

Environment and Sustainability Committee

Meeting Venue:
Committee Room 3 – Senedd

Meeting date:
2 October 2013

Meeting time:
09:30

Cynulliad
Cenedlaethol
Cymru

National
Assembly for
Wales



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Agenda

Private meeting

The Committee agreed at its meeting on 26 September to hold this meeting in private under Standing Order 17.42

Private meeting

1 Introductions, apologies and substitutions

2 Climate Change : UK Climate Change Committee (09:30 – 10:30) (Pages 1 - 78)

Adrian Gault, Chief Economist

3 Climate Change : Climate Change Commission for Wales (10:30 – 11:30) (Pages 79 - 90) E&S(4)-23-13 paper 1

Peter Davies, Chair
Chris Jofeh, Chair, Wales Low / Zero Carbon Hub
Iestyn Davies, Federation of Small Businesses
Lindsey Williams, Wales Council for Voluntary Action
Janet Davies, Plaid Cymru

4 Consideration of evidence (11:30 – 12:00)



Progress reducing emissions and preparing for climate change in Wales



Committee on Climate Change
January 2013

Acknowledgements

The Committee would like to thank:

The members of the Secretariat who prepared the analysis and contributed to the report: Laura McNaught, David Thompson, Sebastian Catovsky, Ute Collier, Adrian Gault, Jenny Hill, Alex Kazaglis, Eric Ling, Tara Barker, Jo McMenamain, and Kavita Srinivasan

Organisations who provided support: The Welsh Government and the Climate Change Commission for Wales

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The Committee on Climate Change



The Rt. Hon John Gummer, Lord Deben, Chairman

The Rt. Hon John Gummer, Lord Deben established and chairs Sancroft, a Corporate Responsibility consultancy working with blue-chip companies around the world on environmental, social and ethical issues. He was the longest serving Secretary of State for the Environment the UK has ever had. His experience as an international negotiator has earned him worldwide respect both in the business community and among environmentalists. He has consistently championed an identity between environmental concerns and business sense.



David Kennedy (Chief Executive)

David Kennedy is the Chief Executive of the Committee on Climate Change. Previously he worked on energy strategy and investment at the World Bank, and the design of infrastructure investment projects at the European Bank for Reconstruction and Development. He has a PhD in economics from the London School of Economics.



Professor Samuel Fankhauser

Professor Samuel Fankhauser is Co-Director of the Grantham Research Institute on Climate Change at the London School of Economics and a Director at Vivid Economics. He is a former Deputy Chief Economist of the European Bank for Reconstruction and Development.



Sir Brian Hoskins

Professor Sir Brian Hoskins, CBE, FRS is the Director of the Grantham Institute for Climate Change at Imperial College 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.



Paul Johnson

Paul is the director of the Institute for Fiscal Studies. He has worked on the economics of public policy throughout his career. Paul has been chief economist at the Department for Education and director of public spending in HM Treasury, where he had particular responsibility for environment (including climate change), transport and public sector pay and pensions. Between 2004 and 2007 Paul was deputy head of the Government Economic Service. He has also served on the council of the Economic and Social Research Council.



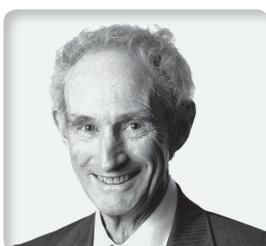
Professor Dame Julia King

Professor Dame Julia King DBE FREng Vice-Chancellor of Aston University. She led the 'King Review' for HM Treasury in 2007-8 on decarbonising road transport. She was formerly Director of Advanced Engineering for the Rolls-Royce industrial businesses, as well as holding senior posts in the marine and aerospace businesses. Julia is one of the UK's Business Ambassadors, supporting UK companies and inward investment in low-carbon technologies. She is an NED of the Green Investment Bank, and a member of the Airports Commission.



Lord John Krebs

Professor Lord Krebs Kt FRS, is currently Principal of Jesus College Oxford. Previously, he held posts at the University of British Columbia, the University of Wales, and Oxford, where he was lecturer in Zoology, 1976-88, and Royal Society Research Professor, 1988-2005. From 1994-1999, he was Chief Executive of the Natural Environment Research Council and, from 2000-2005, Chairman of the Food Standards Agency. He is a member of the U.S. National Academy of Sciences. He is chairman of the House of Lords Science & Technology Select Committee.



Lord Robert May

Professor Lord May of Oxford, OM AC FRS holds a Professorship jointly at Oxford University and Imperial College. He is a Fellow of Merton College, Oxford. He was until recently President of The Royal Society, and before that Chief Scientific Adviser to the UK Government and Head of its Office of Science & Technology.



Professor Jim Skea

Professor Jim Skea is Research Councils UK Energy Strategy Fellow and Professor of Sustainable Energy at Imperial College London. He was previously Research Director at the UK Energy Research Centre (UKERC) and Director of the Policy Studies Institute (PSI). He led the launch of the Low Carbon Vehicle Partnership and was Director of the Economic and Social Research Council's Global Environmental Change Programme.

The Adaptation Sub-Committee



Lord John Krebs, Chair

Professor Lord Krebs Kt FRS, is currently Principal of Jesus College Oxford. Previously, he held posts at the University of British Columbia, the University of Wales, and Oxford, where he was lecturer in Zoology, 1976-88, and Royal Society Research Professor, 1988-2005. From 1994-1999, he was Chief Executive of the Natural Environment Research Council and, from 2000-2005, Chairman of the Food Standards Agency. He is a member of the U.S. National Academy of Sciences. He is chairman of the House of Lords Science & Technology Select Committee.



Professor Samuel Fankhauser

Professor Samuel Fankhauser is Co-Director of the Grantham Research Institute on Climate Change at the London School of Economics and a Director at Vivid Economics. He is a former Deputy Chief Economist of the European Bank for Reconstruction and Development.



Professor Jim Hall

Professor Jim Hall FEng is Director of the Environmental Change Institute at Oxford University where he is Professor of Climate and Environmental Risks. A chartered engineer by background, Prof Hall has pioneered the use of probabilistic methods in flood risk assessment and water resource systems. He is Associate Editor of the Journal of Flood Risk Management and Fellow of the Royal Statistical Society.



Professor Anne Johnson

Professor Anne Johnson is a public health doctor. She is Professor of Infectious Disease Epidemiology and chair of the population health domain at University College London (UCL). She was a member of the UCL/Lancet Commission report on managing the health effects of climate change. She was previously Chair of the Medical Research Council Population Health Sciences Group. She became a Wellcome Trust governor in 2011.



Professor Martin Parry

Professor Martin Parry is a visiting Professor at Imperial College and was Co-Chair of Working of Group II (Impacts, Adaptation and Vulnerability) of the Intergovernmental Panel on Climate Change's (IPCC) 2007 Assessment Report. He was chairman of the UK Climate Change Impacts Review Group, and a coordinating lead author in the IPCC first, second and third assessments. He has worked at the Universities of Oxford, University College London, Birmingham and University of East Anglia.



Sir Graham Wynne

Sir Graham Wynne is a former Chief Executive and Director of Conservation of the RSPB. He is currently a Special Adviser to the Prince of Wales' International Sustainability Unit (ISU), Chair of the Harapan Rainforest Foundation in Indonesia, and a Trustee of Green Alliance. He was a member of the Policy Commission on the Future of Farming and Food, the Sustainable Development Commission, the Foresight Land Use Futures Group and England's Wildlife Network Review Panel. His early career was in urban planning and inner city regeneration.

Part 1: Progress reducing emissions

Introduction

This is our second annual report to the Welsh Government on progress implementing its Climate Change Strategy to reduce emissions and prepare for climate change. In our first progress report in 2011,¹ we found that Wales was making good progress developing approaches to deliver emission reductions over the next decade. At the sector level, however, we found that there was more scope for reducing emissions from electricity use than is outlined in the strategy, while the level of ambition for the agriculture sector needed to be defined.

We also recommended that the Welsh Government should provide more detail about emission reductions envisaged in the strategy due to *wider contributions from others*, which account for a third of the required emission reduction by 2020, but are currently not well defined.

Emission data for the first year of the Welsh Government's annual reduction target (2011) will not be available until mid-2013. Therefore in this report we assess emission trends using the most recent 2010 data and assess the progress towards implementing emissions reduction policies in the last year.

We also address a number of additional issues, as requested by the Welsh Government (see Annex A for full details of the request):

- To review the methodology used to define the Welsh Government target to reduce emissions by 3% each year from 2011, in areas of devolved competence.
- To review the indicators set out by the Welsh Government to monitor progress towards the 3% target.
- To consider legislative options for climate change mitigation and adaptation.

Key messages

The key messages resulting from our analysis are:

- **Emission trends:** Emissions increased in Wales in 2010 but are likely to have fallen in 2011, due largely to weather and macroeconomic trends. Underlying progress reducing emissions through the implementation of measures has been particularly good in the residential and waste sectors, where indicators show Wales ahead of the UK average on a number of measures. However, there are significant challenges ahead, in both these and other sectors, suggesting the need for policy strengthening. In particular:

¹ The Committee on Climate Change (2011): *Reducing emissions and preparing for climate change in Wales: 2011 progress report*.



- The Welsh Government should set out its strategy for promoting the Green Deal and ensuring Wales continues to receive a commensurate share of funding from supplier programmes (i.e. the Energy Company Obligation, ECO).
- The Welsh Government should also develop a renewable heat strategy to ensure that uptake of Great Britain-level incentives is maximised and to help overcome barriers to uptake.
- There are signs that renewable power development is falling behind the rest of the UK. The Welsh Government should explore ways to overcome barriers to achieving the considerable renewable resource it has identified.
- As assessment should be carried out on the emission reductions from transport behaviour measures, and whether these are likely to deliver the level envisaged in the strategy.
- A large part of the envisaged emissions reduction in the climate change strategy from the ‘wider contributions of others’ remains undefined. Greater clarity is required to provide confidence that these contributions will be delivered in practice.
- **3% target methodology:** Overall, the methodology to measure the achievement of the 3% target is appropriate in that it covers emissions within devolved competence and end-user electricity emissions as per the definition of the target. However, there are complexities. The target excludes emissions traded in the EU ETS, which is set to expand in scope during the monitoring period. The risk is that this change to the accounting framework gives the false impression that emissions have been reduced, when actually they have simply been reallocated outside the target. In order to avoid this, it will be important that estimates are made of these emissions. Depending on the degree of confidence around the estimates, these could then be added to emissions from sectors covered by the target. At a minimum, they should be explicitly considered when assessing progress reducing emissions in 2013 (i.e. the year when these emissions enter the EU ETS).
- **Performance indicators:** The indicator framework set out by the Welsh Government in 2012 is in general a sensible and comprehensive approach to tracking emission reductions – and it is compatible with the Committee’s approach to measuring progress. However, there are several gaps, and areas where the indicator set could be expanded to provide a fuller picture of emissions and policy performance:
 - A full set of UK indicators should be included for UK policies. At present, the only UK indicator is for new car emissions. The indicator set should be extended to cover the Electricity Market Reform, the Green Deal, and the Renewable Heat Incentive for example.
 - There should be corresponding Wales level indicators for UK policies (e.g. new car emissions).
 - Sectoral gaps in the monitoring framework should be addressed (e.g. for business and agriculture in particular).

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- Emission reductions from the wider contributions of others – which account for a third of total envisaged emission reductions – should be defined and indicators developed to track progress.
 - It would be useful for monitoring progress towards 2020 objectives if the framework could be related to the level of abatement anticipated by 2020 and a trajectory set towards the uptake of key measures required by that point. This would be subject to data availability and modelling requirements across various sectors, but is something the Welsh Government should explore further.
 - Monitoring progress is more difficult at the devolved level, due to data gaps in some areas. However, addressing the gaps in the framework will be crucial as we move towards reporting on the first target year.
 - Data is also subject to fairly large variability in some areas – e.g. due to the operation of a single power plant, or the effect of swings in temperature on residential sector emissions. On the latter, it is important for the Welsh Government to include or account for weather in its monitoring framework, either by tracking temperature and/or considering weather-adjusted energy/emissions data.

We set out the analysis that underpins these points in 4 sections:

1. Wales' emission targets and monitoring framework
2. Latest emission trends
3. Progress implementing measures by sector:
 - 3.1) Transport
 - 3.2) Business
 - 3.3) Residential
 - 3.4) Agriculture and land use
 - 3.5) Waste
 - 3.6) Public sector

4. Conclusions and recommendations

There is also some supplementary information in three Annexes:

A: Welsh Government request for advice

B: Review of the 3% target methodology

C: Review of the Welsh Government's monitoring framework



Part 2 of this report provides our analysis of the Welsh Government's progress towards implementing its adaptation framework and preparing for flooding in Wales.

The conclusions from Parts 1 and 2 feed in to our assessment of potential legislative options in Wales, which can be found in Part 3.

1. Wales' emission targets and monitoring framework

This section contains our assessment of two of the key elements of the Welsh Government's climate change framework: the methodology used to define and measure the target to reduce emissions within devolved competence by 3% each year, and the indicator set to monitor progress. Although we were not specifically requested to review this target, it is important to be aware that the climate change strategy also includes a target to reduce emissions from all sources by 40% by 2020, relative to 1990.

1.1 Assessment of the 3% target methodology

The Welsh target is to reduce emissions within devolved competence by at least 3% annually from 2011. This covers direct emissions from all sources in Wales, except those within the EU Emissions Trading Scheme (EU ETS) but does include emissions from electricity on an end-user basis, measured at a UK-wide average grid intensity factor.

We find that the overall methodology to define the emissions within the target reflects the spirit of the 3% target (i.e. to cover emissions within devolved competence, defined as direct emissions excluding those in the EU ETS, but including emissions associated with the end-use of electricity in Wales):

- The methodology uses the emissions inventory for Wales by source. This covers all emissions produced in Wales at the point they are generated.
- The emissions reported within the EU ETS are then deducted.
- Electricity CO₂ emissions allocated to end-users in Wales are then added from the end-user part of the inventory, which assigns UK-wide grid intensity to electricity consumption in Wales.

At a high level, this approach meets the definition of the 3% target. However, there are a number of complexities underlying this approach. In particular, there is an issue that the EU ETS increases in scope during the target monitoring period, and therefore some emissions will move to the traded sector and outside the calculation of the 3% target emissions. The risk is that this change to the accounting framework gives the false impression that emissions have been reduced, when actually they have simply been reallocated outside the target. In order to avoid this, it will be important that estimates are made of these emissions. Depending on the degree of confidence around the estimates, these could then be added to emissions from sectors covered by the target. At a minimum, they should be explicitly considered when assessing progress reducing emissions in 2013 (i.e. the year when these emissions enter the EU ETS).

