



Advice on the design of Welsh carbon targets

Committee on Climate Change
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A wide range of stakeholders who attended our Committee meeting in Cardiff, responded to our Call for Evidence, engaged with us, including through public dialogue, or met with the Committee bilaterally.

Foreword

The Welsh Government has committed to introducing a carbon budgeting framework in Wales. The legislative vehicle for this, the Environment (Wales) Act, received Royal Assent in March 2016 and requires that before the end of 2018 the Welsh Government must set in regulation interim emissions targets to 2040, as well as carbon budgets to 2025.

The Committee on Climate Change has been asked by the Welsh Government to provide advice on these emissions targets. We are providing advice in two stages:

- Advice on carbon accounting and design of Welsh carbon budgets/targets (March 2017)
- Advice on the level of ambition embodied within the targets and budgets and sectors in which there are particular opportunities to decarbonise (October 2017)

This report provides our advice on the first set of issues - the form of future emissions reduction targets and the future accounting framework. It takes into account the current UK emissions accounting framework, as well as recent advice to the Scottish Government on devolved carbon targets.

We will come back to advise the Welsh Government on the level of ambition for future carbon targets in October of this year. This will take account of the progress that has been made to date. In 2014 the level of emissions in Wales was around 18% below 1990. That, however, compares to around a 36% reduction across the UK as a whole. We will therefore need to look carefully at where the opportunities are to go further.

Our advice takes account of the existing climate change targets in the UK, and specific circumstances relevant to Wales. We have benefited from engagement with interested parties, including the discussions at a meeting in Cardiff in January, and from responses we have subsequently received to our call for evidence. I am grateful for that engagement, for the contributions and guidance of members of the Committee in developing the advice, and to the team within the secretariat who have worked so hard on its delivery.



Lord Deben, Chairman

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The Committee



The Rt. Hon John Gummer, Lord Deben, Chairman

The Rt. Hon John Gummer, Lord Deben, was the Minister for Agriculture, Fisheries and Food between 1989 and 1993 and the longest serving Secretary of State for the Environment the UK has ever had. His sixteen years of top-level ministerial experience also include Minister for London, Employment Minister and Paymaster General in HM Treasury. He has consistently championed an identity between environmental concerns and business sense. To that end, he set up and now runs Sancroft, a Corporate Responsibility consultancy working with blue-chip companies around the world on environmental, social and ethical issues. Lord Deben is Chairman of the Committee on Climate Change, Valpak Limited, and the Association of Professional Financial Advisors.



Professor Nick Chater

Professor Nick Chater FBA is Professor of Behavioural Science at Warwick Business School, having previously held chairs in Psychology at Warwick and University College London (UCL). He is particularly interested in the cognitive and social foundations of rationality, and in applying behavioural insights to public policy and business. He has served as Associate Editor for the journals *Cognitive Science*, *Psychological Review*, *Psychological Science* and *Management Science*. He co-founded and is a Director of the research consultancy Decision Technology Ltd.



Professor Sir Brian Hoskins

Professor Sir Brian Hoskins CBE FRS is the Chair of the Grantham Institute for Climate Change and the Environment at Imperial College London and Professor of Meteorology at the University of Reading. His research expertise is in weather and climate processes. He is a member of the scientific academies of the UK, USA, and China. He has received the top awards of the American and UK Meteorological Societies, the inaugural Gold Medal of the International Union of Geodesy and Geophysics, and the Buys Ballot Medal of the Royal Netherlands Academy of Sciences and Arts which is awarded every 10 years.



Paul Johnson

Paul is the Director of the Institute for Fiscal Studies and is a visiting professor at UCL. He is widely published on the economics of public policy including tax, welfare, inequality and poverty, pensions, education, climate change and public finances. He is also one of the authors of the “Mirrlees review” of tax system design. Paul has previously worked at the Financial Services Authority and has been Chief Economist at the Department for Education and Director of Public Spending in HM Treasury, as well as Deputy Head of the UK Government Economic Service. He is a member of the council and executive committee of the Royal Economic Society and a member of the banking standards board. Paul has previously served on the council of the Economic and Social Research Council. He was a founder council member of the Pensions Policy Institute and in 2010 he led a review of the policy of auto-enrolment into pensions for the new Government.



Baroness Brown of Cambridge

Baroness Brown of Cambridge DBE FREng (Julia King) is an engineer, a crossbench member of the House of Lords, and Chair of the CCC’s Adaptation Sub-Committee. Energy and climate-related interests include being the UK’s Low Carbon Business Ambassador; membership of the World Economic Forum Global Agenda Council on Decarbonizing Energy; a non-executive director of the Green Investment Bank, and of the Offshore Renewable Energy Catapult. She is Chair of the Henry Royce Institute for Advanced Materials and of STEM Learning Ltd, a non-for-profit company providing continuing professional development for science teachers in UK schools. She is a former Vice Chancellor of Aston University, with an academic and industrial career at Cambridge University, Imperial College, London and Rolls-Royce plc where she held senior engineering and manufacturing posts.



Professor Corinne Le Quéré

Professor Corinne Le Quéré FRS is Director of the Tyndall Centre for Climate Change Research and Professor of Climate Change Science and Policy at the University of East Anglia (UEA). She conducts research on the interactions between climate change and the carbon cycle. She has authored multiple assessment reports by the Intergovernmental Panel on Climate Change (IPCC), and is a member of the Scientific Committee of the Future Earth research platform for global sustainability.



Professor Jim Skea

Professor Jim Skea has research interests in energy, climate change and technological innovation. He has been RCUK Energy Strategy Fellow since April 2012 and a Professor of Sustainable Energy at Imperial College since 2009. He was Research Director of the UK Energy Research Centre 2004-12 and Director of the Policy Studies Institute 1998-2004. He has operated at the interface between research, policy-making and business throughout his career. He is President of the Energy Institute and was elected co-Chair of IPCC Working Group III in 2015. He was awarded a CBE for services to sustainable energy in 2013 and an OBE for services to sustainable transport in 2004.

Executive Summary



The Environment (Wales) Act received Royal Assent in March 2016. It sets a 2050 target to reduce emissions by at least 80% from 1990 levels and provides the legislative framework for establishing a carbon budgeting approach in Wales.

The Act requires that before the end of 2018, Welsh Ministers must set in regulation interim emissions targets for 2020, 2030 and 2040, together with 5-year carbon budgets for the periods 2016-2020 and 2021-2025.

The Committee on Climate Change (“Committee”) has been asked by the Welsh Government to provide independent advice on these emissions targets and is providing that advice in two parts. We will advise in autumn 2017 on the level of emissions targets and carbon budgets. This report provides advice on carbon accounting and design of Welsh carbon budgets and other targets.

