - (Bii) but accommodate in the setting of targets and budgets

Advice from Committee on Climate Change (CCC)

The CCC recommends the inclusion of the emissions within the NWEA, and suggests that accounting for these emissions formally within national emissions targets is clearer and more flexible than excluding them from this framework but taking them into account indirectly (Option Bii). The CCC does not see the requirement for Wales, or any other country, to take strong unilateral decisions which could have perverse outcomes, such as carbon leakage. Their advice indicates the best approach is to address the issue at a global level. However, it cannot see any major technical barriers to accounting for international aviation and international shipping, and evidence suggests that accounting for emissions on the basis of the fuel sold for shipping and aviation ('bunker fuel' sales) is a good proxy.

Preferred option

The preferred option is to include emissions from international aviation and shipping within the NWEA (Option A) as it demonstrates leadership and our support for global initiatives consistent with our commitment to being a globally responsible Wales in the Well-being of Future Generations Act. We will account for emissions on the basis of fuel sales related to international aviation and international shipping (bunker fuel sales), an approach which is consistent with the decision to account directly for emissions from EU-ETS operations (see The Carbon Accounting (Wales) Regulations 2018). Finally, it presents opportunities for Wales to develop and test new low-carbon technologies and benefit from economic opportunities which arise.

Cost and impact assessment

Having considered the Climate Change (Wales) Regulations 2018 against our mandatory and non-mandatory impact assessments, we do not believe it is possible to quantify their impact as they simply provide the technical mechanism and governance framework for meeting the 2050 emissions reduction target. The impact of meeting the 2050 target depends on the measures and policies chosen. These policies will be set out in a report for each carbon budget period, the first being published in March 2019. Policies to deliver our carbon budgets are subject to an engagement process and full and detailed impact assessments. A more detailed assessment of potential costs and impacts has been provided to support The Climate Change (Interim Emissions Targets) (Wales) Regulations 2018 and The Climate Change (Carbon Budgets) (Wales) Regulations 2018.

The Climate Change (Credit Limit) (Wales) Regulations 2018

This regulation provides a limit on the maximum amount of carbon units[33] that can be used to meet the first carbon budget and 2020 interim target.

The Clean Development Mechanism (CDM) was established under the Kyoto Protocol to provide Annex I countries, including the UK, with a way of meeting part of their emission reduction commitments cost-effectively in other countries. Certified Emission Reduction (CER) units generated by the CDM provide a means by which Wales can invest in emission reduction activities overseas. In exchange for this investment, the investing country is able to claim 'credits' towards its own emissions targets. The end result would be the same total quantity of emissions being released into the atmosphere (albeit from different locations), thus achieving the goal of limiting the impact of global greenhouse gas concentrations in the atmosphere.

The level of permitted offsets essentially provides a statement of the level to which Wales' targets are to be met through domestic action versus overseas offsetting. A limit is required in recognition of the need to ensure that business and wider sectors in Wales have certainty in the level of domestic emissions reduction we are committed to. This limit could be zero, which would have the same effect as not having international off-setting within the NWEA.

The Act contains the ability to use offsets to provide flexibility should there be unforeseen changes in emissions, for example due to technical revisions to the emissions inventory methodology or the occurrence of unusually cold years that unexpectedly increase energy use and thus emissions.

This section details the options considered with regard the level at which to set the offset limit.

Option 1: Setting a zero limit, or a low limit (~3% of the first budget)

Setting a lower limit for the use of offset credits may strengthen Wales' commitment to decarbonisation. It would also be consistent with the approach set by other governments in the UK. However, setting a lower limit would not implement the CCC's recommendation that we should introduce additional flexibility to account for unexpected increases in industrial output. This flexibility is particularly important for Wales because of our industrial make-up which makes our targets particularly susceptible to emission volatility.

We support the CCC's suggestion to allow flexibility for changes in industrial output and recognises considerable risks with Wales limiting its flexibility to purchase offset credits. A lower offset limit would increase the chances that unexpected variability would lead to the targets not being met and costly unplanned compensatory measures would be required either through additional investment in action or through the use of our regulatory levers.

[33] Offsets generated through Certified Emission Reduction (CER) units, as defined by The Carbon Accounting (Wales) Regulations 2018.