We consider this, and other issues relating to the methodology in more detail in Annex B.

1.2 Assessment of the Welsh Government's monitoring framework

The Welsh Government intends to meet the 3% target through:

- The implementation of UK Government policy in Wales (accounting for 40% of reductions required by 2020²);
- The Welsh Government's own policies in areas of devolved competence, as well as those to complement UK policy in reserved policy areas (accounting for 30% of reductions required by 2020); and
- 'Wider contributions from others' (businesses, local government and the public sector, the third sector, communities and individuals), accounting for the remaining 30% of reductions required by 2020.

The Welsh Government has set out an indicator framework to measure progress against the policies in its strategy. This was published as an annex to the Welsh Government's first progress report³, and forms the basis on which we perform our review of the framework, as requested by the Welsh Government.

There are two components to our assessment:

- Whether the overall structure/approach of the indicator framework is appropriate.
- Whether the proposed indicators for each policy measure are appropriate/relevant to the associated policy measure, or whether the inclusion of alternative indicators might be appropriate.

We set out below some general conclusions across the framework as a whole. Some of the more detailed sector-level recommendations are picked up throughout the review of progress reducing emissions (section 3), and can be found in full in Annex C.

Overall approach

In terms of the type of indicators that are being tracked in the framework, the overall approach is appropriate. The framework consists of three 'tiers' of indicators and a set of contextual factors:

- Tier 1: CO₂e emission estimates consistent with the 3% target definition for each sector.
- Tier 2: Activity data (such as fuel consumption)
- Tier 3: Policy indicators which aim to monitor the actions the Welsh Government is taking or is aiming to take to reduce GHG emissions.

² Though we note that the estimate of the reduction from electricity use for 2020 could be an underestimate, if grid intensity falls in line with requirements to meet carbon budgets (i.e. over a 40% reduction compared to the 10% reduction implied in the strategy).

³ Welsh Government (2012): *Climate change strategy for Wales: first progress report – technical annex*.



- Contextual factors: External factors that drive emissions – economic conditions and energy prices for example.

The framework therefore covers each level of indicator that we would expect (i.e. emissions, activity, policy implementation indicators, and contextual factors), and is consistent in this approach with the Committee’s own indicator framework designed to report progress to the UK Parliament⁴.

Within this however, we have a number of suggestions on the general approach:

- Emissions in the 3% target are comprised of direct emissions for each sector, plus the indirect emissions associated with electricity use in each sector. These are currently presented as one total. However, it could be helpful to also present these separately. This would help identify increases/reductions in emissions in each sector and therefore make it easier to assess where reductions are on or off-track.
- Around 40% of the emission reductions required by 2020 are to be met through the implementation of UK Government measures in Wales which will impact direct emissions in the transport, residential, business, and public sectors. They will also affect end-user emissions through power sector policies. Indicators for these UK Government measures should be included in the framework, with, where possible, indicators tracking the implementation in Wales.
 - Transport is the only sector where progress in relation to UK measures is currently presented in the indicator document (for new car efficiency).
 - It is important for the Welsh Government to track not only progress at the UK level of each policy relevant to Wales, but also whether the implementation of that policy in Wales is at a level that is consistent with the estimated reductions from UK policy in Wales (for example the number of Green Deal/ECO measures implemented in the UK and in Wales). This will be particularly important for the power sector, which accounts for 10% of the reductions required in the Welsh climate change strategy by 2020.
- The Welsh Government estimates that ‘wider contributions from others’ will contribute around a third of the targeted reduction in emissions by 2020. The indicator framework currently does not include indicators on the wider contribution of others. We recommended in our 2011 progress report that further detail on these should be provided, and the contributions better defined to provide more confidence these reductions will be delivered. Indicators should then be set out for how these will be monitored.

⁴ See for example: Committee on Climate Change (2012): *Meeting carbon budgets: 2012 progress report to Parliament*.

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- The 3% annual reduction target is set as a reduction against average emissions over 2006-2010. Therefore the indicator framework has been designed to measure progress from the first target year, 2011, relative to the 2006-2010 baseline average. However the 3% target is set out to 2020 and it would be useful to be able to measure progress towards that point. This could be done by defining a level of ambition for the policies set to deliver the required reductions by 2020 (e.g. number of cavities and walls insulated) and setting an annual trajectory towards this that can be used to measure progress each year. This would be subject to data availability and modelling requirements across various sectors, but is something the Welsh Government could consider exploring further.
 - While measuring progress at the devolved level is more difficult, due to lack of data in some areas, it is important for the Welsh Government to complete the sectoral gaps in the framework, particularly in business and agriculture where there are no policy indicators currently.
 - For each sector, there are indicators on emissions and on activity – e.g. volume of road traffic for the transport sector or fuel consumption in the business sector. It might be helpful to combine some of these indicators to allow an assessment of emission intensity to be tracked – though this may have to be fairly disaggregated to be meaningful (e.g. presented separately by mode for transport).
 - Currently, indicators are presented for the 3% target only – this means that only activity relating to direct emissions outside the EU ETS and to end-user electricity emissions is being tracked. However, the Welsh Government’s climate change strategy also sets a target to reduce emissions from all sources in Wales, by 40% by 2020. The Welsh Government should therefore consider indicators to track progress reducing economy-wide emissions towards this important 40% target. Though the policy drivers will be largely outside of Welsh Government control (i.e. EU ETS and Electricity Market Reform), the Welsh Government can work with the UK Government on policy development in this area, and take actions to support delivery.

We now turn to the latest emission data for each of the two targets, and then review progress implementing policies in each sector, including views on the monitoring framework developed so far where appropriate.

2. Latest emission trends

This section provides our assessment of progress made towards reducing emissions in Wales. We consider the latest emission data for Wales, which is for 2010, and contextual data on the economy, temperature, the EU ETS and more recent data on UK trends to assess likely emissions for 2011. We assess progress against the two separate emission reduction targets set out in the Welsh Climate Change Strategy⁵:

⁵ Welsh Government (2010): *Delivery plan for emission reduction*.



- To reduce emissions by 3% each year from 2011, in areas of devolved competence, against a baseline of average emissions over 2006-2010.
- To reduce all Welsh emissions by 40% from 1990 levels by 2020.

For each target we establish the level of required emissions by 2020, assess progress to date, and compare this to the level of progress required to meet 2020 targets.

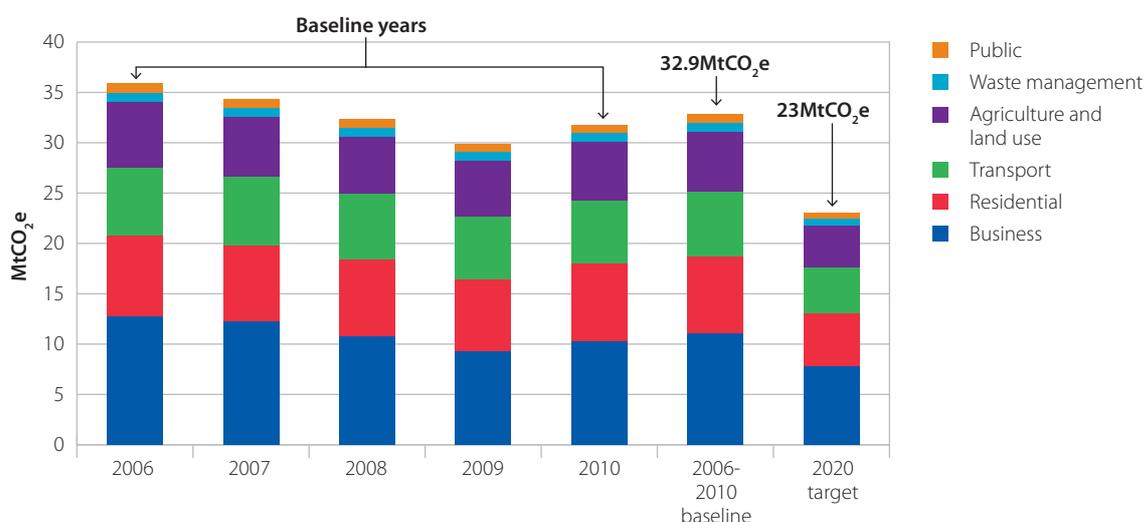
3% target baseline

The 3% target covers direct emissions from all sources in Wales except those within the EU Emissions Trading Scheme (the EU ETS, covering energy supply and energy-intensive industries). The emissions from electricity are included on an end-user basis, using a UK-wide average grid intensity factor (indirect emissions).

With 2010 data now available, the full 2006-2010 baseline can be calculated. This shows that:

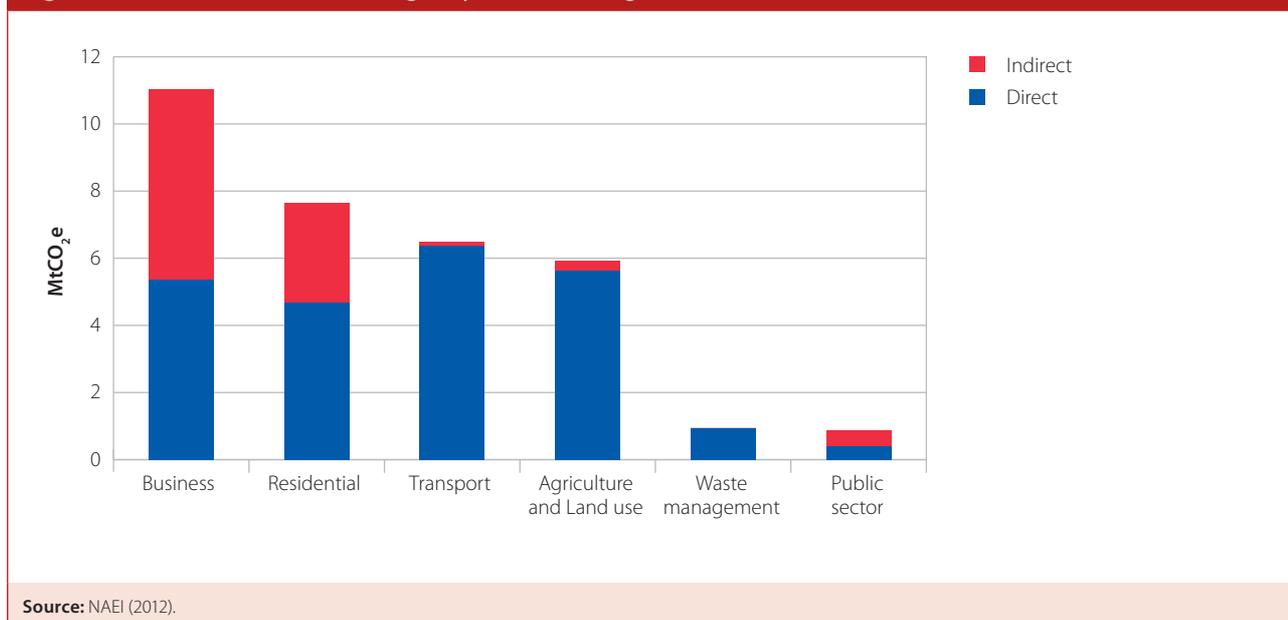
- Over the complete baseline period of 2006-2010, average annual emissions covered by the target were 32.9 MtCO₂e. Meeting the 3% target will require an annual reduction of just under 1 MtCO₂ from 2011, implying emissions of 23 MtCO₂e in 2020 (Figure 1.1).
- Over the baseline period, the target covers an average of 69% of total greenhouse gas emissions in Wales, with the main emitting sectors being business, residential, transport, and agriculture and land use.
- Over two thirds of emissions covered by the target are direct rather than indirect, but at the sector level, indirect emissions account for the majority of overall emissions in both the business and public sectors (52% and 54% respectively – Figure 1.2).

Figure 1.1: The 3% target baseline (2006-2010 emissions) and 2020 target



Source: NAEI (2012).

Figure 1.2: Emissions in the 3% target by sector (average over 2006-2010)



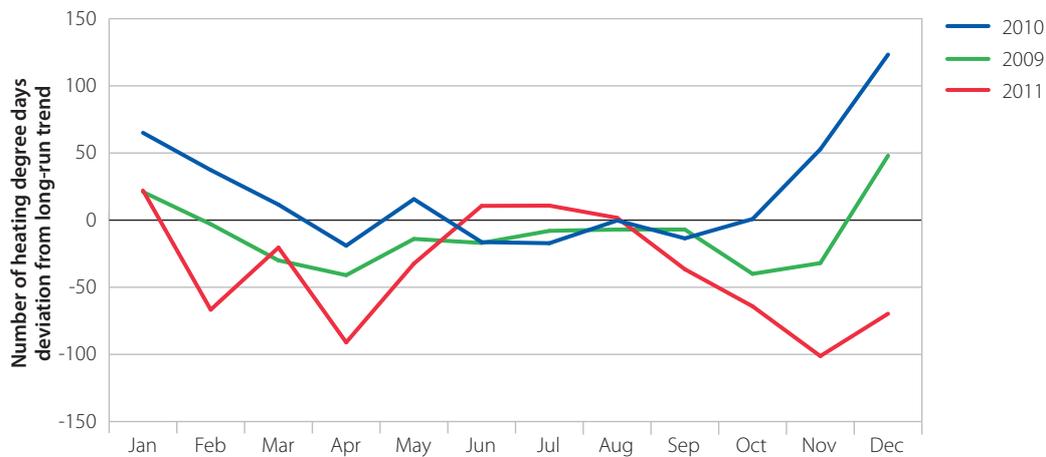
Emissions in 2010

Emissions covered by the target were 31.8 MtCO₂e in 2010, 6% higher than in 2009, but 12% lower than the first year of the baseline, 2006. Within this:

- Both direct and indirect emissions increased in 2010 (by 6% and 7% respectively). This reflects the increased demand for energy use during the particularly cold winter months of 2010 (Figure 1.3), and an increase in the emissions intensity of power generation (from 490 gCO₂/kWh to 496 gCO₂/kWh) in the UK in 2010 (resulting from nuclear outages and a fall in renewable generation).
- Compared to 2006, direct emissions were 11% lower, with reductions in all sectors except residential. Emissions from electricity use are lower in all sectors in 2010, and overall are 12% lower than in 2006. This is likely to be due to a combination of a fall in the emissions intensity of electricity generated in the UK over the longer term, and to a fall in end-user consumption (Figure 1.4):
 - Electricity sales to residential, commercial and industrial consumers fell 9% between 2006 and 2010 (from 17.4 TWh to 15.8 TWh)
 - The emissions intensity of electricity supply in the UK fell 11% over the same period, from 560 gCO₂/kWh to 496 gCO₂/kWh