Our key recommendations are:

- **We recommend that the overall accounting framework is based on actual emissions in Wales**, rather than adjusting for activity in the EU Emissions Trading System as under UK carbon budgets. Using actual emissions is the most transparent way of accounting for emissions and would encourage decarbonisation in all sectors of the Welsh economy. **However, consideration should be given to particular provisions for some industrial sectors:**
 - It is important that where there is a risk of displacement of industrial activity to other countries with less stringent climate policies (i.e. ‘carbon leakage’) policy does not encourage a reduction in Welsh industrial output. It will be important that climate policies are designed carefully to avoid this risk.¹
 - The level of industrial activity in Wales could turn out to be higher or lower than that anticipated when setting emissions targets. In the case that this difference in output is large, this could constitute a significant change in circumstances that warrants reviewing the level of carbon budgets so as to maintain the level of ambition for emissions reduction across the rest of the Welsh economy.
 - Should competitive companies based in Wales win more business, causing actual industrial emissions to be higher than those allowed for under the carbon budgets, it could be reasonable for international emissions credits to be used to offset these additional emissions.
- Beyond the role for purchase of credits in the case of significantly increased industrial output outlined above, **the option for the Welsh Government to purchase credible, international emissions credits should be retained to provide flexibility for unforeseen circumstances:**
 - **The role of these credits should be as a back-up option** rather than their use being planned for and should require prior advice from the Committee on Climate Change.
 - Credible international credits include those linked to international agreements (i.e. Kyoto and the Paris Agreement) or allowances that are part of meeting EU emissions targets.

¹ Our recent report on Energy Prices and Bills (available at <https://www.theccc.org.uk/publication/energy-prices-and-bills-report-2017/>) looks at UK industry and how climate policies can avoid adding to competitive pressures for industries in highly-traded sectors.

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- We will provide advice later in 2017 on the limits to the use of emissions credits to provide flexibility, as part of our advice on the levels of interim targets and the first two carbon budgets (covering 2016-20 and 2021-25).
 - **We recommend that Wales’s share of international aviation and international shipping be included within Welsh emissions targets.** Given our recommendation that emissions accounting be based on actual emissions, rather than ‘net’ emissions used for UK carbon budgets, inclusion of these sectors on the basis of fuel sales would present no practical challenges. Wales should still pursue international policy action (rather than unilateral action) to reduce emissions in these sectors.
 - **We recommend that all targets under the new Bill are expressed relative to 1990 emission levels** (i.e. as percentage reductions), rather than on an absolute (i.e. megatonne) basis. For the 5-year carbon budgets, this would most simply be represented as the average reduction on 1990 emissions across the budget period.
 - This 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.
 - Using a single basis for targets avoids the potential for targets on different bases to become misaligned, as a result of changes to the emissions inventory.

In developing this advice, the Committee has taken note of the responses it received to its Call for Evidence, to feedback at a public meeting in Cardiff and to wider interaction it has with Welsh stakeholders. The Committee has also considered experience to date under the UK Climate Change Act and the Climate Change (Scotland) Act. These are discussed in the rest of this report:

- Chapter 1 reviews progress to date on reducing emissions in Wales.
- Chapter 2 considers how carbon targets can best be designed in order to achieve cost-effective decarbonisation across the economy, while minimising the potential for undesirable outcomes.
- Chapter 3 presents our recommendations on carbon accounting and design of Welsh carbon budgets.

Further advice will follow later in October 2017 on the level of ambition embodied within the targets and budgets, on sectors in which there are particular opportunities to decarbonise and limits to the use of international emissions credits.

Chapter 1: Decarbonisation in Wales



1. Introduction

The Welsh Government has legislated to introduce carbon budgets to reduce greenhouse gas emissions in Wales in its Environment (Wales) Act 2016. The Act requires that before the end of 2018, Welsh Ministers must set in regulation interim emission targets for 2020, 2030 and 2040 and carbon budgets for the periods 2016 to 2020 and 2021 to 2025. The Environment Act was designed alongside complementary legislation in the form of the Well-Being of Future Generations Act (WFGA) 2015. The WFGA sets in place seven well-being goals and a sustainable development principle, which public bodies in Wales must take account of in decision making.

The Committee on Climate Change (CCC) has been asked by the Welsh Government to provide advice on aspects of the Environment (Wales) Act. This report provides the first part of the requested advice, including specifically:

- Advice on the emissions accounting approach, including:
 - The circumstances in which carbon units (i.e. international emissions credits) may be credited to, or debited from the Net Welsh Emissions Account and how this is to be done;
 - How carbon units should be defined; and
- Whether Wales's share of emissions from international aviation and international shipping should be included.

Chapter 1 outlines progress to date on decarbonisation and relevant circumstances in Wales. Chapter 2 sets out design considerations for carbon targets, with recommendations presented in Chapter 3.

The second part of the Committee's advice will be on the appropriate decarbonisation pathway for Wales with levels for the interim targets and first two carbon budget periods. It will also include a detailed assessment of the constraints and opportunities within each sector. This advice will be published in autumn 2017.

The Welsh Government has previously (in 2011² and 2013³) asked the Committee to produce reports on progress reducing emissions and preparing for climate change. The Committee also reports on Wales's emissions and progress towards meeting targets in the annual report on progress to UK Parliament each year.⁴ As part of the Environment (Wales) Act the Committee will provide the Welsh Government a report on progress at the end of every carbon budget period.

The Committee engages widely with businesses, governments, researchers, non-government organisations, representative bodies and other relevant parties throughout its work. The Committee has gathered evidence specifically for this advice (Figure 1.1):

- On 15 December 2016 we published a Call for Evidence, containing nine questions on the form of emissions targets and carbon accounting framework; the role for emissions trading

² CCC (2011) *Reducing emissions and preparing for climate change in Wales – 2011 progress report*. Available at: <https://www.theccc.org.uk/publication/reducing-emissions-and-preparing-for-climate-change-in-wales-2011-progress-report/>

³ CCC (2013) *Progress on reducing emissions and preparing for climate change in Wales*. Available at: <https://www.theccc.org.uk/publication/progress-on-reducing-emissions-and-preparing-for-climate-change-in-wales/>

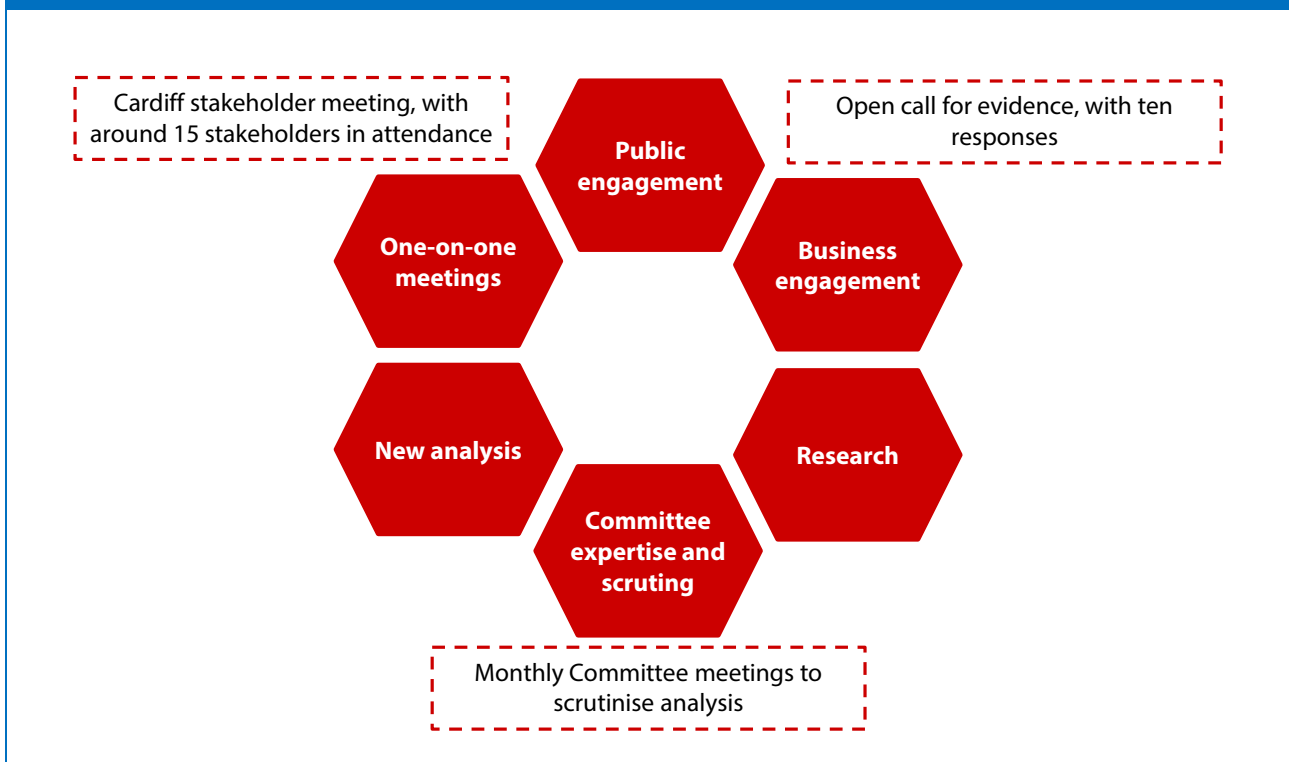
⁴ CCC (2016) *Meeting Carbon Budgets – 2016 Progress Report to Parliament*. Available at: <https://www.theccc.org.uk/wp-content/uploads/2016/06/2016-CCC-Progress-Report.pdf>