Option 2: Setting a 10% limit

It is difficult to assess in advance exactly what level of offset limit would be sufficient. However, it is possible to look at historic variations in industrial output and use this as a measure of the likely scale of future changes. Over the five-year carbon budget period the amount of flexibility required would depend on the estimated frequency of such large events occurring. A 10% budget limit represents the maximum estimate of the flexibility required and assumes that the largest historical event is repeated in every year of the five-year budget period.

The 10% figure has been constructed on the basis that it would allow flexibility to account for unexpected variation in Welsh emissions due to:

- uncertainty associated with the Welsh greenhouse gas inventory reporting that underpins the Welsh targets,
- significant increases in industrial emissions (increases in every year of the five year budget period), or
- a run of cold winters (every year of the five year budget period).

Strengths of a 10% limit

- A 10% limit is likely to allow for industrial sector flexibility in most situations and means if industrial activity is significantly higher than anticipated, offset credits can be purchased to allow the carbon budget to be met.

- Placing a 10% limit on offsets meets the legal requirement on Ministers to set a limit and is effectively consistent with the CCC recommendation not to set a limit on offsets, because a 10% limit would not restrict offset use in most circumstances analysed.

- The CCC has confirmed it believes a 10% limit on offsets for the first carbon budget "would provide sufficient flexibility, whilst meeting [the] statutory duty under the Act."

- A 10% limit is expected to allow sufficient offset purchase to account for most unexpected changes that could lead to Wales' emissions exceeding the budget limit. As a result, Ministers have the ability to purchase offset credits rather than undertake what is likely to be more costly corrective action. This flexibility will allow Ministers to meet the budget in the most cost-effective manner.

- In circumstances where the 10% limit is exceeded, it is assumed that this would provide adequate grounds to re-assess the level of the targets and budgets, and therefore additional offsets purchase may not be needed in these instances.

Weaknesses of a 10% limit

- A 10% limit may reduce confidence in Wales' commitment to domestic decarbonisation discouraging stakeholders to commit to decarbonisation action.[34]

[34] The United Nations Environment Programme Finance Initiative and 285 investors representing more than $20 trillion in assets stressed the urgent need for policy action which stimulates private sector investment into climate change solutions, creates jobs, and is essential for ensuring the long-term sustainability and stability of the world economic system. They also emphasises that long-term policy stability is critical and retroactive changes can significantly damage investor confidence.

- A 10% limit is a higher limit than that set in equivalent legislation by the UK and Scottish governments but the circumstances in Wales are different, in particular our greater exposure to variability in industrial output due to Wales' high share of industrial emissions.

- Whilst the proposed 10% limit accounts for the maximum anticipated scenario (i.e. large industrial increases in each year of the budget period) it may not account for every possible future scenario. For instance, if we experienced a run of cold years, combined with large inventory changes and extended periods of heightened industrial activity. In such a scenario our flexibility to account for these changes could be exceeded and Wales may fail to meet its budget or interim targets. As a result Welsh Ministers may need to invest in rapid additional unplanned mitigation action, or introduce higher regulatory standards, to compensate for the higher emissions. This could be more costly than the cost of purchasing offsets.

Option 3: Setting a higher offset limit (significantly greater than 10% of Carbon Budget 1)

Welsh Ministers could opt to allow much greater flexibility in the use of offset credits and use this to provide flexibility in any situation where the carbon budget, or interim targets, may be exceeded. Whilst offset credits remain at a low price this may represent a more cost-effective solution to meeting the required targets but it is likely to introduce a long-term reliance on offsets and expose Wales to future rises in the cost of offset purchase.

Adopting a higher level of offset purchase would also provide businesses in Wales with the certainty over government policy that they see as important to their effective investment in decarbonisation.

Furthermore, to use a higher level of offsets to allow greater flexibility in all areas of the economy goes against the CCC advice and they have indicated they would not be supportive of such an unrestricted use of offset credits, favouring their use only to counter unexpected industrial variability.

Advice from the Committee on Climate Change (CCC)

The CCC recommended we legislate to allow for international offsetting as a back-up to provide flexibility in meeting carbon budgets, for example in the event of significant unforeseen increases in industrial activity in Wales. It recommended that offsetting should not be the mainstream policy response to meeting carbon budgets and that any economy-wide use of offset credits to provide flexibility should be small.