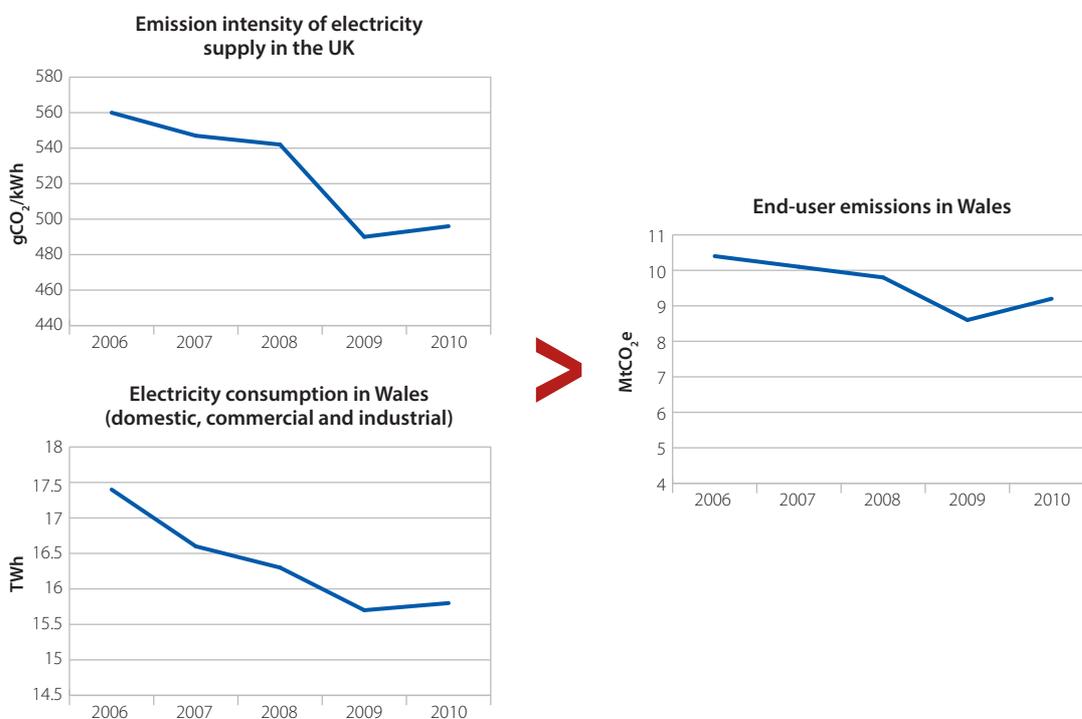
Figure 1.3: Temperature data – number of heating degree days variation from the long-run average (2009-2011)



Source: Vesma.com (2012).

Notes: Heating degree days (HDDs) are calculated relative to a baseline temperature, typically 15.5°C, which is the outside temperature above which a building needs no heating. One HDD is the number of degrees centigrade deviation from the base temperature of the actual temperature on a given day (e.g. if the temperature was 5.5°C for one day the number of HDD would be 10). Long-run trend is 1971-2000. Points above the x-axis reflect colder than average temperatures, and points below indicate higher than average temperatures.

Figure 1.4: Emissions intensity of electricity supply, electricity demand, and end-user emissions in Wales



Source: NAEI (2012) and DECC (2012), CCC calculations.

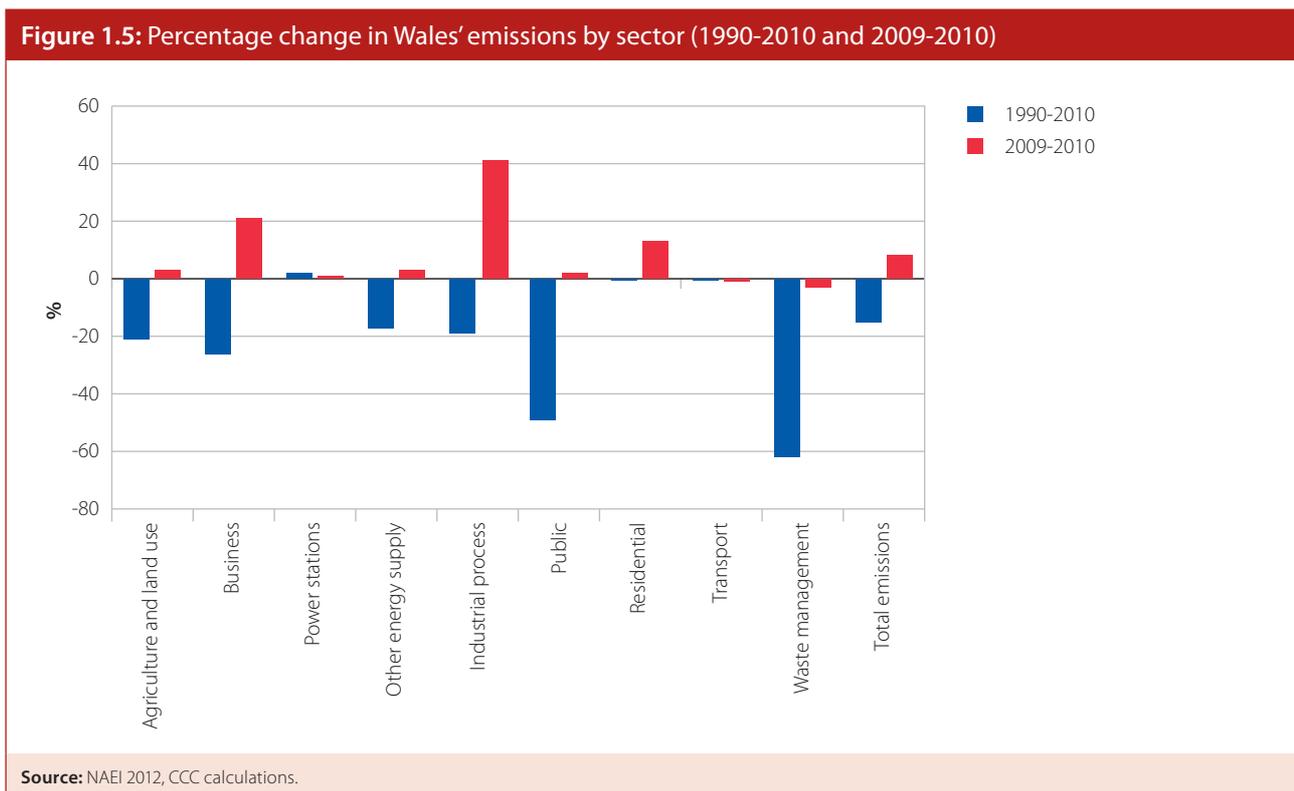
Notes: The electricity consumption data for Wales is based on an estimated split of consumption across England and Wales as the data are collected together, and therefore estimates are uncertain.

Target for all Welsh emissions

In addition to the target for emissions under Welsh competence, there is also a separate target to reduce emissions from all sources (i.e. including the EU ETS emissions excluded in the 3% target) by 40% from 1990 levels⁶ (i.e. from 54.9 MtCO₂e to 32.9 MtCO₂e) by 2020. Emissions from all sources were 46.6 MtCO₂e in Wales in 2010, a reduction of 15% since 1990.

Since 1990, emissions have fallen in all sectors except residential and transport, which are at the same level as 1990 (Figure 1.5), and the power sector, where emissions fluctuate extensively around the operation of individual plant, but overall are 2% higher than in 1990. In percentage terms, the largest reductions have been in waste management (62%), the public sector (49%), and the business sector (26%).

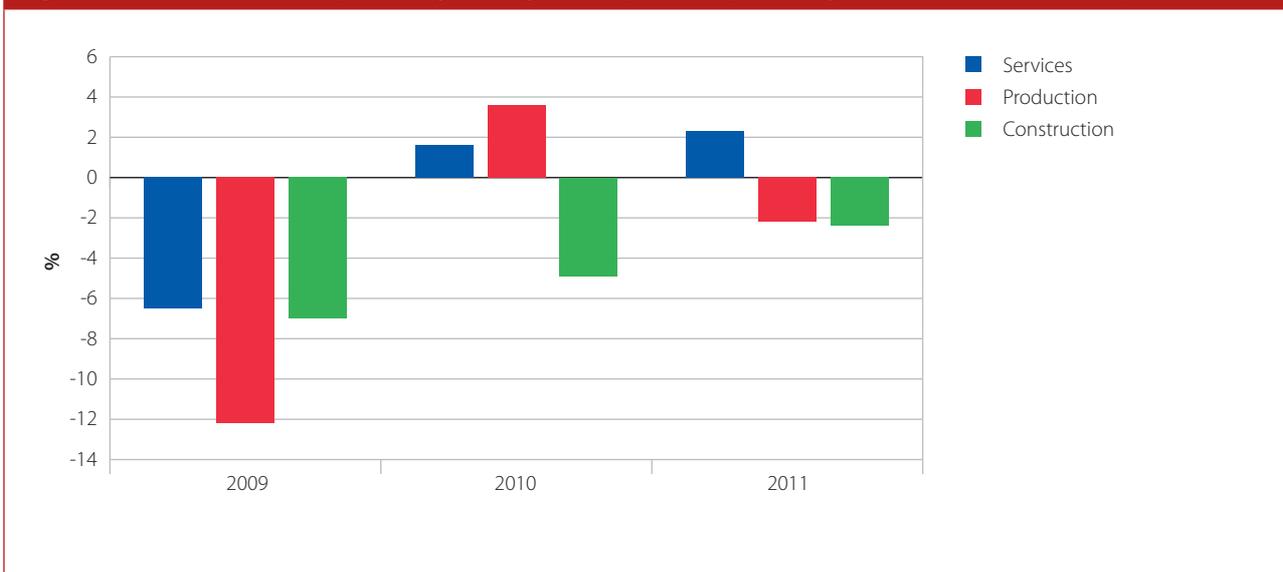
In 2010, emissions increased by 8%, or 3.5 MtCO₂e, due mainly to the increased energy demand during the cold winter months (Figure 1.3), and a return to growth in the production sector of the Welsh economy (Figure 1.6). Reflecting this, increases were concentrated in the business sector (increase of 1.7 MtCO₂e), industrial processes (0.6 MtCO₂e) and the residential sector (0.6 MtCO₂e).



⁶ Note that 1990 is the base year for CO₂, Nitrous oxide and methane, while 1995 is the base year for F-gases. The 40% target is set on a 'gross' basis – i.e. it does not account for emission trading in the EU ETS.



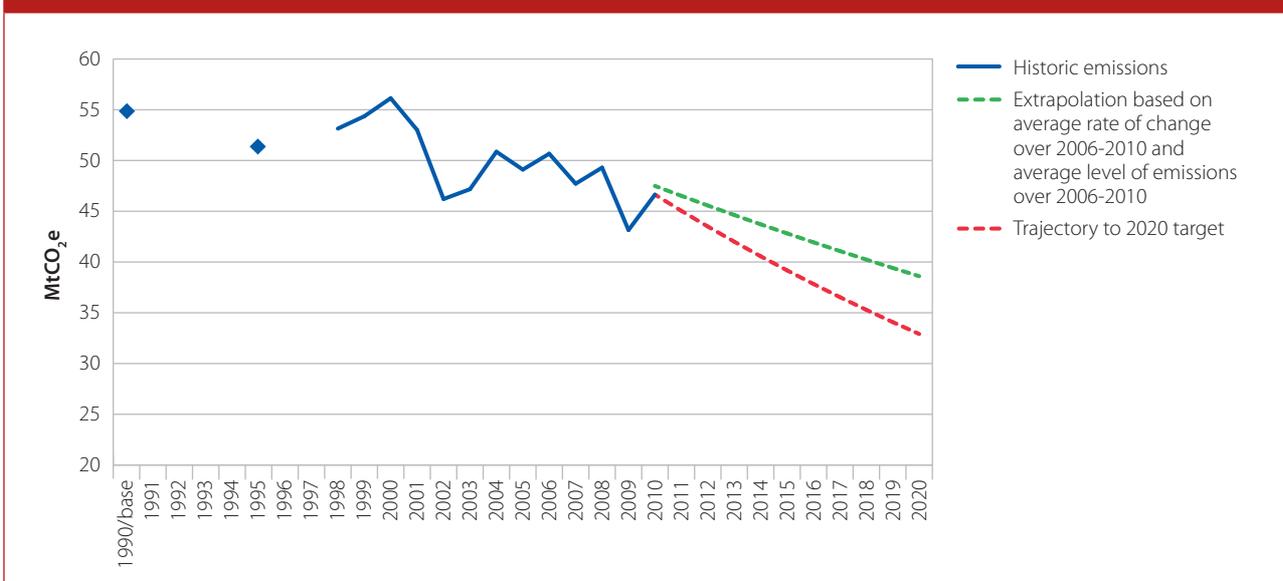
Figure 1.6: Economic data – percentage change in output from previous year (2009, 2010 and 2011)



Source: StatsWales (2012).

Meeting the target requires emissions to fall to 32.9 MtCO₂e by 2020. Given the level of emissions in 2010, this requires a 3% average annual reduction each year from 2011. This will require an increase in the pace of emission reduction relative to recent trends – over 2006–2010 the average annual reduction was only 2.1%, and includes the sharp fall in emissions in 2009 due to the recession (12% – Figure 1.7).

Figure 1.7: Target to reduce emissions by 40% by 2020: Historic emissions, required trajectory, and extrapolation of recent trend



Source: NAEI 2012, CCC calculations.

Notes: There is no emission data available for Wales for 1991-1994 or 1996-1997.