and implications for the competitiveness of Welsh industry; and the inclusion of Wales's shares of emissions from international aviation and international shipping.

- In January 2017, we held a stakeholder workshop jointly with the Welsh Government to present and discuss the issues raised by the Call for Evidence.
- We received ten responses to the Call for Evidence, spanning companies in the power and industry sectors, Natural Resources Wales, the National Farmers Union and NGOs. All responses have been published in full on our website.⁵
- We have also held meetings with individual stakeholders and Welsh Government departments.

Our engagement has been valuable in gathering views about the design of carbon targets and the relevant circumstances that pertain to Wales.

Figure 1.1. Evidence and engagement for this report



2. Existing targets and progress to date in reducing emissions

Wales currently has a legislated 2050 target of an 80% reduction in greenhouse gas emissions (on 1990 levels), and the Welsh Government has set two further emission reduction targets:

1. Reduce overall emissions by 40% from 1990 levels by 2020.
2. Reduce emissions by 3% annually in areas of devolved competence, against a baseline of average emissions over the period 2006-2010.

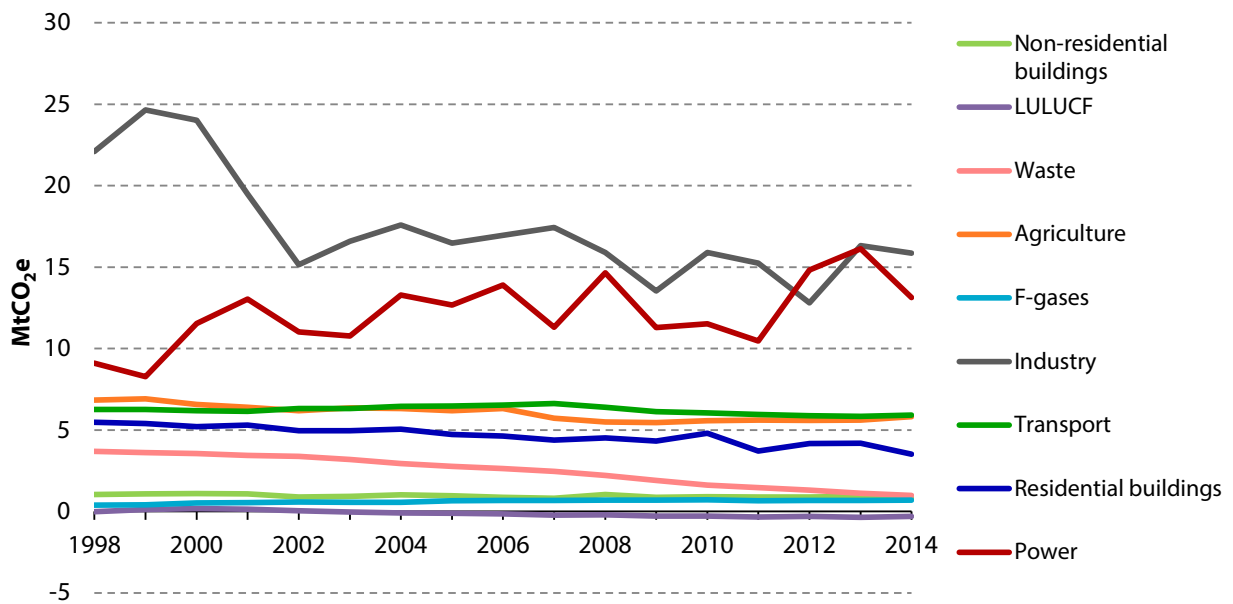
⁵ <https://www.theccc.org.uk/2017/03/09/responses-to-the-environment-wales-act-consultation/>

Welsh emissions were 18% below 1990 levels in 2014, implying that a 40% reduction by 2020 is highly challenging. However, the Welsh Government's 3% target has been met each year since 2010.

- Since 1990, emissions in Wales have fallen 18% (compared to 36% across the UK). Within this, power sector emissions have risen by 17%, while falls have been seen in industry, buildings and waste (Figure 1.2).
 - **Power** sector emissions in Wales have increased in 17% since 1990, due to the closure of Transfynydd nuclear power station in 1991, an increase in gas-fired generation and continued emissions from Aberthaw coal-fired power station. Aberthaw represented 46% of Welsh power emissions and 13% of total Welsh emissions in 2014.
 - **Industry** emissions in Wales have been broadly flat since 2008, although they have fallen by around 30% since 1990. This fall is less than the 45% reduction in industrial emissions for the UK as a whole over the period to 2014, during which UK manufacturing output has shown fairly steady slow growth (with the exception of the financial crisis).⁶
 - **Buildings.** Direct emissions from buildings are down 32% on 1990 levels. The Welsh Government's Arbed and Nest schemes have been successful in delivering energy efficiency measures to over 45,000 households.
 - **Waste** emissions in Wales have fallen by 72% since 1990. Wales has the highest recycling rates in the UK (55% of municipal waste is reused, composted or sent for recycling in 2014/15), and the fourth best in Europe, as a result of meeting strong regulatory targets for waste reduction through the Towards Zero Waste strategy.
 - **Agriculture and land use.** Agriculture emissions have fallen 15% since 1990, although they have been rising gently since 2009. The size of the land-use sink has decreased due to more land being converted to settlements and a reduction in tree-planting rates.
 - **Transport** emissions have been broadly flat since 1990.
- Wales accounts for 9% of UK-wide emissions, but only around 5% of UK population. The pattern of emissions in Wales differs to that for the UK as a whole, with a much higher share of industry and, consequently, a greater share of emissions covered by the EU emissions trading system (EU ETS):
 - Industry is responsible for 34% of emissions in Wales, against an average of 23% for the UK as a whole (Figure 1.3). In particular, Port Talbot steelworks represented 52% of Welsh industrial emissions and 18% of total Welsh emissions in 2014.
 - Consequently, the EU ETS, which applies to the power sector and heavy industry, covers a greater proportion of emissions in Wales, at 56% compared to 39% in the UK as a whole.
- The Welsh Government's 3% annual reduction target has been met each year since 2010. By 2013, the third target year, emissions in areas of devolved responsibility (transport, resource efficiency and waste, business, residential, agriculture and related land-use, and the public sector) had fallen 14.7% against the 2010 baseline. Due to the cumulative outperformance of the target for a reduction of 3% per year, it is likely the target for 2014 will also be met.