The advice did not recommend placing a specific limit on the use of emissions credits in legislation because in the CCC's view doing so would limit the flexibility to allow higher offset use in the case that industrial emissions are significantly greater than anticipated. However, the Act requires Welsh Ministers to set a limit in regulations for each budgetary period. Following further correspondence, the CCC confirmed it believes the proposed limit for the first carbon budget "would provide sufficient flexibility, whilst meeting [the] statutory duty under the Act." Although not required by the Act, the Decarbonisation Ministerial Task and Finish Group has committed to seeking the CCC's advice before using offset credits in relation to the first carbon budget or 2020 target.

Preferred option

The preferred option is to set an offset credit limit for the first carbon budget at 10% of the budget level. In making this decision we recognise this approach does not provide flexibility to account for every possible situation we may need flexibility for (such as the combined effects of cold winters in every year, higher than expected industrial output every year, and the failure of UK Government policy to deliver in Wales) and there is a risk that we could exceed our flexibility limit should this occur.

However, the 10% offset limit is recommended on the basis that it provides a suitable compromise between allowing complete flexibility to account for uncertainty and volatility in Welsh emissions, whilst balancing issues of costs, clarity in domestic policy intent and the advice received from the CCC.

Cost and impact assessment

Setting a limit on the maximum purchase of offset credits permissible for the first carbon budget does not commit Welsh Ministers to the purchase, or use, of offset credits in this period. Cost will only be incurred if we have to use them. Therefore, setting a limit does not directly commit us to financial expenditure. By way of illustration of potential costs, in the event that the 10% limit is used to its maximum the cost for the first budget period is expected to be a maximum of £3.4 million. It is important to note that the price of offset credits is highly variable, and the cost of using the 10% limit is estimated to range from £112 million to £1.12 billion.[35]

The ultimate cost of any offset purchase will depend on a combination of factors, including performance against carbon budgets and targets. In their recent advice the CCC suggested that the first carbon budget should be met through our current policies and should not require the planned use of offsets. As such, the recommended 10% offset limit is made on the basis of allowing flexibility for unforeseen circumstances and does not constitute any expected financial commitment to purchase offset credits.

Having considered the Climate Change (Wales) Regulations 2018 against our mandatory and non-mandatory impact assessments, we do not believe it is possible to quantify their impact as they simply provide the technical mechanism and governance framework for meeting the 2050 emissions reduction target. The impact of meeting the 2050 target depends on the measures and policies chosen. These policies will be set out in a report for each carbon budget period, the first being published in March 2019. Policies to deliver our carbon budgets are subject to an engagement process and full and detailed impact assessments. Should we require the use of international off-sets, a more detailed assessment of impact will be undertaken at that stage, relevant to the level of investment required in comparison with the cost of domestic action.

[35] The price of offset credits though the Clean Development Mechanism are highly variable, producing a large range for the future cost estimates of offset purchases. At the time of our analysis the price was £0.15/tCO_2e. However, the UK government assume the cost of credits post-2020 could be between £5/tCO_2e and £50/tCO_2e, depending on the future demand and availability of credits globally.

The Carbon Accounting (Wales) Regulations 2018

The NWEA defines what emissions we are going to account for. The Act begins by including all emissions in Wales. Total emissions include emissions produced from activities such as energy production, industry and transport. It then subtracts the emissions which are naturally removed from the atmosphere by carbon sinks, such as trees and land-use.

However, the Act provides for carbon units to be included within the calculation of the NWEA. Options exist to define a wide range of activities as carbon units, essentially varying the coverage and operation of the NWEA.

Wales' emissions are split between emissions from the traded and non-traded sectors. The traded sector relates to the largest emitters that currently fall within the European Union Emissions Trading Scheme (ETS). These are emitters associated with heavy industry (predominately iron and steel production), energy production (power stations such as Aberthaw) and heavy energy usage sites such as the Heath Hospital in Cardiff. The traded sectors account for approximately 57% of Wales' total emissions. Everything outside of the EU-ETS is defined as the non-traded sector and covers areas such as the public sector, transport, agriculture and small scale energy production.