Likely changes in 2011

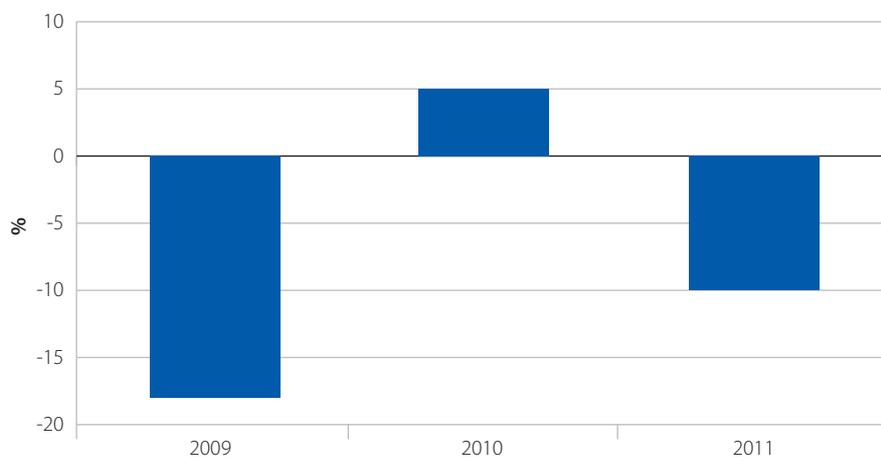
More recent (preliminary) emissions data is available for the UK as a whole for 2011, showing economy-wide emissions fell 7% in 2011. We concluded in our 2012 progress report to the UK Parliament that of this 7% reduction, 3 percentage points were due to the mild winter temperatures in 2011, with much of the remainder due to rising energy prices, falling real income and transitory changes in the power generation mix. Only around 0.8 percentage points could be attributed to the implementation of measures to reduce emissions.

We also considered contextual 2011 data for Wales and conclude that given milder temperatures relative to 2010 (Figure 1.3), falling production sector output (Figure 1.6) and a fall in EU ETS emissions (5% – Figure 1.8), that overall it is likely that emissions fell in Wales in 2011.

Specifically, power sector emissions will have fallen in 2011. Overall generation fell by 15%, largely driven by a large fall in gas-fired generation (33%, from 16 TWh to 10.7 TWh). Nuclear and coal-fired generation remained broadly level, while renewable power generation increased 33% from 1.6 TWh to 2.2 TWh.

The following sections present our assessment of progress in each sector, focusing on the commitments in the Welsh Climate Change Strategy, which are aimed primarily at achieving the 3% target.

Figure 1.8: Percentage change in Wales' EU ETS emissions from previous year (2009, 2010 and 2011)



Source: European Commission (2012).



3. Progress implementing measures by sector

3.1 Transport

Emission trends

Transport emissions as defined by the 3% target, increased in 2007, but have fallen each year since:

- Emissions (includes road, rail and domestic aviation and shipping) were 6.2 MtCO₂e in 2010, having fallen from 6.7 MtCO₂e in 2006 and 2007 and overall average 6.5 MtCO₂e in the 2006-2010 baseline, accounting for a fifth of the total emissions covered by the target. 62% of emissions are from cars, with heavy goods vehicles accounting for 17% of emissions and vans 16% (the remainder of emissions, 4%, are from buses and motorcycles).
- The fall in emissions since 2007 has largely reflected reductions in car emissions, as HGV and van emissions have remained broadly level. The reduction in car emissions reflects an improvement in the efficiency of new cars over that time, as well as a reduction in vehicle-kilometres (Figure 1.9 and 1.10 – for cars).
- Emissions are mainly comprised of direct emissions rather than indirect emissions (6.1 MtCO₂e and 0.1 MtCO₂e in 2010 respectively).

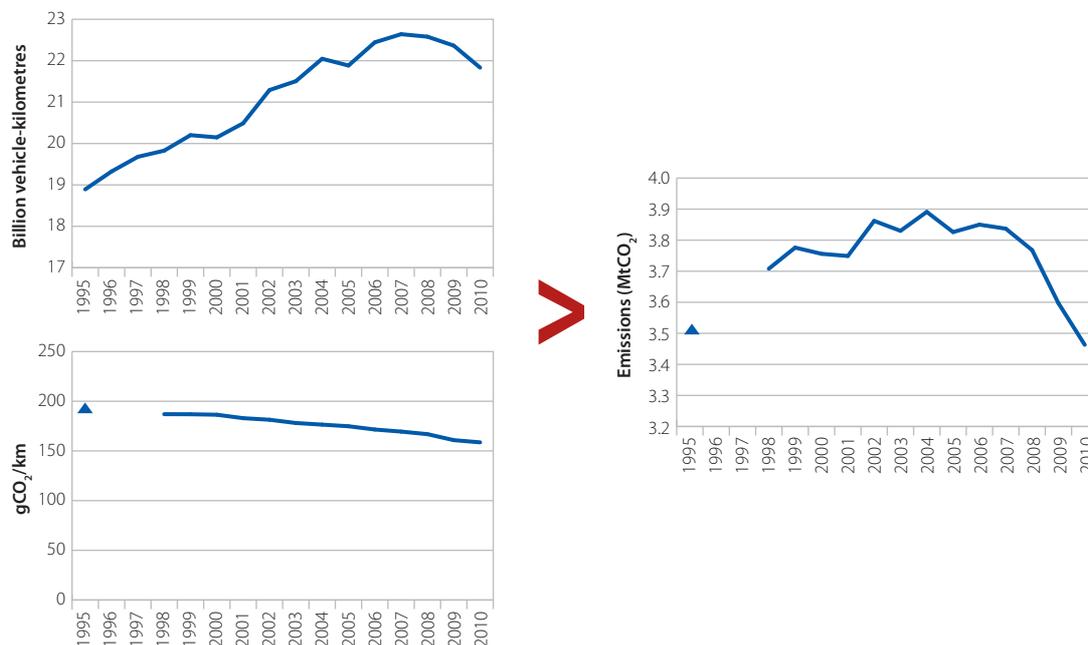
Currently the Welsh Government's indicator framework tracks the total volume of road traffic as a Tier 2 indicator – however it would be helpful if data on traffic by mode could be presented alongside the chart showing the total to provide a fuller picture of underlying travel demand trends. From an emissions point of view it is desirable that distance travelled is reduced for some modes (i.e. cars, through the implementation of 'Smarter Choices' programmes) but for others (e.g. buses, from greater use of public transport) an increase would be more desirable.

Figure 1.9: New car efficiency in Wales, UK and CCC indicator level



Source: The Society of Motor Manufacturers and Traders (2012).

Figure 1.10: Historical trends of vehicle km, MtCO₂ and gCO₂/km for cars



Source: NAEI (2012), Department for Transport (2012), CCC calculations.
 Notes: Emission data are not available for Wales for 1996 and 1997.

Emission reduction – targets and policies

According to the climate change strategy, transport sector emission savings can be achieved through:

- UK/EU fuel efficiency standards and greater use of renewable energy sources for transport (savings of 1.07 MtCO₂e)
- Welsh Government measures to encourage Smarter Choices, support for eco-driving, provision of travel planning, promoting infrastructure for electric and hydrogen vehicles, supporting the freight industry to reduce emissions, and investment in rail and bus services (Welsh Government estimates savings of 0.29 MtCO₂e by 2020).

These provide total savings of 1.36 MtCO₂e in 2020.

Progress

New car efficiency has continued to improve in Wales in 2011, with gCO₂/km falling 4% to 136 gCO₂/km, just under the UK level of 138 gCO₂/km (Figure 1.9). This is outperforming the level we envisaged for 2011 (151 gCO₂/km) on a pathway towards achieving the EU’s target for 2020 (95 gCO₂/km). However, it should be noted that new car registrations in Wales fell by 7,000, or 10% in 2011 (to 68,000) dampening the impact of new, efficient car sales on the overall fleet emission intensity. This was greater than the reduction in the UK, where the number of new car registrations fell 4.4%.



Currently the data on new car efficiency presented in the Welsh Government's monitoring framework is at the UK level. The Welsh data for new car efficiency should also be tracked. It is likely that given EU reporting requirements due to start next year, new van emissions data will be publicly available in the near future – should this become available for Wales, the Welsh Government should incorporate this within the monitoring framework.

The Welsh Government's support for research and development and the deployment of infrastructure for **hydrogen** as a transport fuel has helped develop additional hydrogen refuelling infrastructure at the University of Glamorgan, which also developed the Renewable Hydrogen Research and Demonstration Centre. The Centre is designed to provide a platform for the experimental development of renewable hydrogen production, hydrogen energy storage, hydrogen vehicles, fuel cell applications and overall hydrogen energy systems. The climate change strategy has the aim of starting to make hydrogen vehicles commercially viable by 2020.

In relation to **electric vehicles**, the Welsh Government's approach is to engage with private sector schemes on the location of charging points at the UK level, rather than directly fund infrastructure. Plugged-in Places is the UK Government's programme for match-funding electric vehicle recharging infrastructure in eight pilot lead areas in the UK. Evidence about the use of the points in these pilot areas and 'lessons learned' will be used to inform the design of a national system of infrastructure. Although Wales is not part of the pilot programme, the evidence from the scheme should still be useful for the Welsh Government to inform its work with private sector schemes.

This work could be further informed through tracking the development of infrastructure and sales of electric vehicles through the Welsh Government's indicator framework. For example, we have considered 2011 data on electric vehicle shares for Wales compared to the rest of the UK. While we would caution against drawing conclusions from one year of data, this shows that the share of EV registrations in Wales (1%) was lower than the Welsh share of total new car registrations within the UK in 2011 (4%). However, this is not unexpected given the lower population density and a greater rural population in Wales (with similar results also found in Scotland and Northern Ireland).

On the **demand-side**, the main Welsh Government interventions include:

- Further funding of £3.65 million to continue the Sustainable Travel Centres (STCs) initiative, which was originally piloted in Cardiff, and has now been rolled out to 4 towns in Wales. This funding has been accompanied by £1.3 million in 2011/12 to contact 63,000 households in Cardiff for personalised travel planning advice, and a further £1.35 million in 2012/13 to continue roll-out to the other STCs. Together these centres cover around a quarter of Wales' urban population.

-
- Funding for the Energy Saving Trust's programme to encourage eco-driving by providing advice over the phone and at events. The programme aimed to contact 5,000 individuals in Wales in 2011/12. While this compares well to the number of people who received training in England in 2011 (8,000), our analysis suggests that for the full abatement potential of this measure to be realised, 300,000 people across the UK as a whole should receive actual in-vehicle training each year. This would equate to 15,000 per year in Wales on a population share basis.
 - The Welsh Government should monitor the impact of these schemes on travel behaviour (and in particular on car vehicle-kilometres) and identify if these are cost-effective interventions to inform consideration of roll out to the remaining urban population in Wales.

It would also be helpful to be able to track the proportion of drivers exceeding the 70mph speed limit in Wales, in order to explore the scope for reducing emissions by enforcing current speed limits. However, currently the data on this is only available at a GB level, and regional analysis is not possible.

3.2 Business

Emission trends

Emissions in the business sector, as defined by the 3% target, were 10.3 MtCO₂e in 2010, and 11 MtCO₂e in the 2006-2010 baseline, having fallen 19% over the baseline period. Business sector emissions account for a third of emissions in the 3% target, with emissions from electricity use representing a higher share of the sector's emissions than direct emissions:

- In 2010, direct emissions were 4.7 MtCO₂e (48% of business sector emissions). Direct emissions averaged 5.3 MtCO₂e over the 2006-2010 baseline, having fallen 27% over the baseline period, despite a 10% increase in 2010 as production output recovered following the 2009 recession.
- Indirect emissions were 5.5 MtCO₂e in 2010, (52% of business sector emissions). Indirect emissions averaged 5.7 MtCO₂e over the 2006-2010 baseline period. Indirect emissions increased 11% in 2010, though were still 11% lower in 2010 than in 2006 – due to a combination of a reduction in the carbon-intensity of UK electricity over that period and a fall in electricity consumption across the sector.

Emission reduction targets and policies

The climate change strategy estimates that savings of 1.12 MtCO₂e can be achieved in the business sector:

- 0.62 MtCO₂e from Welsh Government policies to grow the economy in a sustainable way, funding of Carbon Trust activities to help businesses reduce their energy use, and maximising the generation of electricity from low carbon sources.



- 0.50 MtCO₂e from UK policies such as Climate Change Agreements, the Energy Performance of Buildings Directive, smart meters, products policies, the CRC Energy Efficiency Scheme, and Feed-in Tariffs.

The strategy also presents the abatement from the decarbonisation of the power sector (through the Renewables Obligation as replaced by the Electricity Market Reforms) within the business sector. The Welsh Government estimated this would reduce indirect emissions in the 3% target by 0.93 MtCO₂e by 2020.

Progress

Currently, Welsh Government indicators to measure progress against policies in the business sector are still under development, therefore it is difficult to assess what impact the policies in the business sector are having.

In relation to the implementation of UK policy in Wales, only limited data is available:

- Data on the CRC Energy Efficiency Scheme does not identify all Welsh businesses, only businesses headquartered in Wales.
- Data on Feed-in Tariffs (which are available for small scale (up to 5MW) wind, photovoltaic, micro combined heat and power, anaerobic digestion, and hydro installations) by location and type of installation shows around 5 MW of installed capacity in the non-residential sector in Wales (as at end of September 2012). Unfortunately, the majority of the installed capacity in the commercial and industrial sector across GB (275 MW, or 75%) is not identifiable by location, therefore we are not able to comment on the relative progress of implementation of this policy in Wales.
- We noted in the 2012 progress report to the UK Parliament that we are unable to access data on the impact of products policy due to lack of monitoring by government or industry. It is not therefore clear at present how this policy could be tracked, or whether the envisaged savings of this policy are being realised.
- The latest data on the Renewable Heat Incentive (RHI) shows that after nine months of scheme operation to the end of September 2012, 98 MW of renewable heat capacity had been accredited by Ofgem across GB. 11 MW, or 11% of this total, is shown to be in Wales. However, because there is no Wales-specific data available on total heat demand, or heat demand in the commercial and industrial sectors, we are not able to comment on the significance of this capacity against potential. There are no targets for renewable heat in Wales to assess progress against.