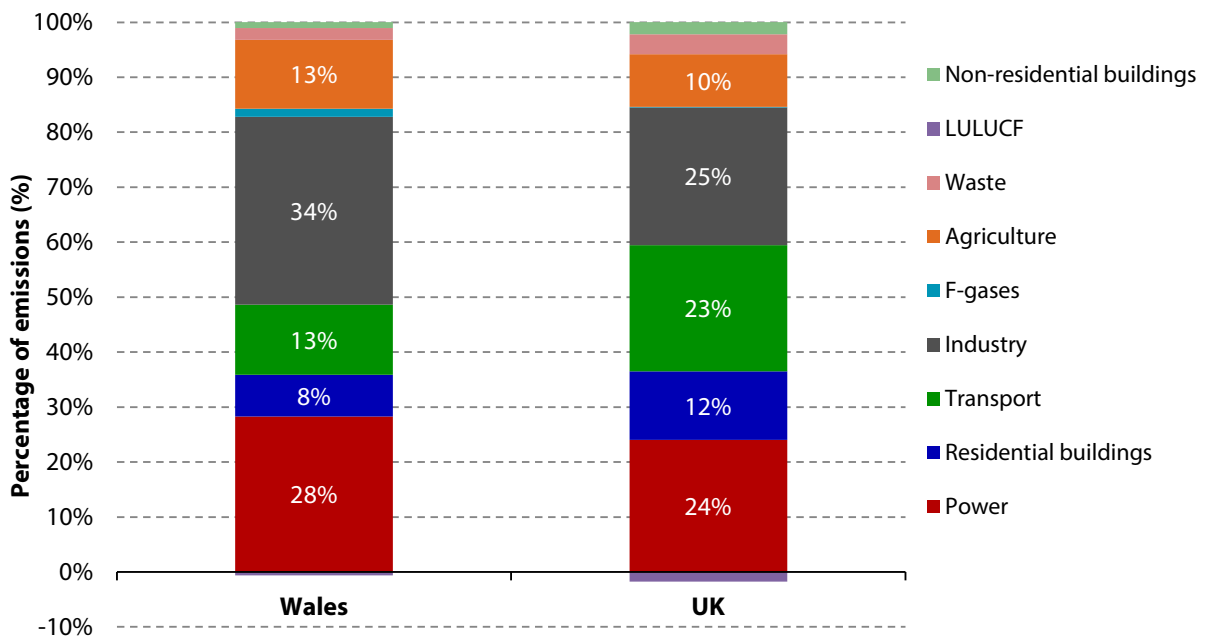
⁶ Data on Welsh manufacturing output are not available for the entire time period since 1990. For more on trends in industrial output and emissions see our report on Energy Prices and Bills: <https://www.theccc.org.uk/publication/energy-prices-and-bills-report-2017/>

Figure 1.2. Welsh emissions by sector (1998-2014)



Source: NAEI (2016) *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2014*, https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1606140853_DA_GHGI_1990-2014_Report_v1.pdf
Notes: Annual data for Welsh emissions are only available from 1998.

Figure 1.3. Sectoral shares of emissions in Wales and the UK



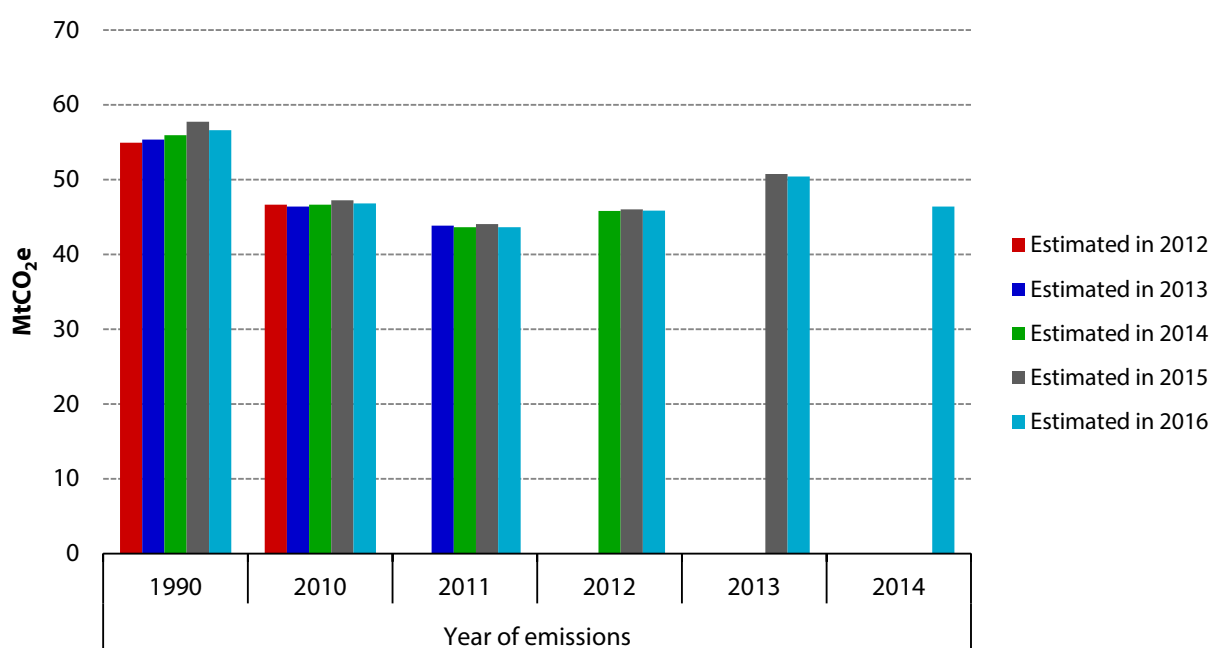
Source: NAEI (2016).

3. Revisions to the emissions inventory

The Welsh greenhouse gas inventory has been subject to regular revisions over time, some of them significant in magnitude. These changes are welcome, and reflect improvements in the methodology for estimating emissions:

- Revisions apply not just to estimates of recent emissions but also retrospectively to estimates going back to 1990. These revisions have included improvements in estimating emissions from drainage of grasslands on organic soils and the impacts of research to derive more representative emission factors for nitrous oxide.
- Estimates of emissions have tended to go up over time, although those published in 2016 revised down the estimates published in 2015 (Figure 1.4). However, since 2012 there has been an upward revision to 1990 emissions of 1.7 MtCO₂e (3%).
- Uncertainty for Welsh emissions is $\pm 3\%$,⁷ similar to that for England and considerably lower than that for Scotland ($\pm 10\%$).⁸
- Currently only a relatively small fraction of peatland emissions are included in the inventory. The future inclusion of all peatland emissions will affect estimates of historical and future emissions. We will advise on how this affects Welsh emissions targets when evidence is available on their impacts on emissions estimates and the potential to abate these.