The EU-ETS is an international system for trading greenhouse gas emission allowances and works on the 'cap and trade' principle. A 'cap', or limit, is set on the total amount of greenhouse gases which can be emitted by the factories, power plants and other installations in the scheme, on an EU-wide basis. The cap is reduced over time so total emissions fall.

Given Wales' lack of direct control over the traded sector emissions, we considered the pros and cons of three options.

Option 1: Exclude EU-ETS emissions

As carbon units are required to cover all emissions within the traded sector, we could credit the NWEA with an amount of carbon units equivalent to the size of the traded sector emissions each year. This would have the effect of removing the traded sector emissions from the NWEA. Under this approach the NWEA would align more closely with our devolved powers. However, excluding these emissions would also mean Wales would not benefit from the emission reductions achieved in the traded sector. It would also place the full responsibility of the 80% target on the rest of the economy which would make the Welsh targets relatively more challenging than targets in UK and Scotland, thus reducing Wales' competitiveness.

Option 2: Include EU-ETS emissions

This option does not include the EU-ETS as a type of carbon unit for the NWEA and therefore EU-ETS emissions are reported fully within the NWEA. This is the most clear and transparent approach where we account for all emissions generated within our borders. It provides the opportunity for Wales to benefit from emission reductions coming from EU-ETS operators and allows for a more even spread of responsibility across the traded and non-traded sectors. However, it also includes sources where Wales has little to no control over emissions reduction actions and policies and if sufficient action is not taken at UK or EU level our targets will be harder to meet.

Option 3: Introduce an EU-ETS 'cap'

Under this option, the EU-ETS emissions would be represented by a fixed cap (allocated amount of emissions) as is the case in the current UK and Scottish Climate Change Acts. So, regardless of whether the actual emissions are greater than or less that the capped amount, it would only be the capped amount that is brought into the NWEA.

It would include near full coverage of emission sources in Wales and would spread the responsibility for the targets over the traded and non-traded sectors. It is however the most complex option and would not allow for emission reductions above the cap to be counted toward the target. Both the UK and Scottish Governments have previously adopted this approach but Scotland has since decided to move away from it in favour of a more transparent approach, similar to option 2.

Advice from Committee on Climate Change (CCC)

The advice from the CCC was to include emissions from EU-ETS emitters in the NWEA directly, without a cap. They suggest this is the most transparent way of accounting for emissions and would encourage decarbonisation in all sectors of the Welsh economy.

The CCC recognises industrial emissions present a specific challenge within the devolved setting where large changes in emissions can occur as a result of business decisions at individual sites, over which Wales has little control. They suggest two specific solutions to address this issue:

- To allow Ministers to revise budget levels as a result of significant changes in industrial emissions
- To allow an increased international offset provision to be used where budgets could be missed specifically because of unexpected increases in emissions from Wales' industrial sectors (see The Climate Change (Credit Limit) (Wales) Regulations 2018)

Preferred option

The preferred option is Option 2. This approach will include all emissions, including those from EU-ETS operators, as this is the most transparent and simplest way of accounting for emissions. Operations which contribute the most to emissions can also contribute most to reducing them; therefore, including them in the account would most effectively allow us to meet our targets. This approach would also encourage decarbonisation in all sectors of the Welsh economy.

Cost and impact assessment

Having considered the Climate Change (Wales) Regulations 2018 against our mandatory and non-mandatory impact assessments, we do not believe it is possible to quantify their impact as they simply provide the technical mechanism and governance framework for meeting the 2050 emissions reduction target. The impact of meeting the 2050 target depends on the measures and policies chosen. These policies will be set out in a report for each carbon budget period, the first being published in March 2019. Policies to deliver our carbon budgets are subject to an engagement process and full and detailed impact assessments. A more detailed assessment of potential costs and impacts has been provided to support The Climate Change (Interim Emissions Targets) (Wales) Regulations 2018 and The Climate Change (Carbon Budgets) (Wales) Regulations 2018.