We recommended last year that the Welsh Government should consider developing a renewable heat strategy. While the Welsh Government has launched a refreshed energy strategy for Wales, there are no actions or targets within this in relation to renewable heat. We would re-iterate our recommendation that a heat strategy should be considered to identify the opportunities in Wales and how any barriers to developing renewable heat could be

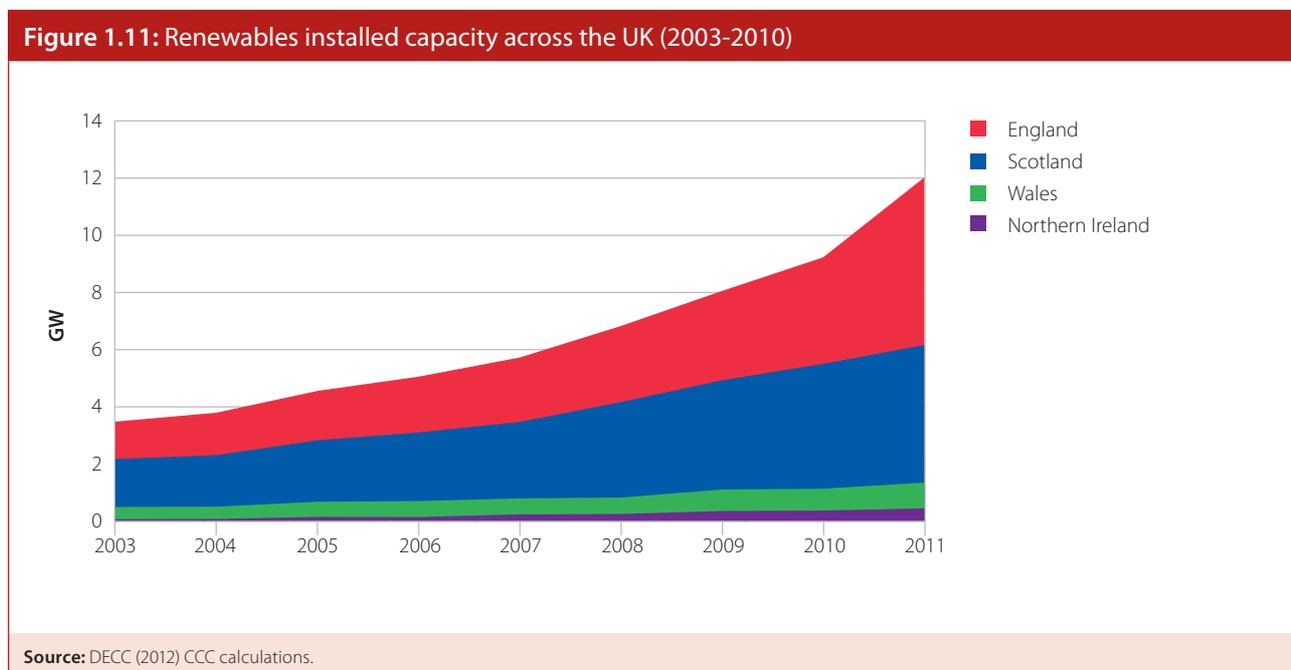
overcome. It is even more important now that the RHI is up and running, to ensure that Wales is maximising the potential benefits of the scheme.

Decarbonising the power sector

The strategy estimates that UK Government policy relating to power generation could reduce end-user electricity emissions in the 3% target by 0.93 MtCO₂e by 2020. This makes it one of the key measures in the strategy, accounting for around 10% of the overall required emission savings by 2020.

At the UK level, 2011 emissions intensity of generation (486 gCO₂/kWh) was ahead of our indicative level (523 gCO₂/kWh) on a pathway to longer-term decarbonisation of the power supply. Looking forward, the prospects for the nuclear development pipeline have improved in some respects, though uncertainties remain. The CCS demonstration programme is moving forward in a second competitive funding round, following the failure of the first competition to award funding. The support framework for renewables is also confirmed to 2020, however there is currently uncertainty over what happens beyond that, which could feed back to near term investment decisions.

Within Wales, current renewable generation in 2011 as a proportion of the UK total (6%) is slightly below overall generation shares within the UK (7%), but is in line with Wales' share of UK electricity consumption (6%). However, renewable deployment has been slower to grow in Wales than the rest of the UK (Figure 1.11):





- In the UK, installed capacity has increased at an average annual rate of 17% from 2003-2011, compared to 9% in Wales. Overall, capacity increased 100% in Wales from 2003-2010, from 430 MW to 860 MW. Over the same time period, Scotland's renewable capacity increased by 3.1 GW (187%, from 1.7 GW to 4.8 GW), while Northern Ireland increased 782% (though from a much lower base, from 48 MW to 430 MW).
- 9% of the UK's wind generation in 2011 was from Wales – while this is a higher rate that would be expected from overall generation/electricity demand shares, it is a large fall from 2003, when Wales accounted for a third of the UK's wind generation.

The Welsh Government has previously identified potential to increase renewable generation to 48 TWh/year by 2025 (twice Wales's current total electricity demand, and compared to 2.2 TWh today) from potential installed capacity of 22.5 GW. This includes 2 GW of onshore wind, and 6 GW of offshore wind, (assessed by the Welsh Government as deliverable by 2015-17), 8.5 GW from the Severn Barrage and 4 GW from other tidal range and wave (deliverable by 2025), 1 GW from biomass and 1 GW from small-scale local generation.

Overall average annual installation rates would need to increase from around 50 MW over the period 2003-2011, to 1.6 GW each year between now and 2025 in order to achieve this potential (though noting that some of this potential capacity relates to large scale projects such as the Severn Barrage (at around 8.5 GW) which are one-off rather than annual/incremental installations).

Last year the Welsh Government commissioned a review of the planning process for renewable energy schemes, with the aims of identifying any factors that might be delaying consents and improving the approval process. A commitment to improve the planning and consenting regime in Wales was also set out in the Welsh Government's policy statement on delivering a low-carbon Wales earlier in 2012.

Currently there are no power sector indicators in the Welsh Government's monitoring framework. Given its importance within the strategy to meet the 3% target, the framework should track the carbon intensity of the UK grid, electricity use within Wales, and also consider other indicators such as installed capacity and generation of renewables in the UK and Wales. This would allow an assessment as to whether this measure is on track to deliver the estimated savings.

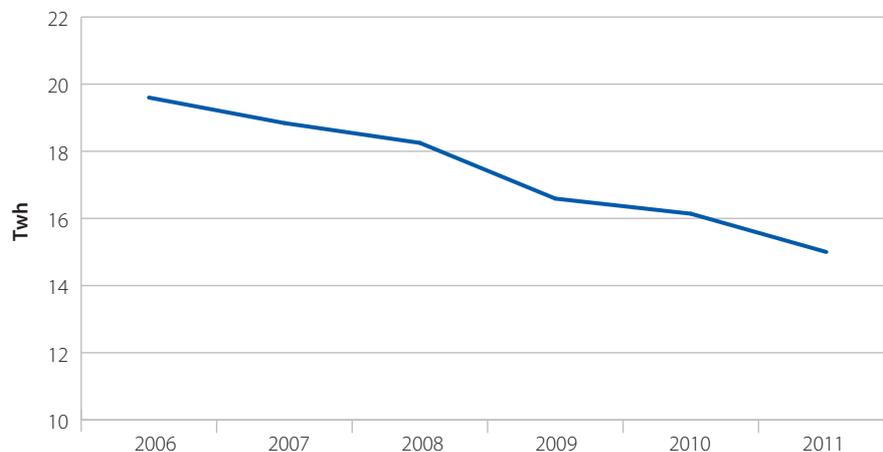
3.3 Residential

Emission trends

Emissions in the residential sector baseline are 7.6 MtCO₂e, having fallen from 8.1 MtCO₂ in 2006 to 7.1 MtCO₂e in 2009 but increasing to 7.7 MtCO₂e in 2010 due to the particularly cold winter temperatures. Residential sector emissions account for 23% of total emissions covered by the 3% target:

- Direct emissions were 5 MtCO₂e in 2010, higher than the average over the baseline period (4.7 MtCO₂e), having risen 13% in 2010, and reflecting the increased demand for heating during the cold winter months of 2010. Weather adjusted gas demand data suggests that without these exceptionally cold temperatures, gas demand would have fallen in Wales in the residential sector in 2010 (Figure 1.12).
- Overall, direct emissions were 4% higher in 2010 than in 2006, and on average account for 61% of total residential sector emissions in the 3% target.
- Indirect emissions were 2.8 MtCO₂e in 2010, 1% higher than in 2009 but slightly lower than 2006-2010 average emissions of 2.9 MtCO₂e. Overall, indirect emissions were 15% lower in 2010 than in 2006, due to a combination of reductions in both the carbon-intensity of power and in the electricity consumed by end-users over that time.

Figure 1.12: Residential gas sales – weather corrected (2006-2011)



Source: DECC (2012).

Notes: The data used to produce these 2010 estimates cover the gas year – the period from 1 October 2009 through to the following 30 September 2010 (i.e. 9 months of the reference year). The data are also weather corrected.



Emission reduction targets and policies

The strategy estimates that total savings of 1.76 MtCO₂e can be made in the residential sector by 2020:

- 0.56 MtCO₂e savings from Welsh Government policies to implement energy efficiency measures, particularly for those in fuel poverty, support community scale generation, encourage behaviour change in the home and policies to encourage low carbon new build.
- 1.2 MtCO₂e from UK Government energy efficiency programmes including the Green Deal, Feed-in Tariffs, the Renewable Heat Incentive, and minimum standards for the private rented sector.

Progress

For energy efficiency, Wales has continued to successfully draw in funding from GB policies such as CERT (see Table 1.1), and CESP and to supplement these with additional Welsh Government-funded programmes:

- Over the four years of CERT (to 31 March 2012), 6% of cavity wall insulations and 7% of loft insulations were in Wales. This compares favourably to Wales' share of the GB housing stock (5%). A higher proportion of the housing stock was treated in Wales (18%, 242,000 homes) than across GB as a whole (15%).
- By the end of June 2012, a total of 6,731 homes in Wales (0.5% of the Welsh housing stock) had received 10,954 measures through CESP. This is equal to 10% of the homes treated, and 9% of the measures installed across GB as a whole. Again this compares favourably with Wales' share of eligible areas in the scheme (6%, as defined by Lower Super Output Areas).
- We singled out the Welsh Government's area-based home insulation scheme 'arbed' last year for its achievements, including carrying out the equivalent of a fifth of the total number of solid wall insulations across GB in 2010/11. A second phase of the scheme will see £45 million investment over three years to improve energy efficiency and develop renewable energy in a further 5,000 existing homes in Wales.
- A five year Welsh Government fuel poverty scheme has been confirmed, with the aim of treating 15,000 hard-to-treat homes over that time.

Table 1.1: Residential energy efficiency measures through four years of CERT in Wales (5% of GB housing stock)

CERT measure (percentage of GB measures in Wales in brackets)	2008-09	2009-10	2010-11	2011-12
Cavity wall insulations	34,700 (7%)	28,500 (6%)	21,300 (5%)	23,200 (5%)
Loft insulations	49,900 (7%)	45,700 (8)	40,000 (7%)	42,800 (5%)

Source: Energy Saving Trust HEED database: <http://www.energysavingtrust.org.uk/Organisations/Local-delivery/Free-resources-for-local-authorities/Homes-Energy-Efficiency-Database/CERT-reports-from-HEED>

Note: There is a lag between data records being submitted to Ofgem (who operate the scheme) and the submission of data to HEED. This results in a data gap of around 9% (at the GB level) for the 16 quarters of CERT shown above.

For renewable heat and the Feed-In Tariff, installations are above Wales' share in the housing stock:

- The data on phase 1 of the Renewable Heat Premium Payment (RHPP) shows that as of the end of April 2012, the proportion of the total installations in GB in Wales for each technology was 10% of air source heat pumps, 11% of biomass boilers, 10% of ground or water source heat pumps, 10% of solar thermal. Data for Phase 2 show that 8% of the vouchers allocated across GB have been issued in Wales, with higher proportions for biomass boilers (10% of vouchers allocated in Wales) and air source heat pumps (9% of vouchers).
 - However it should be noted that grants for heat pumps and biomass boilers are only available for off-gas grid properties, of which Wales has a higher proportion than the GB average (21% versus 16% respectively) and therefore more scope for uptake. Furthermore, these figures are limited in that they only refer to the first six months of the scheme and represent a total of just over 500 renewable heat installations in Wales, compared to a total of almost 270,000 off-gas grid properties. Ongoing monitoring of the implementation of the scheme is required to ensure Wales continues to receive an appropriate level of installations.
- On Feed-in Tariffs, the data is more complete for the residential sector than for non-residential – just 4% of installations are not identifiable by location. In Wales, installations are above what would be expected from a share of the housing stock in GB, at 7% of installations (plus any that are in Wales but not identifiable in the dataset).

Broadly, the indicators set out to track implementation of these policies are appropriate (number of households receiving insulation measures, number of insulation measures, installed capacity of renewable heat and renewable electricity). However:

- The energy performance of social housing cannot be tracked directly, due to a lack of a detailed house condition survey in Wales (i.e. one carried out by qualified building surveyors), and number of households receiving energy efficiency measures is used instead.
- The indicator tracking the SAP rating of new homes is of limited value given it is likely to just be tracking what building regulations require. It would be preferable to track SAP ratings and energy performance across the Welsh housing stock, but again the absence of a detailed house condition survey means this can not currently be done.
- Indicators on behaviour change are still under development.
- The indicator document currently lists domestic energy prices, household disposable income and household estimates as contextual factors to be tracked. We recommend that temperature should also be tracked as a contextual factor, given it is a key driver of energy demand and crucial in explaining emission changes, particularly in the residential sector. However, there are various ways of illustrating temperature trends and consideration is required on the most appropriate method to reflect the potential impact on emissions. For example, we have presented two approaches in this report – heating degree days (see Figure 1.3) and temperature adjusted gas demand (see Figure 1.12).



In terms of policy development and implementation, the indicators show a broadly positive story, with Wales outperforming GB in regard to the implementation of key energy efficiency and fuel poverty measures, and renewable heat and electricity generation installations. However, to ensure continued progress, a number of issues need to be addressed:

- The Welsh Government needs to set out its approach to supporting implementation of the Green Deal and ECO.
- Fuel poverty remains a serious issue in Wales – over 330,000 households, or 26% of the total in Wales, are estimated to be in fuel poverty. It is positive that funding for fuel poverty schemes in Wales is being continued – in contrast to England, where the equivalent scheme is being discontinued. However, the current funding level is enough to target only around 5% of homes in fuel poverty. While there are drivers of fuel poverty that are outside the Welsh Government’s control (e.g. energy prices), this highlights the importance of ensuring that Wales continues to draw in a proportional share of funding available through the implementation of UK-level insulation policies, such as the forthcoming ECO, which will focus on vulnerable and hard-to-treat households.
- The lack of a detailed house condition survey in Wales makes it difficult to assess how much remains to be done in Wales to fully insulate the housing stock.
- As also recommended in relation to the business sector (section 3.2, above), a renewable heat strategy should be developed to set out aims for renewable heat and Welsh Government action to support development of renewable heat – particularly since there are likely to be greater opportunities in Wales given a greater rural population off-gas grid than in the UK as a whole.