Figure 1.4. Revisions to estimates of Welsh emissions (1990; 2010-14)



Source: NAEI (2016) *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2014*, https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1606140853_DA_GHGI_1990-2014_Report_v1.pdf

⁷ With 95% confidence.

⁸ NAEI (2016) *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland 1990-2014*, https://uk-air.defra.gov.uk/assets/documents/reports/cat07/1606140853_DA_GHGI_1990-2014_Report_v1.pdf

Chapter 2: Design considerations for carbon targets



Setting emissions targets is not an end in itself. The targets are a means to drive the action that is necessary to reduce emissions by the required amount. The design of the targets must take account of the outcomes they are seeking to achieve.

In order to be effective, well-designed carbon targets should be transparent, stable, feasible and evidence-based. They should drive cost-effective decarbonisation across the economy, while minimising the risk of perverse outcomes. These principles, combined with experience about what has been effective, inform our consideration of how best to design Welsh carbon targets.

This chapter considers:

1. Percentage reductions or absolute targets
2. Emissions accounting for power and heavy industry
3. Inclusion of Wales's share of emissions from international aviation and international shipping
4. Use of international emissions credits

1. Percentage reductions or absolute targets

When carbon targets are set, the level of ambition embodied within them does not depend on whether they are set in a percentage form (e.g. a 80% reduction on 1990 levels by 2050) or in absolute terms (e.g. a reduction to 15.8 MtCO₂e by 2050).

The two targets do diverge if the estimate of emissions in 1990 changes. That estimate is based on the inventory of emissions.

This has been a more significant issue in Scotland than in Wales to date. However, lessons from Scotland support the use of targets in one form rather than two. For example, over time, changes in the estimates of emissions under the Scottish greenhouse gas emissions inventory affected different forms of targets in different ways. Changes to the inventory reflect improvements in the methodology for estimating emissions. It is neither possible nor desirable to stick with the emissions inventory methods in use when a target was first set. The methodology is continually updated as scientific understanding evolves. Emissions targets are generally set more than a decade in advance.

There is no single best basis on which to set targets. Percentage targets tend to mean that the amount of policy effort required to meet a target is less affected by changes to the emissions inventory, while absolute targets remain more aligned to the underlying climate science that links megatonnes of emissions to the extent of climate change.

Neither method is clearly correct or incorrect. However, the mix of the percentage and absolute targets that has existed in Scotland proved unsatisfactory. It is therefore preferable to specify targets on one basis or the other. Our recent advice to the Scottish Government on their new climate change legislation was that targets should not be set on both a percentage and absolute basis.⁹

The Committee's assessment is that percentage reduction targets provide a more consistent, stable basis from which to drive decarbonisation, as changes to the emissions inventory have a smaller impact. Should there be a major divergence between the underlying scientific basis and the legislated targets in place at any time, this could be a significant change in circumstances that justifies revisiting the level of ambition in the targets.

⁹ <https://www.theccc.org.uk/publication/advice-on-the-new-scottish-climate-change-bill/>

Conclusion: Welsh targets should not be specified for any time period on both a percentage and an absolute basis. We recommend use of a percentage reduction basis for all targets, as these provide a more stable means of driving policy action to reduce emissions.

2. Emissions accounting for power and heavy industry

The Committee was asked to provide the Welsh Government with advice about how carbon budgets are accounted for. Broadly, there are two accounting options:

- **Actual (or 'gross') emissions.** Emission reduction only counts towards meeting domestic carbon targets if that emission reduction has taken place within Welsh territory. This is the approach under UK carbon budgets for sectors outside the EU Emissions Trading System (EU ETS) – transport, buildings, agriculture, land use and parts of industry – but could be used across the entire economy.
- **'Net' emissions.** For sectors within the EU ETS, an adjustment is made to the actual level of emissions to account for net trading by Welsh installations within the EU ETS. These 'net' emissions essentially reflect Wales's share of the EU ETS cap. If actual Welsh emissions are above the Welsh share of the cap, this implies that Welsh installations are net buyers of EU ETS allowances; conversely, if actual emissions are below the share of the cap, Welsh installations are net sellers of allowances. This method is used for UK carbon budgets.

In assessing the best choice of how to account for emissions covered by the EU ETS – the power sector and heavy industry – we first consider the set of issues that apply to both sectors. We then draw conclusions for each of these sectors in the context of the design of Welsh emissions targets.

Considerations for the choice of accounting approach

The choice of accounting approach depends on a number of considerations, relating to transparency, ensuring efficient outcomes, whether it drives cost-effective decarbonisation and changes in the output of large emitters:

- **Transparency.** It is important in designing emissions targets that they provide a clear signal to policy-makers, investors and the wider public about the extent of the emissions reductions that are required. Experience with 'net' carbon targets at UK level and under the existing Scottish framework suggests that this accounting method does not provide that clear signal. The most transparent method is to account for actual emissions in all sectors.
- **Efficiency.** If targets are based on actual emissions, it is important that climate policy is designed to avoid reducing Welsh industrial output or distorting decisions on the location of new generating capacity:¹⁰
 - **Carbon leakage** is the risk of closure or reduced output from an industrial installation, with production moving elsewhere, accompanied by a commensurate increase in emissions overseas. This is something that climate policy in the UK and Europe has consistently striven to avoid (e.g. through allocation of free allowances within the EU ETS and through compensation to electricity-intensive companies for increased power

¹⁰ The choice of emissions accounting approach need not be tied to the policy instruments by which emissions are reduced. Being part of an emissions trading scheme does not necessitate accounting for emissions on a 'net' basis, especially when the emissions cap in that trading scheme is 'soft' (i.e. over-supplied or subject to unpredictable policy adjustments) as is currently the case for the EU ETS.

prices). Having emissions accounting for vulnerable sectors based on actual emissions need not raise the risks of carbon leakage, given that it is possible design policies to minimise such impacts.

- **Siting of new plant.** Should some parts of the UK account for actual emissions in power or industry, while other parts use the UK carbon budget treatment on a net basis, in principle there is the potential for new sources of emissions to be sited in areas that do not have targets based on actual emissions. However, policy can be designed to avoid such outcomes.
- **Effort leakage.** If emissions are covered by a well-functioning emissions trading scheme covering a number of countries that has a ‘hard’ (i.e. inflexible) cap on emissions, it can be argued that additional policy effort to reduce actual emissions in one country will simply create headroom within the cap that leads to corresponding higher emissions in other countries (sometimes known as the ‘waterbed effect’). In principle, this is a strong argument, but it relies on the emissions trading scheme having a hard cap, so that extra policy effort in one country will lead to lesser reductions elsewhere. In practice, the EU emissions trading system (EU ETS) is oversupplied and has a mechanism by which emissions permits can be taken out of the market, so for the time being the cap is ‘soft’ and significant offsetting reductions in effort elsewhere are unlikely.¹¹
- **Cost-effective decarbonisation.** Targets can fail to drive the policy effort required to follow the cost-effective path for economy-wide decarbonisation if emissions reduction in particular sectors is not counted towards meeting the target:
 - Whilst some important policy levers are in the hands of the UK Government, there is an important role for the Welsh Government to drive emissions reductions by using the levers under its control (e.g. planning) or by working with the UK Government.
 - Long-term decarbonisation of the economy will require contributions from all sectors, although the timing and extent of these will depend on the relative costs of opportunities to reduce emissions. Emissions accounting approaches that treat some sectors differently may lead to an unbalanced decarbonisation strategy (e.g. use of finite bioenergy resources in sectors where emissions reductions ‘count’ rather than where they are most cost-effective).
 - Carbon capture and storage (CCS) is crucial to meet long-term emissions targets at reasonable cost¹² and to reach net-zero emissions. Its potential to reduce emissions largely applies to sectors covered by the EU ETS. A net emissions accounting approach that does not reward reductions in these sectors could provide insufficient focus on CCS to overcome the initial barriers to its implementation.
- **Changes in operational capacity.** The possibility that large industrial emitters or fossil fuel-fired power stations might have output considerably higher or lower than anticipated when setting emissions targets creates the potential for the emissions reduction required in the rest of the economy either to be much stronger or weaker than originally intended. In the