Reducing the impacts of climate change on well-being

The Climate Change (Wales) Regulations 2018 simply provide the mechanism or framework for meeting the 2050 target. This Regulatory Impact Assessment estimates the costs and impacts of potential policies to achieve the preferred emissions reduction pathway. The actual impact of meeting our targets on our well-being goals and objectives depends on the measures and policies chosen. These policies will be set out in a report for each carbon budget period, the first being published in March 2019. Policies to deliver our carbon budgets are subject to an engagement process and impact assessments.

However, given that the regulations provide the framework for reducing emissions in Wales it is possible to reflect on how achieving Welsh and global targets might contribute to the well-being goals by reducing the impacts of climate change.

A prosperous Wales

The Stern Review estimated the annual cost of climate change mitigation to the global economy is in the region of -1% to 3.5% of annual global GDP by 2050, while unabated climate change could cost the world at least 5% of GDP and, if more dramatic predictions come to pass, the cost could be more than 20% of GDP. Costs incurred to meet the targets and budgets in the short- and medium-term will lessen the financial burden on future generations. The cost of meeting the targets and budgets depends on the measures and policies adopted. However, the CCC estimates that the total cost of following the interim targets to an 80% reduction in 2050 is around £30bn, compared to a scenario where no new policies are implemented. This estimate refers to the costs of decarbonising to society as a whole: costs will be split between the UK Government, Welsh Government, businesses and people in Wales.

The UK Climate Change Risk Assessment: Wales Summary (CCRA) identifies a series of risks for business and industry that would be mitigated in the event of achieving Welsh and global emissions reduction targets.[36] The most significant include risks to business sites from flooding, to business operations from water scarcity and disruption to supply chains and distribution networks. Some of the expected changes to weather patterns in Wales could provide businesses with opportunities to capitalise on changes in demand for goods and services. Achieving Welsh and global emissions reduction targets would restrict these opportunities by limiting such changes to our weather patterns.

A resilient Wales

Climate change affects biodiversity in many ways. Impacts on species include changes in distribution and abundance, the timing of seasonal events and habitat use. As a consequence there are likely to be changes in the composition of plant and animal communities. The world's oceans absorb around 25% of atmospheric carbon dioxide produced by human activity. This has caused acidification of marine waters. Rising sea temperatures and acidity appear to be associated with various changes in biodiversity in UK marine and coastal ecosystems. Climate driven changes to salinity, wind, waves and currents are also having an impact.

Climate change affects food security and nutrition through changing water availability, food production, trade, stability of food supplies, access to food, and food safety. Rising food

[36] https://www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Wales-National-Summary.pdf

prices push populations to limit food intake by reducing either the quality or the quantity of food they consume. The CCRA identifies two risks with an international dimension that may have an effect in Wales: risks from weather-related shocks to international food production and trade, and risks and opportunities from long-term, climate-related changes in global food production.

Climate change is likely to reduce the amount of available fresh water in parts of Europe and affect source water quality. Projected water scarcity and agricultural droughts may increase the demand on irrigation, including wastewater reuse. Competition for access to water will increase.

A healthier Wales

Climate change affects the health of people in Wales through warming temperatures and changing weather patterns. More intense and frequent extreme events and changes in air, water and food (quality and quantity), ecosystems, agriculture, livelihoods and infrastructure affect human health and well-being. Health impacts can be broadly grouped as respiratory illnesses, heat-related problems and deaths, flood-related health impacts and infectious diseases. Loss of property and livelihoods through extreme weather and disasters can lead to psychological effects like sleeplessness, anxiety and depression.

A more equal Wales

As a result of climate change low-income households will face proportionately greater impacts on the cost of living, for example in relation to higher food prices and flood risks, though they will also benefit most from reduced heating demand. For some low-income households, even the modest changes expected in future decades could have important impacts on household budgets, especially under higher warming scenarios. Moreover, for some impacts, there will be very large individual impacts to low income households, such as from uninsured flood losses, which will have major (life-changing) consequences for those affected.

A Wales of cohesive communities

The CCRA identifies risks to people, communities and buildings from flooding and to building fabric from moisture, wind and driving rain. There are specific risks to the viability of certain coastal communities from sea level rise. Climate change further threatens the safety and connectivity of our communities as it poses risks to transport and energy networks, water supplies and sewers. The CCRA identifies a series of risks to such infrastructure, including from flooding, coastal erosion, drought, high winds and lightning, storms and high waves, and extreme heat.