3.4 Agriculture and land use

Emission trends

Emissions from agriculture and land use were 5.9 MtCO₂e in 2010, down from 6.6 MtCO₂e in 2006. Overall across the 2006-2010 baseline period, emissions were 5.9 MtCO₂e on average, and account for 18% of emissions in the 3% target. The majority of these emissions are due to methane associated with livestock and nitrous oxide associated with fertiliser use in the agriculture sector:

- Methane emissions associated with livestock were 2.5 MtCO₂e in 2010 (42% of emissions in this sector as defined by the 3% target), down from 2.9 MtCO₂e in 2006, in line with a longer term trend of falling livestock numbers. Average emissions over the baseline period are 2.6 MtCO₂e.

- Nitrous oxide emissions associated with crops and nitrogen application were 2.7 MtCO₂e in 2010, 46% of emissions in this sector. Emissions in 2010 were 11% lower than in 2006, and over the baseline period average 2.7 MtCO₂e. Data on nitrogen use is not available separately for Wales (it is combined with England) but it is likely the reduction reflects a reduction in nitrogen fertiliser application between 2006 and 2010.
- The land use sector provides a very small net sink of emissions (-42 ktCO₂e), while 0.5 MtCO₂e is due to fuel use in agricultural machinery and the small remainder of emissions (0.3 MtCO₂e) are due to electricity use in the agriculture sector.

Emission reduction targets and policies

Welsh Government policies in this sector are primarily aimed at woodland creation (3,000 hectares of woodland creation each year from 2010) and supporting farmers to develop sustainable land management practices through a five-year grant funding scheme, ('Glastir'), and behaviour change programmes. The contribution of these policies to reducing emissions in the agriculture sector is not defined at present.

There are no UK Government measures related to land use in the climate change strategy, given that agriculture and land management is a devolved policy area.

Agriculture

We noted in last year's report that it was not clear what the emission reduction objective of the agricultural measures in the strategy were, and recommended that programmes are aligned with underlying abatement potential. Following that, the Welsh Government committed to further consideration of how to best assess the impact of Glastir on greenhouse gas emissions, and estimated a 2-3 year timescale to produce estimates. We welcome these commitments, particularly as currently there are no Tier 3 indicators on policy in the monitoring framework for agriculture.

There are a range of Tier 2 indicators for the agriculture sector:

- Crop production data – potatoes (tonnes per hectare)
- Crop production data cereals (tonnes per hectare)
- Nitrogen application rates for all crops and grass
- Fuel consumption by agricultural mobile machinery

These broadly capture the activity underpinning agriculture emissions, with the exception that livestock is not included. Though not included in the published technical annex, additional workbooks provided to us do include an indicator for livestock.

We understand that following the completion of the agriculture greenhouse gas inventory improvement project, there will be much more Wales-specific data available to help develop



more detailed/robust indicators for agriculture. Furthermore, it is anticipated that Glastir will have a comprehensive monitoring programme in place, as set by EU regulations, which may provide additional data that could help develop indicators in future.

The Committee's monitoring framework for agriculture contains a number of indicators that it might be useful to track in Wales also, should the data become available. These include:

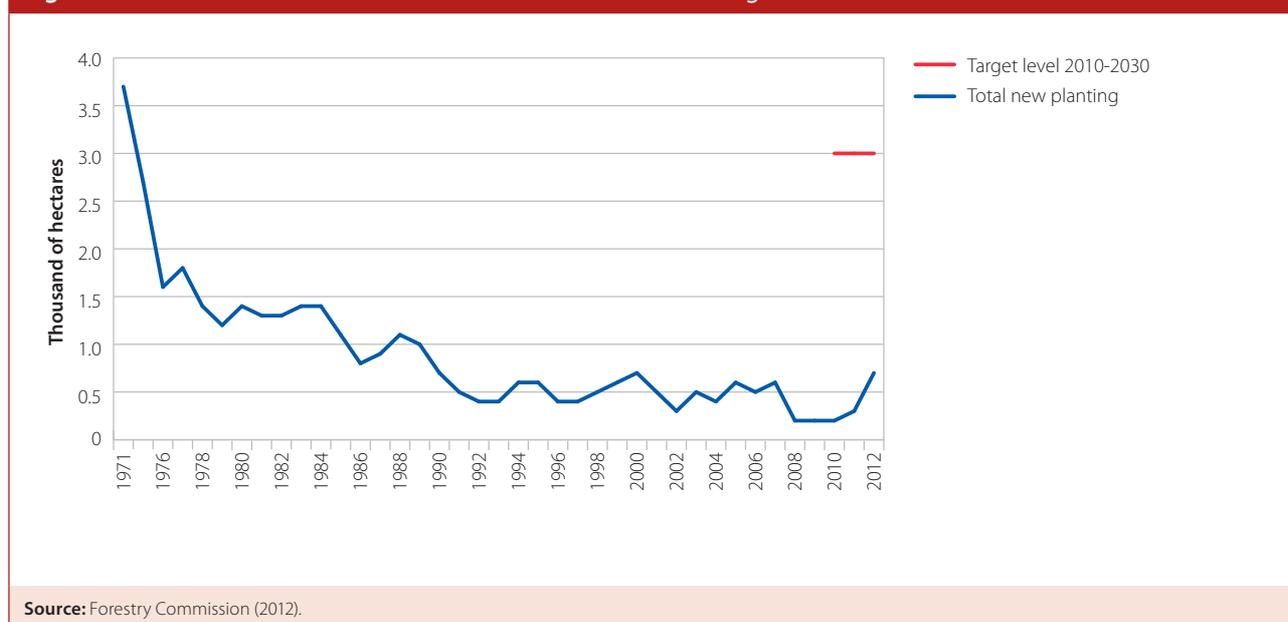
- The emission intensity of livestock output – i.e. the emissions per volume of meat output by type.
- On the crop production side, it may also be preferable to link the output to emissions – i.e. to track the emission intensity of potato and cereal output. If data is available, it would also be better to split out nitrogen application rates for crops and grass. This is because external events can mean that impacts move in different directions (e.g. in the UK as a whole, poor weather in 2010 meant that crop output reduced and emission intensity increased. However, the grazing land for livestock was not impacted as strongly, and emission intensity of livestock output improved).

Where there are data gaps, it would be helpful for the framework to set out holding places for indicators that would be desirable to track, and where data could in future be developed.

Woodland creation

Woodland creation rates in Wales have recently picked up following a long-term decline (Figure 1.13). This indicates some success of the woodland creation element of Glastir which was launched in October 2010. However, annual rates still need to increase significantly to meet annual afforestation targets and the level of sequestration envisaged by 2020.

Figure 1.13: Woodland creation rates in Wales – historical and target



Source: Forestry Commission (2012).

Currently, the Welsh Government's monitoring framework is tracking the annual rates of new planting, restocking, and certified woodland area in Wales, which are appropriate indicators for this policy measure.

3.5 Waste

Emission trends

Total emissions in the waste sector were 0.9 MtCO₂e in 2010, down from 1.0 MtCO₂e in 2006, in line with a longer term trend for falling emissions due to the progressive introduction of methane capture at landfill sites.

- Emissions averaged 0.9 MtCO₂e over the baseline period and account for 3% of total emissions in the 3% target.
- There are no indirect emissions allocated to the waste sector, therefore emissions in the 3% target are comprised entirely from emissions from waste management and wastewater handling.

Emission reduction targets and policy

The climate change strategy estimates that savings of 0.66 MtCO₂e could be achieved in 2020 through Welsh Government policies aimed at diverting all municipal biodegradable waste from landfill by 2020, and all other (commercial, industrial, construction and demolition) biodegradable waste by 2025, as well as further reducing greenhouse gas emissions at landfills.

Progress

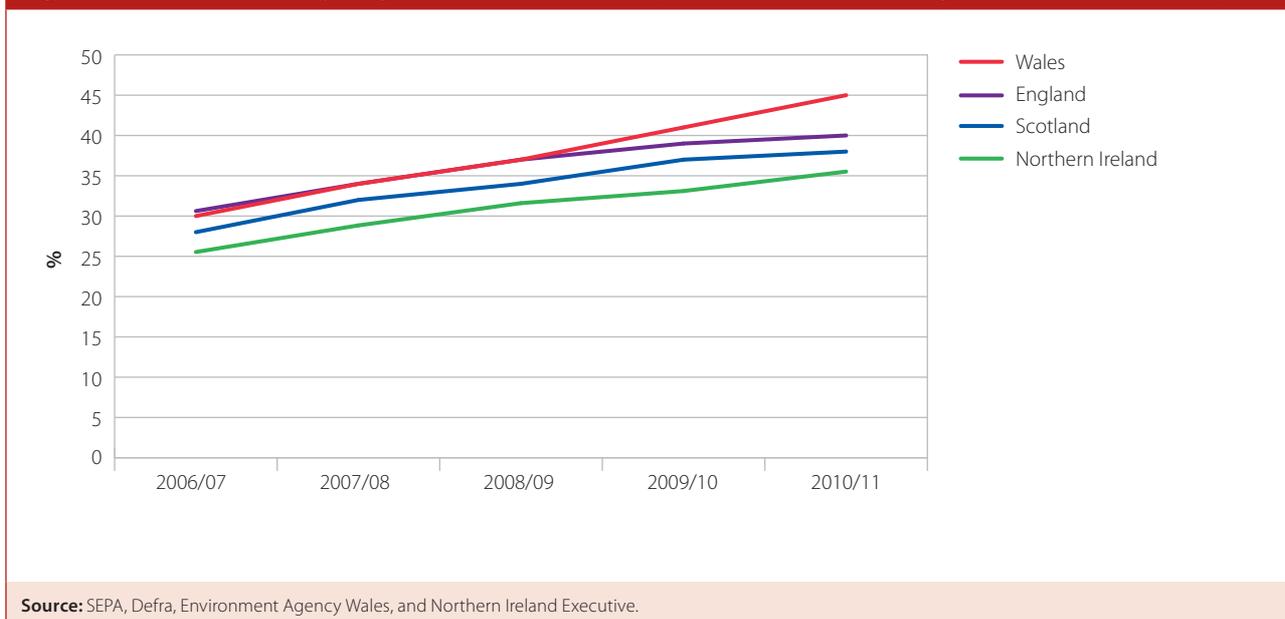
The targets that the Welsh Government has set for the waste sector go further than requirements for the UK under the EU Landfill Directive, which requires a 25% reduction in the amount of biodegradable waste to be landfilled in 2020 relative to 2010.

The Welsh Government has supported these ambitions with statutory targets for local authorities for minimum levels of reuse, recycling and composting of municipal waste, rising from 52% in 2012/13 to 70% in 2024/25. The latest available comparable annual data across the UK show that Wales has the highest rates of recycling across the UK (Figure 1.14). More recent data for Wales show further improvement, with recycling rates increasing to 53% in the first quarter of 2012-13.

Wales is also ahead in terms of food and green waste, being the only country in the UK where food and/or food and green is collected separately by every local authority– with the Welsh Government's policy to treat the food waste principally via anaerobic digestion (AD).



Figure 1.14: Household recycling rates in Scotland, Wales, Northern Ireland and England (2006-07 – 2010-11)



In terms of how the waste sector progress will be measured, Tier 3 policy indicators in the Welsh Government’s framework are still under development, however a set of Tier 2 indicators have been developed:

- Volume of municipal waste sent to landfill
- Volume of biodegradable waste sent to landfill
- Volume of total waste sent to landfill
- Landfill methane capture rate

These indicators provide a good picture of the amount and type of waste being sent to landfill and are consistent with those being used for the waste sector in the Committee’s framework.

However, it would also be helpful to include indicators on recycling, composting and AD rates to provide a full picture of waste management, and to help track how food waste and residual waste is being treated.

These could be set in the context of the total amount of waste being produced in Wales by source and also possibly type. Tracking trends in overall waste arisings will be useful to determine the impact of economic trends and effectiveness of waste minimisation strategies. In summary, additional Tier 2 indicators to potentially track include:

- Amount, proportion, and type of waste sent to landfill and to alternative treatments (recycling, composting, energy-from-waste, AD)
- Municipal recycling rates
- Total waste arisings (by type and source if possible)

One contextual factor is noted for waste – the landfill tax rate. However, other factors could for example include the number of local authorities meeting Welsh Government recycling targets and the number of local authorities providing for separate food waste collection for example.

3.6 Public sector

Emission trends

Total emissions in the public sector were 0.8 MtCO₂e in 2010, down from 0.9 MtCO₂e in 2006. Emissions in the 2006 – 2010 baseline average 0.9 MtCO₂e, accounting for 3% of the emissions in the 3% target. Indirect emissions account for a greater proportion of total emissions in the 3% target than direct emissions:

- Over the baseline period, indirect emissions average 54% of the baseline, and direct emissions 46%.
- Direct emissions increased 2% in 2010, though overall were 18% lower than in 2006. Indirect emissions remained level in 2010 and overall are 13% lower than in 2006.

Emission reduction targets and policies

Policies in the climate change strategy are aimed at reducing the carbon footprint of various parts of the public sector (NHS, education, Welsh Government estate etc), embedding climate change in key policies and programmes, and enabling the wider contribution of others.

At this stage the contribution of these policies to emission reduction has not yet been quantified, though the Welsh Government has estimated a reduction of 0.03 MtCO₂e by 2020 through the implementation of the UK-wide CRC Energy Efficiency Scheme.

Progress

Currently, the Welsh Government's indicator framework has data from the CRC scheme for the NHS, Welsh Government, education sector and local authorities to track progress in the public sector. While this is a helpful source of emissions in different parts of the public sector, currently only one year of data is available, therefore it cannot yet be used to measure progress. In relation to 2,109 other participating organisations, the Welsh Government was placed 320th, which is within the top 16% of organisations. The Welsh Government reported this year that it has reduced emissions by 11% in 2010, through rationalising the use of buildings, reducing journeys, and making savings in IT infrastructure.

An additional source of information to track progress that the Welsh Government could consider is the local authority emission data (available from DECC⁷). Although this contains emissions in the area, rather than just those associated directly with the public sector, it would provide a good indication of what is happening at the local level.

⁷ DECC (2012): *Local authority carbon dioxide figures*.



4. Conclusions and recommendations

Emission data for the full period of the 3% target baseline period has only become available this year, with data on the first target year (2011) due to be published mid-2013. Therefore, it is not possible at this stage to assess progress directly against this emission reduction target.