¹¹ Analysis by Sandbag suggests that only 2-8% of emissions allowances freed up by additional action to reduce emissions covered by the EU ETS will be used elsewhere in the system. See *Puncturing the Waterbed Myth*, available at <https://sandbag.org.uk/project/puncturing-the-waterbed-myth/>

¹² The importance of CCS in achieving an 80% reduction by 2050 reflects its applicability across heavy industry and power, together with its importance in options for heat decarbonisation (e.g. hydrogen) and in maximising the emissions reduction from sustainable bioenergy.

case that stronger action is required elsewhere, this could lead to excessive costs. Where weaker action is sufficient, this ‘hot air’ can undermine long-term progress in decarbonisation.¹³

Having considered the general principles for the accounting framework, it is then necessary to consider them in the context of the specific sectors in Wales.

Power sector

For the power sector, targets based on actual emissions can help to drive the necessary action in Wales to help bring forward cost-effective forms of low-carbon generation, for example through the planning system. The risks of having targets based on actual emissions are relatively low:

- **Transparency.** Targets based on actual emissions are easier to understand than those based on net emissions. Given the potential for low-carbon power generation in Wales, it is important that emissions reductions in the power sector are rewarded within Welsh targets.
- **Efficiency.** It makes sense to optimise power sector decarbonisation at the level of Great Britain, while allowing for an important role for interconnection to other countries primarily to provide flexibility. An accounting approach based on actual emissions for Wales would help to drive decarbonisation (e.g. through supportive planning decisions), with limited potential for perverse outcomes.
 - Within this GB-level optimisation, policy levers sit at both UK Government (e.g. contracts for difference) and devolved levels (e.g. planning). It therefore makes sense to have targets based on actual emissions for the power sector for Wales to help facilitate the deployment of low-carbon capacity.
 - Given that UK carbon budgets are currently based on a net approach for the power sector, there is theoretically some scope for incentivisation of fossil-fired back-up plants to be located in England rather than in Wales. In practice, there are other reasons for power station siting (e.g. grid stability) that are likely to be given greater consideration.
- **Cost-effective decarbonisation.** Wales can make a significant contribution to providing low-carbon generation as part of cost-effective decarbonisation within Wales, and at UK and EU levels.
 - Targets based on actual power sector emissions should not mean that Wales resorts to high-cost options in order to decarbonise its power sector. Wales is part of the GB power system and can access low-carbon electricity at reasonable cost if generation within Wales is insufficient.
 - In order to achieve overall emissions reductions in the most cost-effective way at Welsh, UK and EU levels, it is important to unlock the potential for lower-cost forms of low-carbon generation in Wales. This would be the case even if the EU ETS were functioning

¹³ Hot air – lower emissions in one area leading to the allowed emissions for other areas being too high – could arise in a variety of ways. Under targets based on actual emissions, the closure or reduction in output of a large emitter can allow excessive emissions for other sectors. Under net emissions targets at UK level, hot air has arisen due to a failure to accurately estimate the share of the trading system cap in advance (see our letter to the Secretary of State in 2015: <https://www.theccc.org.uk/wp-content/uploads/2015/03/CCC-DECC-letter-re-emissions.pdf>). However, as we recommended in our advice on the UK’s fifth carbon budget (<https://www.theccc.org.uk/publication/the-fifth-carbon-budget-the-next-step-towards-a-low-carbon-economy/>) steps can be taken to avoid this, by fixing the level of the traded sector part of the budget, rather than using the out-turn share of the EU ETS cap. The UK Government did not accept this recommendation.

as originally intended; given its current weakness, it is all the more important to drive Welsh electricity decarbonisation.

- **Changes in operational capacity.** Risks relating to 'hot air' from a large emitter closing are important to consider in the context of Wales, where the large Aberthaw coal-fired power station continues to operate.
 - It is anticipated that Aberthaw will close by 2025, as part of the UK commitment to phasing out unabated coal-fired generation by this date.¹⁴ The precise timing of this may affect the level of Welsh emissions significantly during the periods of the first two carbon budgets (2016-2020 and 2021-2025). We will consider this in recommending the levels for Welsh carbon budgets later in 2017.
 - The size of other effects, such as further closures of fossil-fired plant or the siting of a new thermal plant to provide back-up to renewables should be of a small enough scale to be managed within the overall targets.

Power sector conclusion: We recommend that the power sector be accounted for on the basis of actual Welsh emissions. This will reward action to reduce power sector emissions within Wales, and provide transparent accounting for those emissions.

Industry

The best solution for the parts of industry covered by the EU ETS is less clear-cut. Although there are clear benefits to multi-country emissions trading, long-term decarbonisation would ideally proceed more quickly than is likely under the EU ETS. Targets based on actual emissions would be more transparent and need not lead to risks of carbon leakage if policy is designed well, but uncertainties in the levels of future industrial output present a challenge to setting targets:

- **Transparency.** Targets based on actual emissions are easier to understand than those based on net emissions. However, there may be presentational challenges should the closure of a significant emitter make the difference between meeting targets and not doing so, even if this closure was not due to climate policy.
- **Efficiency.** Many industries are international in nature. Reducing output in Wales will not necessarily lead to a reduction in global greenhouse gas emissions. There are potential risks to industrial competitiveness if one country pursues more ambitious climate policies than competitor countries and if the additional costs relating to decarbonisation are borne by the relevant companies.
- **Cost-effective decarbonisation.** While a net emissions approach would protect industry from extra costs of decarbonisation, it is unlikely to lead to the necessary long-term decarbonisation where the market for emissions allowances is not functioning well. Targets based on actual emissions could help to support actions to decarbonise Welsh industry, but policy would have to be designed carefully to avoid undermining competitiveness, which may imply significant Government expenditure.
 - In order to achieve the challenging long-term emissions targets, the industrial sector in Wales will need to make significant emissions reductions. While the EU ETS provides an

¹⁴ This is consistent with the Energy Statement made by the Cabinet Secretary in December 2016. <http://www.assembly.wales/en/bus-home/pages/rop.aspx?meetingid=4010&assembly=5&c=Record%20of%20Proceedings#447844>

incentive to undertake some incremental improvements in energy efficiency it looks unlikely to drive the more significant measures that will be required.