A Wales of vibrant culture and thriving Welsh language

Historic buildings and their fittings could not only be severely affected by the sudden impact of flooding and storms, but also by a series of individually less severe - but cumulatively significant - impacts. These may include insect infestation and fungal growth in warmer, more humid conditions, and structural problems, for example, caused by soils shrinkage in hotter, drier summers. At the very least, the result of climate change on historic buildings may be more frequent maintenance and higher insurance premiums.

It is reasonable to assume that achieving Welsh and global targets will lessen the impact of climate change on communities across Wales, including Welsh speaking communities.

Opportunities arising from action to reduce emissions, for example farm diversification and new, local jobs in energy efficiency or community renewables, may encourage Welsh speakers in rural areas to remain in their communities, helping to sustain the language.

A globally responsible Wales

Disasters linked to natural hazards, including the adverse impacts of climate change, are drivers of contemporary displacement. The ten largest displacement events of 2016 were climate-related.[37] Climate change is also a threat multiplier, and may exacerbate conflict over depleted resources. Looking to the future, there is widespread agreement among scientists that the effects of climate change, in combination with other factors, will increase the displacement of people.[38] Persons already displaced for other reasons often reside in climate change hotspots and may be exposed to secondary displacement related to disasters and the effects of climate change. Their ability to return can be limited if their home areas are similarly impacted.[39]

The purpose of the Well-Being of Future Generations Act is to demonstrate Wales's commitment to playing its part in global efforts to combat greenhouse gas emissions by requiring Welsh Ministers to set a statutory framework for reducing emissions. Achieving Welsh and global targets will lessen the impact of climate change on populations around the world as well as mitigating the risk to the UK from climate-related international human displacements.

Welsh Government well-being objectives and Prosperity for All

Although the Climate Change (Wales) Regulations 2018 will not directly contribute to the Welsh Government's well-being objectives, indirectly they create the framework for action that can reasonably be expected to make a significant contribution to several of the objectives, primarily:

- Drive sustainable growth and combat climate change
- Promote good health and well-being for everyone
- Build healthier communities and better environments
- Build resilient communities, culture, and language
- Deliver modern and connected infrastructure

The regulations deliver the Prosperity for All commitment to "set out a low-carbon pathway, providing clarity and certainty for action and investment…through setting targets for 2020, 2030 an 2040". In working towards the targets, it will be possible to adopt measures and policies that support other Welsh Government priorities and commitments, and bring benefits beyond reducing emissions.

[37] Climate change, migration and displacement (Overseas Development Institute and UN Development Programme, 2017): https://www.odi.org/sites/odi.org.uk/files/resource-documents/11874.pdf
[38] Climate Change 2014 Synthesis Report Summary for Policymakers (IPCC, 2014): http://www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf
[39] Climate change and disaster displacement: An overview of UNHCR's role (2017): http://www.unhcr.org/uk/protection/environment/5975e6cf7/climate-change-disaster-displacement-overview-unhcrs-role.html

Examples of such policies include:

- Replacing private vehicle use with walking or cycling reduces emissions and improves health
- Insulating homes reduces emissions, lowers energy bills and improves health
- Reducing emissions from private vehicle use improves air quality and health

Consultation

Two joint Calls for evidence were held with the CCC to inform their advice relating to the regulations. We have embedded the five ways of working in all decisions relating to the regulations.

Long-term

By taking a view to 2050 the overall target and interim targets are looking at the long-term. However, the carbon budgets help to focus near term action to enable us to reach our long-term goal. Alongside our framework the future trends report helps to identify wider changes. It can help us understand the potential short- and long-term issues associated with the potential actions, and identify long-term trends and opportunities for action.

Prevention

When assessing where to set our pathways, multiple strands of evidence have been considered to ensure that they are realistic and achievable and prevent, where possible, problems occurring. Collating evidence focussing around the social, cultural, economic and environmental impacts have allowed us to understand the potential impacts of different scenarios. This will enable us to consider what levels to set the targets and budgets.

Integration

The 'whole impact' and well-being approach allows us to consider at a high level where potential interventions will impact on both the well-being goals and our well-being objectives. During the policy development stage, consideration will be given into how other public bodies are affected when decisions on how to meet the targets and budgets are made.