Instead we have reviewed progress against the policies set out to meet the 3% target and find that:

- Wales has made continued progress implementing emission reduction measures, particularly in the residential and waste sectors, where indicators show progress above the UK average on a number of measures.
- There are signs that progress installing renewable generation capacity has fallen behind the rates elsewhere in the UK. The Welsh Government should explore ways to overcome any barriers to achieving the considerable renewable resource it has identified.
- We reiterate our recommendation made last year that the Welsh Government should develop a renewable heat strategy to ensure uptake in Wales is commensurate with the potential available (i.e. given the higher proportion of householders who could benefit most, e.g. off-gas grid properties on more expensive, carbon-intensive fuels).
- It is difficult to assess progress in the business and agriculture sectors in particular, as policy indicators are still under development. It will be important for the Welsh Government to seek ways to complete the monitoring framework over the coming year, particularly as data on the first target year is due next year. This should include indicators on UK policies that are due to deliver the target, with corresponding Wales level indicators where data is available. Sectoral gaps in the monitoring framework should be addressed, while emission reductions from the wider contribution of others should also be defined, with accompanying indicators.
- In conclusion, there is a positive story on several fronts in Wales, but there are still large challenges ahead. In particular, the sharp increase in emissions in 2010, driven primarily by the cold winter temperatures highlights the need to increase the roll-out of residential energy efficiency measures, especially given the high rates of fuel poverty in Wales.

Part 2: Progress in preparing for climate change in Wales

Introduction

This section of the report sets out the Adaptation Sub-Committee's (ASC's) second review of the Welsh Government's progress in developing and implementing its adaptation framework.⁸

In our first progress report to the Welsh Government in October 2011, we:

- reviewed the Welsh Government's adaptation framework and progress against the actions within the adaptation delivery plan;⁹ and
- provided advice on the formation and delivery of the sectoral adaptation plans.

We concluded that the Welsh Government and key delivery partners had made good progress in implementing the measures set out in the adaptation delivery plan, with many of the policies or programmes in place or shortly to be completed. We advised that the following should be priority areas for action over the coming year:

- produce the four remaining sectoral adaptation plans to ensure that adaptation is properly embedded in Welsh Government plans and policies, and those of key delivery organisations (businesses, local authorities, and other public agencies); and
- clarify the position on the future delivery of adaptation advice, given that central funding for the UK Climate Impacts Programme (UKCIP) had been stopped.

Section 1 of this report sets out our review of progress against these recommendations over the last year, as well as our views on the key aspects of the Welsh Government's adaptation policy framework, as requested by the Welsh Government.¹⁰

An important focus of the report is our review of preparedness for flooding in Wales – one of the main climate risks identified for Wales in the recent Climate Change Risk Assessment (CCRA).¹¹ Section 2 sets out our analysis of changes in exposure and vulnerability to flooding in Wales, and the uptake of actions to manage flood risk.

Key messages

- **The Welsh Government has produced well-developed and structured guidance as a basis to develop adaptation plans – but to date, the plans themselves are still not complete.** The Welsh Government should ensure the remaining sectoral adaptation plans are produced over the coming year.

⁸ The Committees' first progress report to the Welsh Government was in October 2011: *2011 Progress report*.

⁹ Welsh Government (2010): *Adaptation delivery plan*.

¹⁰ See Annex A for the full official request for advice.

¹¹ HR Wallingford (2012): *A climate change risk assessment for Wales*.



- **The Welsh Government should set out how it will ensure that businesses have a clear source of advice on adaptation** – to complement current efforts to provide advice on adaptation to the public sector, in particular local authorities.
- **The Welsh Government and local authorities should ensure robust implementation of planning policy in relation to development in the floodplain and the design of urban areas.** Our analysis found that:
 - Development in the coastal floodplain has grown twice as fast than outside the floodplain since 2001, although the rate of increase has declined somewhat since 2008.
 - The majority of floodplain development has been within areas that are protected by flood defences and so face a relatively low risk. However, just over a fifth (21%) of floodplain development has been in areas that are currently exposed to a significant chance of flooding.
 - The area of greenspace in Welsh towns and cities has reduced, with potentially adverse implications for surface water flood risk over coming decades.
 - The Environment Agency Wales appears to be increasingly satisfied that the majority of development in the floodplain is acceptable. However, this development will still be subject to residual risk and will require on-going investment in flood protection, particularly with the expected implications of climate change and sea level rise on future flood risk.
- **The flood defence budget in Wales has been maintained in line with inflation in the current spending review period**, making it better protected than in England, where spending is set to fall in real terms. Nonetheless, this level of investment is unlikely to keep pace with the increased flood risk from future climate change.

1. Review of progress

This section sets out the Committee’s review of progress against the two key recommendations made in last year’s report, as well as progress in developing the adaptation policy framework. This analysis feeds into our consideration of whether the adaptation framework in Wales requires strengthening through further statutory provisions – a more detailed assessment of this can be found in Part 3.

1.1 Progress in producing sectoral adaptation plans

Last year we highlighted that only the Welsh Government’s health sector adaptation plan was in place. Plans for infrastructure, business and tourism, communities, and the natural

environment were due to be developed by the end of 2012. These plans are the key mechanism by which the Welsh Government aims to deliver climate resilience across Wales. We recommended that priority should be given to developing these over the following year.

At the time of this year's report, the four remaining plans are still to be published. The Welsh Government has now indicated that a separate plan for the natural environment will not be developed. Instead we understand that adaptation will be embedded within the Welsh Government's wider Natural Environment Framework and forthcoming Environment Bill.

In the last year the Welsh Government has produced guidance and a process for developing the remaining adaptation plans, with a view to these being in place by June 2013. This guidance overall provides a structured and comprehensive approach to developing an adaptation plan. There remain some areas where the guidance could be strengthened:

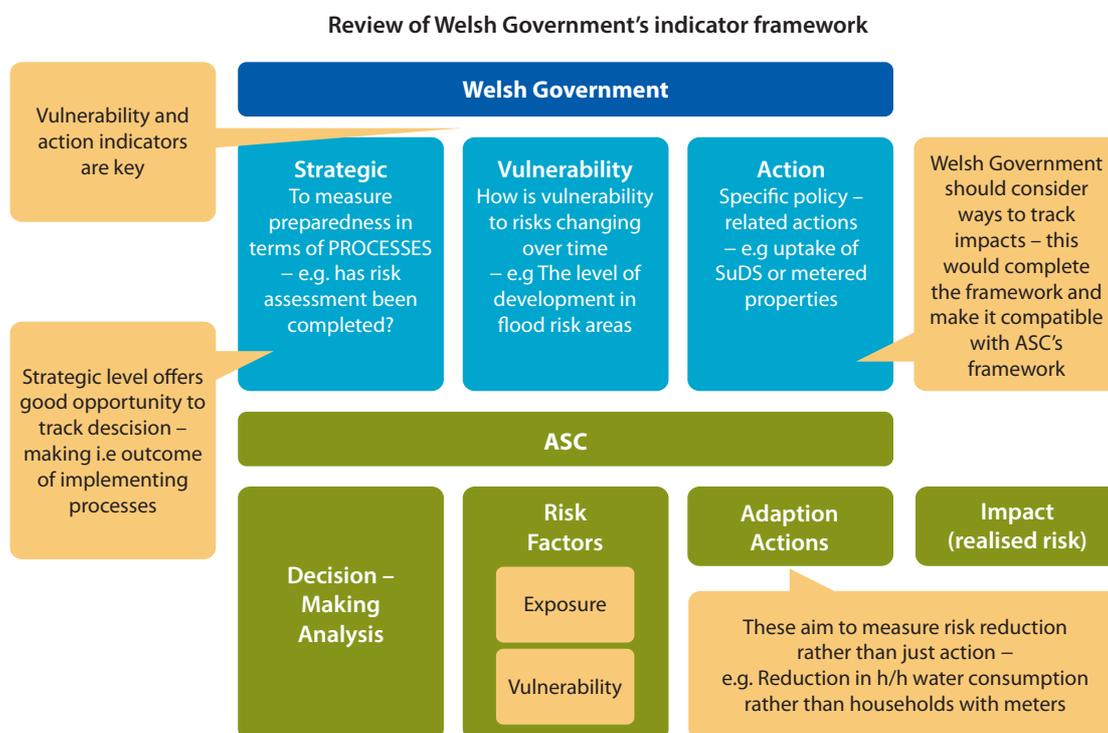
- **Plans should define and set out adaptation outcomes and clear policy priorities for the most significant risks.**
- **Plans should enable the early uptake of low-regret adaptation actions in the short-term. Where there is not widespread uptake of measures, sector plans should identify barriers to uptake and put in place mechanisms to overcome them.**
- **Plans should ensure key decision-makers explicitly and systematically consider future climate risks and adaptation in long-term plans.**

In addition, we have reviewed the indicator framework the Welsh Government has established to monitor commitments identified by each sector's adaptation plan. At a high level, the approach is compatible with the ASC's approach to monitoring progress, as shown in Box 2.1.



Box 2.1: The Welsh Government's adaptation monitoring framework

Following the publication of the Adaptation Framework in 2010, the Welsh Government committed to developing a robust method to monitor and evaluate its progress and performance. The Welsh Government asked the Committee to provide a review of the overall framework. We find that the framework fits well with the Committee's own assessment toolkit and should provide a sound basis for measuring progress in adaptation.



1.2 Advice on adaptation provided by the Welsh Government

Our 2011 report recommended that the Welsh Government should clarify its position on the future delivery of adaptation advice, given that central funding for the UK Climate Impacts Programme (UKCIP) had been stopped. In England, many of the functions of UKCIP have now been transferred to the Environment Agency.

This year the Welsh Government launched a Knowledge Transfer Programme (KTP) to provide support and advice to public bodies, communities and businesses on adapting to climate change. This will be the main route for provision of adaptation advice in Wales, together with the wider engagement planned through the sectoral adaptation planning process.

The programme has to date focused on local authorities given their key role in adaptation (particularly land use planning) and their responsibility for delivering services that can be affected by weather events.

Successfully achieving Wales' adaptation objectives will require that all relevant sectors are considering climate change in their decision-making – including the private sector. The Welsh Government has produced a sample business case for organisations designed to set out the rationale for preparing for climate change and help prepare the business case for

action. However it is not clear at present how tailored advice to key sectors/businesses will be provided.

2. Progress preparing for flooding in a changing climate

2.1 Overview

This section evaluates preparedness for the impacts of flooding on homes, businesses, infrastructure and people in Wales. The UK's first Climate Change Risk Assessment (CCRA) identified flooding as one of the largest risks from climate change facing Wales. The devastating impacts of flooding were felt across Wales in 2012, with major flooding incidents including in Aberystwyth in June, where 150 people were evacuated from a flooded caravan park, and St Asaph in November where some 100 homes were flooded, hundreds evacuated and one person was killed.

The section:

- summarises the current and future scale of risk from flooding and coastal erosion in Wales; and
- assesses how exposure and vulnerability to flooding have changed in recent years, and the amount of adaptation taking place.

2.2 Risks from flooding in a changing climate

The river and coastal floodplain¹² in Wales has been populated for centuries. The nature of Wales' landform and topography, with the majority of the land area consisting of uplands and a relatively long coastline relative to its size, has strongly influenced the historic pattern of development. Around 11% of Wales' building stock (approximately 165,000 properties) is located in the river or coastal floodplain today (Table 2.1). Of these, 53,000 properties are in parts of the floodplain that have a significant chance of river or coastal flooding, after accounting for the presence of flood defences.¹³

Expected annual damages to properties in Wales from river and coastal flooding are estimated to be around £200 million each year on average,¹⁴ which is around 0.4% of Welsh GVA¹⁵. This figure does not include the impact of surface water flooding or account for the wider costs from the loss of essential services, transport delays, and disruption to businesses. Equally important is the personal stress and hardship caused by flooding for affected households, particularly the more vulnerable in society. The CCRA highlights evidence that flooding can have a long-term impact on people's health and well-being.

¹² Defined as the area that would naturally be affected by flooding if a river rises above its banks, or high tides and stormy seas cause flooding in coastal areas, taking no account of the presence of existing flood defences. This area could be flooded from the sea by a flood that has a 1 in 200 or greater chance of happening in any given year, or from a river by a flood that has a 1 in 100 or greater chance of happening in any given year.

¹³ Defined as a greater than 1 in 75 chance in any given year of river and coastal flooding, when considering the presence and condition of flood defences.

¹⁴ Environment Agency Wales (2009): *Flooding in Wales*.

¹⁵ StatsWales (2012) and CCC calculations.



Flood risk and damages are expected to increase in Wales due to climate change, although large uncertainties in the potential scale of the impact remain. The CCRA suggests that increases in rainfall intensity and the frequency of high river flows are likely under a changing climate, leading to a higher risk of surface water and river flooding. There is greater certainty that sea levels will continue to rise, leading to an increased risk of coastal flooding and storm surges, as well as higher rates of coastal erosion.

Table 2.1: Comparison of the scale of current future flood and coastal erosion risk in Wales

Type of flooding	Number of properties at risk currently ¹⁶	Expected damage each year ¹⁷	Impact of climate change
River flooding	77,000 (5% of stock in Wales) Significant risk: 24,500	£110 million	Increase in properties at significant risk to 60,000 in 2080s (accounting for population growth). Increase in expected annual damages to between £150 million and £280 million by 2080s (2011 prices).
Coastal flooding	62,000 (4% of stock in Wales) Significant risk: 20,000	£90 million	Increase in properties at significant risk to 49,000 in 2080s (accounting for population growth). Increase in expected annual damages to between £170 million and £370 million by 2080s (2011 prices).
Both river and coastal flooding	26,000 (2% of stock in Wales) Significant risk: 8,000	Included in above figures	Increase in properties at significant risk to 21,000 in 2080s (accounting for population growth). Increase in expected annual damages included in above figures.
Surface water flooding ¹⁸	146,000 (10% of stock in Wales) 7,200 are at 1 in 30 annual chance or greater	No estimates available for Wales	Not estimated by the CCRA.
Coastal erosion ¹⁹	2,400 (0.2% of stock in Wales)	No estimates available for Wales	Not estimated by the CCRA.

¹⁶ Note that for river and coastal flooding the CCRA reports a higher number of properties at risk than those shown in this table. The data that underpin the CCRA (the Environment Agency's National Receptor Database) include 5 million more commercial properties for England and Wales than the dataset used in our assessment (Ordnance Survey's MasterMap Property Layer 2). The Environment Agency database includes non-addressable 'properties' such as residential outbuildings and bus shelters that are unlikely to suffer significant damages from flooding. Property Layer 2 excludes these properties. See the *technical report* prepared by: HR Wallingford for ASC (2012) for *further details*.