- Targets based on actual emissions in industry would mean that the Welsh Government has a reason to find and incentivise ways of reducing industrial emissions. While there are ways to incentivise more ambitious policy action without imposing the extra costs on companies, such measures may imply significant expenditure by the UK or Welsh Government.
- **Changes in operational capacity.** Risks relating to ‘hot air’ from reductions in industrial activity within Wales are significant, as a relatively large proportion of emissions come from a small number of installations. This will need to be monitored closely. Were major changes in industrial output to occur, either upwards or downwards, it would be possible to address this through reconsidering the level of the targets, as a result of a significant change in circumstances. It would also be possible to allow flexibility for the Welsh Government to buy international emissions credits in the case that higher than anticipated industrial output led to actual Welsh emissions being above the target.

Industry conclusion: Rather than accounting for industrial emissions in a more complex, less transparent, way it is preferable to keep the emissions accounting simple and deal with areas of concern in others ways. ***We therefore recommend that accounting for industry emissions is on the basis of actual Welsh emissions.*** This would encourage decarbonisation and be more transparent than under UK carbon budgets. ***However, consideration should be given to particular provisions for some industrial sectors:***

- It is important that where there is a risk of displacement of industrial activity to other countries with less stringent climate policies (i.e. ‘carbon leakage’) policy does not encourage a reduction in Welsh industrial output. Climate policies should be designed carefully to avoid this risk.
- The level of industrial activity in Wales could turn out to be higher or lower than that anticipated when setting emissions targets. In the case that this difference in output is large, this could constitute a significant change in circumstances that warrants reviewing the level of emissions targets so as to maintain the level of ambition for emissions reduction across the rest of the economy.
- Should industrial output be higher than anticipated, causing actual emissions to be higher than the target, it could be reasonable for international emissions credits to be used to offset these additional emissions.

The Welsh Government should work with the UK Government to ensure that compensation for, and exemptions from, the costs of low-carbon policies remain so long as there are differences in low-carbon policy costs between Wales and international competitors.

3. Inclusion of Wales's share of emissions from international aviation and international shipping

Under the UN Framework Convention on Climate Change (UNFCCC), emissions from international aviation and international shipping (IAS) are accounted for separately from those of individual countries.¹⁵ Countries do provide supplementary information regarding the emissions resulting from the consumption of the fuel sold for shipping and aviation ('bunker fuel' sales). This raises an issue of whether Wales's shares of emissions from these sectors should be included within legislated targets.

These emissions contribute to climate change and in principle should therefore be included within the scope of national emissions targets, unless there are strong practical considerations which prevent this. Considering aviation and shipping in turn:

- **International aviation.** For international aviation, the complications that affect inclusion at a UK level relate to emissions targets that are accounted for on a net basis (e.g. the inclusion of aviation in UK carbon budgets has been constrained by the limited geographical scope of aviation included in the EU ETS). As we have recommended that Wales move to targets based on actual emissions, this barrier does not apply.
- **International shipping.** There is no reason to exclude Wales's share of international shipping emissions from the targets. We have recommended inclusion under UK carbon budgets.¹⁶

Accounting for these emissions formally within national emissions targets is clearer and more flexible than excluding them from this framework while taking them into account indirectly.

Inclusion of a sector within emissions targets does not automatically mean that strong carbon policies should be enacted at national level to limit them. As we have set out previously,¹⁷ 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. A unilateral approach would have limited impact reducing emissions and could result in perverse outcomes or leakage, given the specific characteristics of these sectors:

- Unilateral policy action would not result in technology innovation as regards aircraft or ships, given that these industries are international, and require a critical mass of countries to support innovation.
- A Wales-only policy in shipping, such as a bunker fuels tax or a cap-and-trade scheme, could displace bunkering to elsewhere in Europe, and result in transshipment via other European ports, with no overall reduction in emissions or increased incentive for efficiency improvement.
- A unilateral approach to aviation could result in displacement of hubbing to other airports in Europe (e.g. passengers might fly short-haul to other EU airports and connect to long-haul flights) without an overall reduction in emissions.

¹⁵ The emissions attributed to individual countries under the UNFCCC are those occurring within that country's territory, including energy system CO₂ emissions, CO₂ process emissions (e.g. from chemical reactions in cement production), non-CO₂ emissions (e.g. landfill methane) and those relating to land use, land-use change and forestry.

¹⁶ CCC (2015) *The fifth carbon budget – the next step towards a low-carbon economy*. Available at:

<https://www.theccc.org.uk/publication/the-fifth-carbon-budget-the-next-step-towards-a-low-carbon-economy/>

¹⁷ CCC (2012) *Scope of carbon budgets – Statutory advice on inclusion of international aviation and shipping*. Available at: <https://www.theccc.org.uk/publication/international-aviation-shipping-review/>

As an estimate of emissions based on bunker fuel sales is reported to the UNFCCC as a memo item, this is the simplest and most transparent basis for inclusion. Evidence suggests that this is a good proxy for a country's share of international transport emissions.¹⁸

Conclusion: Wales's shares of international aviation and international shipping emissions should be included within the scope of Welsh gross emissions targets, as measured by bunker fuel sales. Wales should pursue cost-effective policies to reduce emissions in these sectors, including international action (rather than unilateral action) where appropriate.

4. Use of international emissions credits

Emissions trading can help to achieve emissions reductions at the lowest overall cost across a group of countries. This is particularly important for the industrial sector, where carbon-intensive installations may be clustered in particular countries and where a collective approach can reduce the risk that unilateral climate policies will lead to industrial output moving overseas (see section 2).

The Committee's view is that national targets for emissions reduction should focus primarily on measures to reduce domestic emissions. We have previously stated that the aim should be to meet the 2050 target through domestic action, given that international credits may be expensive in a world of low emissions. It follows that nearer-term targets need to drive domestic action in order to stay on track to achieving this by 2050. However, at the margin, the ability to purchase emissions credits can provide useful flexibility in meeting the targets.

Conclusion: In addition to their potential use in case of high industrial output (see section 2), **the option to purchase some credible, international emissions credits should be retained to provide a flexibility mechanism.** However, their role should be as a back-up option rather than their use being planned for and should require prior advice from the Committee.

Credible international credits include those linked to international agreements (i.e. Kyoto and the Paris Agreement) or allowances that are part of meeting EU emissions targets. We will provide advice later in 2017 on the limits to the use of emissions credits to provide flexibility alongside our advice on the levels of interim targets and the first two carbon budgets (covering 2016-20 and 2021-25).

¹⁸ See Chapter 2 of CCC (2012) *Scope of carbon budgets – Statutory advice on inclusion of international aviation and shipping*. Available at: <https://www.theccc.org.uk/publication/international-aviation-shipping-review/>

Chapter 3: Recommendations



The Committee on Climate Change (CCC) was asked by the Welsh Government to provide advice on aspects of the Environment (Wales) Act. This report provides the first part of the requested advice, including specifically:

- Advice on the emissions accounting approach, including:
 - The circumstances in which carbon units may be credited to, or debited from the Net Welsh Emissions Account and how this is to be done;
 - How carbon units should be defined; and
- Whether Wales's share of emissions from international aviation and international shipping should be included.