Collaboration

To meet the scale of the challenge and set credible targets we have collaborated with different Welsh Government sectors to provide clarity and certainty for others and to understand the wider evidence. A comprehensive cross-Government governance structure has been established to support development of the regulations, consisting of:

- A Ministerial Task and Finish Group
- A Programme Board
- Cross-Government Working Groups

Consulting and engaging at the policies and proposals stage will allow interested parties and the public to help shape our policy development, providing richer evidence in support of meeting our well-being objectives and allowing us to further understand the impacts of any action.

Involvement

For the setting of pathways, targets and budgets, citizens were provided with the opportunity to comment on relevant issues through a Call for evidence issued by the CCC. We promoted the Call through targeted stakeholder engagement, various newsletters and bulletins and through social media. We also hosted two joint stakeholder events to discuss the subject matter and inform responses.

The joint Calls for evidence have allowed us to involve interested parties in where to set our targets and budgets. When developing the methodology for collating and assessing evidence of wider impacts, we held workshops internally with specific policy areas and externally with a wide variety of stakeholders. This enabled us to consider best practice and involve others in shaping the method.

Competition assessment

This impact assessment does not include a Competition assessment because the core elements do not provide for specific policies. It is not possible, therefore, to consider the specific impacts on competition within individual markets.

The competition filter test	
Question	
Q1: In the market(s) affected by the new regulation, does any firm have more than 10% market share?	
Q2: In the market(s) affected by the new regulation, does any firm have more than 20% market share?	
Q3: In the market(s) affected by the new regulation, do the largest three firms together have at least 50% market share?	
Q4: Would the costs of the regulation affect some firms substantially more than others?	
Q5: Is the regulation likely to affect the market structure, changing the number or size of businesses/organisation?	
Q6: Would the regulation lead to higher set-up costs for new or potential suppliers that existing suppliers do not have to meet?	
Q7: Would the regulation lead to higher ongoing costs for new or potential suppliers that existing suppliers do not have to meet?	
Q8: Is the sector characterised by rapid technological change?	
Q9: Would the regulation restrict the ability of suppliers to choose the price, quality, range or location of their products?	

Post-implementation review

Government progress review

The Environment (Wales) Act 2016 requires Welsh Ministers to prepare and lay a statement after each budgetary period setting out whether Wales has met the budget, whether they have debited or credited any carbon units and giving details on the type and number of units. The statement must explain what the Welsh Ministers consider to be the reasons why the carbon budget for the period has, or has not, been met. In particular, it must include the Welsh Ministers' assessment of the extent to which their proposals and policies for meeting the carbon budget for the period have been carried out and have contributed to the carbon budget for the period being met or not. This report must be laid before the end of the second year after the budgetary period, allowing time for the emissions data to be compiled, which requires 18 months from the close of year.

With regards to each interim target and the 2050 target, Welsh Ministers must also prepare and lay a statement before the National Assembly for Wales. This statement must be made before the end of the second year after the relevant interim target year. This statement will provide the Welsh Government's assessment of the total amount of emissions in that year, whether the interim emissions target have been met, and the total amount of carbon credits or debits for that year. The statement must also explain what the Welsh Ministers consider to be the reasons why the target has, or has not, been met.

Independent progress review

The Act provides for the CCC to monitor and report on progress. Before the end of the first budgetary period the CCC must send a report to Welsh Ministers advising on the progress that has been made towards meeting:

- the first and second carbon budgets
- the interim emissions targets
- the 2050 emissions target

This report must also provide the CCC's view on whether the relevant budgets and targets are likely to be met, and outline any further measures that are needed to meet them.

In addition, no later than six months after the Welsh Ministers lay the final progress statement for a budgetary period, the CCC must provide a report setting out their views on:

- the way in which the carbon budget for the period was or was not met
- the action taken by the Welsh Ministers to reduce net Welsh emissions of greenhouse gases during the period

Following the Welsh Government's progress reports on the 2030 and 2040 interim targets, the CCC is required to advise whether the forthcoming interim target(s) and 2050 target represent the highest achievable targets for Wales. If not, they must state what the highest achievable target is.