We set out our recommendations on each of those aspects in this Chapter. As some of these issues are inter-related, we have provided the advice in four sections:

1. The emissions accounting framework
2. Use of international emissions credits
3. Inclusion of international aviation and international shipping
4. Form of targets

1. The emissions accounting framework

In providing advice on emissions accounting under the new Bill, our recommendations seek to provide a high level of transparency and to reward decarbonisation in all sectors, while guarding against perverse outcomes.

Emissions accounting for the power sector

The power sector is of major strategic importance to economy-wide decarbonisation, both in displacing fossil generation and providing the means to decarbonise other sectors (e.g. through electric vehicles). Power consumption within the GB system is likely to increase between now and 2050, by which time virtually all generation will need to be low-carbon. It is therefore especially important that substantial progress is made now on investment in low-carbon generation capacity. Wales is well placed to contribute to a cost-effective supply mix.

The primary policy levers to encourage low-carbon electricity generation are held at UK level, both for large-scale projects (contracts for difference) and smaller scale (feed-in tariffs). However, there is also an important role at devolved and local government levels in facilitating the addition of new generating capacity, especially relating to the planning system.

We therefore recommend that the power sector be accounted for on the basis of actual Welsh emissions, rather than the 'net' approach under UK carbon budgets. This will reward action to reduce power sector emissions within Wales, and provides a transparent basis for accounting for those emissions.

Emissions accounting in industry

The arguments for and against different ways of accounting for industry emissions are more finely balanced (see Chapter 2). The method of accounting under UK carbon budgets is not transparent and does not reward emissions reductions across the whole economy. However, in

taking a different approach it is important that this does not introduce risks of undesirable outcomes.

The most transparent way to account for emissions in the industry sector is to include them on the basis of actual emissions. Accounting for them in this way would also reward actions to reduce emissions in Welsh industry. However, it would raise questions over two aspects: the risk of displacing Welsh industrial production overseas (i.e. 'carbon leakage') and concerns that unanticipated changes in industrial output – upwards or downwards – should not lead to emissions targets for the rest of the economy that are too tight or too loose.

The Committee's view is that rather than accounting for industrial emissions in a more complex, less transparent, way it is instead preferable to keep the emissions accounting simple and deal with areas of concern in others ways. ***We therefore recommend that the industry sector be accounted for on the basis of actual Welsh emissions.***

In order to limit the potential for carbon leakage or other perverse outcomes, we make three accompanying recommendations:

- **Design of climate policies.** It is important that where there is a risk of displacement of industrial activity to other countries with less stringent climate policies (i.e. 'carbon leakage') policy does not encourage a reduction in Welsh industrial output. It will be important that climate policies are designed carefully to avoid this risk.¹⁹
- **Maintaining ambition in other sectors.** The level of industrial activity in Wales could turn out to be higher or lower than that anticipated when setting emissions targets. In the case that this difference in output is large, this could constitute a significant change in circumstances that warrants reviewing the level of emissions targets so as to maintain the level of ambition for emissions reduction across the rest of the economy.
- **Purchase of emissions credits.** Should industrial output be higher than anticipated, causing actual emissions to be higher than the target, it could be reasonable for international emissions credits to be used to offset these additional emissions.

2. Use of international emissions credits

The Environment (Wales) Act sets out provision for potential use of "carbon units" (i.e. the role for international emissions credits). The Welsh Government has requested advice on how these should be defined and the circumstances in which carbon units may be credited to, or debited from the Net Welsh Emissions Account.

The Committee's view is that national targets for emissions reduction should focus primarily on measures to reduce domestic emissions. We have previously stated that the aim should be to meet the 2050 target through domestic action, given that international credits may be very expensive in a world of low emissions. It follows that nearer-term targets need to drive domestic action in order to stay on track to achieve this by 2050. However, at the margin, the ability to purchase emissions credits can provide useful flexibility to meet the targets.

Emissions trading can help to achieve emissions reductions at least cost across a group of countries. This is particularly important for the industry sector, where carbon-intensive installations may be clustered in particular countries and where a collective approach can

¹⁹ See our report on Energy Prices and Bills: <https://www.theccc.org.uk/publication/energy-prices-and-bills-report-2017/>

reduce the risk that unilateral climate policies will lead to industrial output moving overseas (i.e. 'carbon leakage'). In principle, emissions trading could lead to Welsh industry emissions increasing as part of a least-cost approach to reducing emissions across multiple countries (e.g. within the EU emissions trading system).

Therefore, whilst the recommended targets relate to reductions in actual Welsh emissions, purchase of emissions credits by the Welsh Government could be appropriate:

- **To cover increased industrial output.** As outlined above, should Welsh industrial output exceed that anticipated when setting the targets, causing actual Welsh emissions to be above the target levels, it could be reasonable for international emissions credits to be used to offset these additional emissions.
- **To provide flexibility.** The option to purchase some credible, international emissions credits should be retained to provide a flexibility mechanism. However, their role should be as a back-up option rather than their use being planned for and, as under the current legislation, should require prior advice from the Committee.

Credible international credits include those linked to international agreements (i.e. Kyoto and the Paris Agreement) or allowances that are part of meeting EU emissions targets. We will provide advice later in 2017 on the limits to the use of emissions credits to provide flexibility alongside our advice on the levels of interim targets and the first two carbon budgets (covering 2016-20 and 2021-25).

Given current uncertainties over the role for emissions trading in the long term it therefore remains appropriate for Wales to plan to meet long-term targets through domestic action.

3. Inclusion of international aviation and international shipping

We have previously recommended that in principle the relevant shares of international aviation and international shipping emissions should be included in emissions targets. The issue therefore relates to the practicality of inclusion:

- **International aviation.** In practice, complexities relating to the inclusion of aviation within European emissions trading and accounting for this within net emissions targets have meant that we have recommended against inclusion to date. However, such a barrier is only relevant where emissions targets are based on 'net' emissions accounting; there is no barrier to inclusion in targets based on actual emissions.
- **International shipping.** There is no practical barrier to including the share of international shipping emissions within targets, regardless of the form of emissions accounting (e.g. as part of the Committee's advice on the UK fifth carbon budget²⁰ we recommended that the UK share of international shipping be included in UK carbon budgets).

Given the recommendations to account for Welsh emissions based on actual emissions, ***we recommend that Wales's emissions targets should include the relevant shares of international aviation and international shipping emissions***, using emissions estimates calculated from bunker fuel sales. However, this should not necessarily mean that Wales pursues unilateral policy action to reduce emissions in these sectors (see Chapter 2).

²⁰ CCC (2015) *The fifth carbon budget – the next step towards a low-carbon economy*. Available at: <https://www.theccc.org.uk/publication/the-fifth-carbon-budget-the-next-step-towards-a-low-carbon-economy/>

4. Form of targets

The Committee's assessment is that setting targets on different bases, such as the percentage reduction and absolute (megatonne) targets in the Climate Change (Scotland) Act, is unsatisfactory and that one or other basis should be chosen that applies to all targets.

Given that percentage reduction targets will generally be more robust to changes in the greenhouse gas emissions inventory, ***we recommend that the 2050 target, all interim targets and the annual targets are all specified as percentage reductions on baseline (i.e.1990) emissions levels.***

Should there be changes in the scientific evidence such that the level of climate change consistent with the legislated percentage reduction targets comes to be sufficiently different from the current understanding, this could constitute a significant change in circumstances and warrant a review of the target levels.

The Committee will provide advice on the level of Welsh emissions targets towards the end of 2017.



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