¹⁷ Expected annual damages are the estimated average economic cost per year of damage from the weather hazard. The costs will not be evenly distributed over years.

¹⁸ Defined as a 1 in 200 annual chance of a 'shallow' (>0.1m depth) flood event.

¹⁹ Defined as houses located on erodible coastlines that are predicted to be at risk within the next 100 years under a central scenario.

2.3 Assessing preparedness for flooding in a changing climate

This section identifies how exposure and vulnerability to flooding has changed in recent years and the amount of adaptation occurring.

Decisions concerning the location and design of new development are important for adaptation to flood risk.

Land use planning decisions can reduce exposure to current and future flood risk by avoiding inappropriate development within the floodplain and other areas at risk from flooding and coastal erosion. Where development in flood prone areas is considered necessary, the land use planning system can potentially reduce risk by requiring it to be designed in a way that minimises damages should flooding occur, and does not increase risk elsewhere. This is, in essence, the Welsh Government's policy on flood risk and development, as set out in Technical Advice Note 15: Development and Flood Risk that was published in 2004.

Urban design can play a critical role in managing the flow of surface water and the risk of surface water flooding.

A day of even modest rainfall can deposit several million litres of water on a town or city.²⁰ Managing the resulting surface water run-off will be increasingly important as climate change is likely to increase the frequency of intense rainstorm events. The paving over of permeable green space ('urban creep') within existing developed areas results in an expansion of hard impermeable surfacing. This can increase the risk of surface water flooding by exacerbating the impacts of intense rainstorms.²¹

2.3.1 Trends in exposure and vulnerability: rate of development in the floodplain

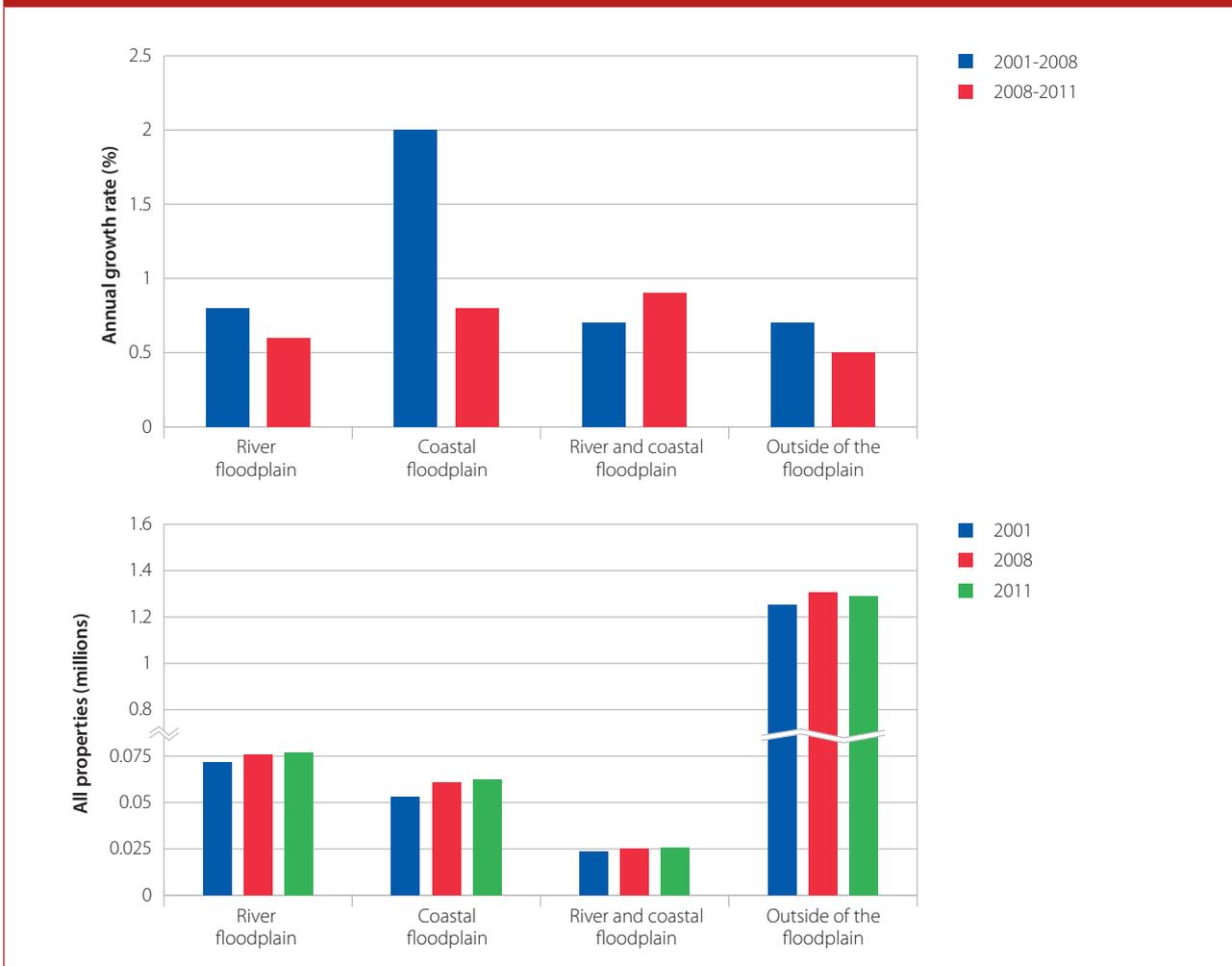
Development in the coastal floodplain has grown twice as fast as development outside the coastal floodplain since 2001, although the rate of increase has declined somewhat since 2008. (Figure 2.1). The rate of development in the coastal floodplain fell from 1.6% a year in 2001-2008 to 0.8% a year from 2008, although it remains higher than the rate outside the floodplain (0.5% a year). A proportion of this decline is likely to be due to the overall reduction in the rate of development since 2008 as a result of the economic slowdown. The scale of reduction is sharper than that seen in the river floodplain (0.8% to 0.6% a year), perhaps reflecting a stronger influence of planning policy introduced during this period. There has been a greater decline in the rate of development behind eroding coastlines (from 5.1% in 2001-2008 to 0.4% 2008-2011).

²⁰ Ofwat (2011). *Future impacts on sewer systems in England and Wales*.

²¹ Houston D., et al. (2011) for the Joseph Rowntree Foundation. *Pluvial (rain-related) flooding in urban areas: the invisible hazard*.



Figure 2.1: Development in the river and coastal floodplain compared with all development in Wales outside the floodplain, shown as: (a) annual growth rate for two time periods (2001-2008 and 2008-2011); and (b) stock of properties in each category (2001, 2008 and 2011)

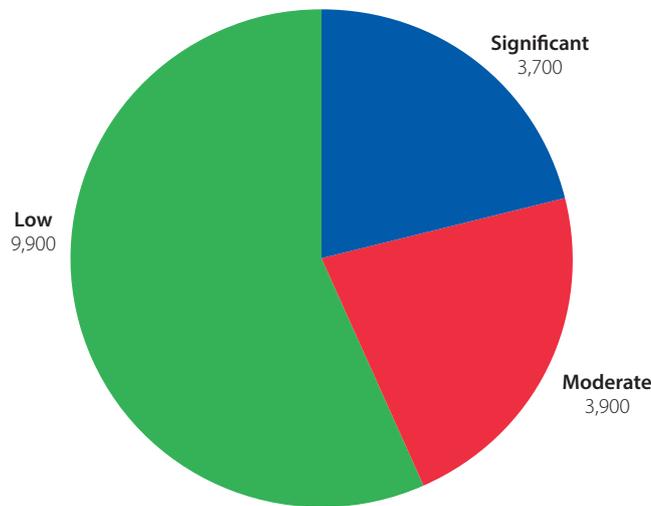


Source: HR Wallingford (2012) for ASC. *Development of spatial indicators to monitor changes in exposure and vulnerability to flooding and the uptake of adaptation actions to manage flood risk in Wales.*

Notes: GIS mapping was used to identify the number of properties in three time periods (2001, 2008 and 2011) for all Wales and within the river and coastal floodplain (not accounting for the presence of flood defences). The datasets used were Ordnance Survey MasterMap Address Layer and the Environment Agency's Flood Map. OS MasterMap is updated every six weeks and ground-truthed through aerial photography and site visits. The Address Layer gives the grid reference, type, address and other parameters for around 27 million properties in Great Britain (but not Northern Ireland). The data include residential and non-residential properties and objects without postal addresses, such as factories, halls and churches, but excludes non-addressable 'properties' such as residential outbuildings and bus shelters that are unlikely to suffer significant damages from flooding. The data does include upper floor addresses, therefore a proportion of the observed development will be properties such as high-rise flats and apartments that would not be at risk of direct damage from a flood event (although they would still suffer disruption). It was not possible to estimate the proportion of upper floor properties in the above data.

Most development in the floodplain has been within built-up areas that are at a relatively low risk of flooding. Some 17,500 properties were built in the floodplain since 2001. Of this, four-fifths (around 14,000 properties) were constructed in locations where the risk of flooding is low or moderate, either due to the presence of existing flood defences or because of floodplain topography (Figure 2.2). The remaining 3,700 properties (21% of the total number of properties developed in the floodplain) were in areas that are exposed to a significant chance of flooding due to a low standard of flood protection, or no defences being in place at all (see Footnote 13 for definition of significant risk). It is possible that development in areas of high risk was designed to be resilient to flooding (as discussed below). However, even with design measures included in new development, there will remain an element of residual risk from continuing to locate properties in areas facing a significant chance of flooding.

Figure 2.2: Number of properties built in the floodplain over ten years (2001-2011) by flood risk category, accounting for the presence of flood defences

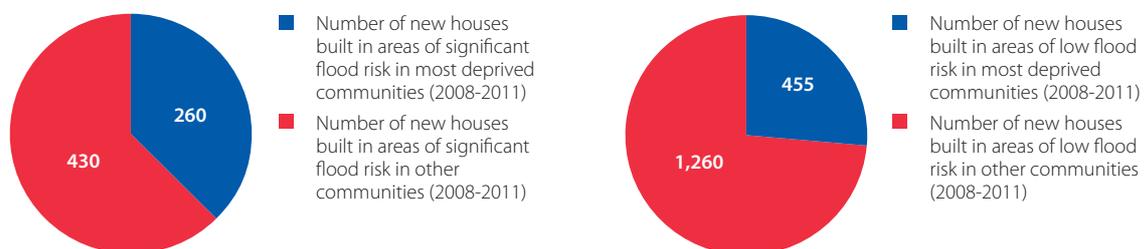


Source: HR Wallingford (2012) for ASC. *Development of spatial indicators to monitor changes in exposure and vulnerability to flooding and the uptake of adaptation actions to manage flood risk in Wales.*

Notes: GIS mapping was used to identify the number of properties in three time periods (2001, 2008 and 2011) in significant, moderate and low flood risk categories, accounting for the presence and condition of flood defences. These areas are identified by the Environment Agency's National Flood Risk Assessment (NaFRA) dataset.

Of the new homes built in areas of significant flood risk since 2008, nearly two-fifths (38%) of them were in the 20% most deprived communities in Wales (Figure 2.3).²² This is higher than the proportion of new homes built in areas of low flood risk that were in the most deprived communities (27%). As a comparison, 29% of existing homes at significant flood risk are currently located in the most deprived communities in Wales. These communities generally have a lower capacity to prepare, respond and recover from flood events.²³

Figure 2.3: Proportion of new houses built in areas of significant and low flood risk that are located in communities in the bottom 20% of income distribution (2008-2011)



Source: HR Wallingford (2012) for ASC. *Development of spatial indicators to monitor changes in exposure and vulnerability to flooding and the uptake of adaptation actions to manage flood risk in Wales.*

Notes: GIS mapping was used to identify the number of properties in 2008 and 2011 located in significant, moderate and low flood risk categories that were also located within the highest 20% of ranked deprived areas, using the Wales Deprivation Index data for 2010. The WDI data has a time series, but only 2010 data was used to ensure that the changes reported are solely related to development in the present day (2010) deprived areas, rather than as a consequence of any changes in the locations of the 20% most deprived communities over time.

²² Defined as the communities in the bottom 20% of income distribution, based on the Multiple Index of Deprivation.

²³ As highlighted by Houston (2011).



2.3.2 Trends in exposure and vulnerability: hard surfacing in built-up areas

The area of urban greenspace has reduced in Wales's towns and cities over the last ten years. Our analysis suggests that areas of urban green space, such as playing fields, parks and open spaces are being replaced by man-made surfaces. It is likely that a high proportion of these surfaces will be impermeable and therefore increasing the risk of surface water run-off. The rate of loss of urban greenspace appears to have increased since 2008, to an average of 1% a year (Figure 2.4). Continuation of this trend could have significant implications for surface water flood risk in Wales' towns and cities over coming decades.

More research is required to better understand trends in hard surfacing, particularly for urban gardens. Our research in England estimated that the proportion of urban gardens that were paved over increased from 28% in 2001 to 48% in 2011. However, we were unable to undertake a similar estimate for Wales due to a lack of relevant data on rates of urban creep within Welsh towns and cities. We were also unable to identify a robust measure of the uptake of permeable paving and sustainable drainage systems in both new and existing development that may be helping to mitigate the increase in hard surfacing. These are important gaps in the evidence base that the Welsh Government should consider addressing.

Figure 2.4: Change in area of permeable and impermeable surfaces for urban areas in Wales (2001 to 2011)



Source: HR Wallingford (2012) for ASC. *Development of spatial indicators to monitor changes in exposure and vulnerability to flooding and the uptake of adaptation actions to manage flood risk in Wales.*

Notes: GIS mapping was used to assess change in the area of permeable and impermeable land within all built-up areas in Wales. For the purposes of this study, 'built-up' was defined as those 1 km grid cells that had with a property density of >500 in 2011. As a result, the analysis does not pick up land use change outside existing built-up areas, for example from out-of-town greenfield development. The approach was validated by cross-checking grid cells with >500 properties with the boundaries of a sample of urban areas and found a good match. The dataset used to assess change in surfacing was the OS MasterMap Topography Layer. This has three broad categories of land: 1. Natural – features that are not man-made but possibly man altered, for example, parkland, areas of water and uncultivated/cultivated vegetation. 2. Man-made – features that have been constructed, for example, areas of tarmac or concrete including roads, paths and buildings. 3. Multiple – features that contain a mixture of surfaces but are not depicted separately within the data, for example, residential gardens and road verges.

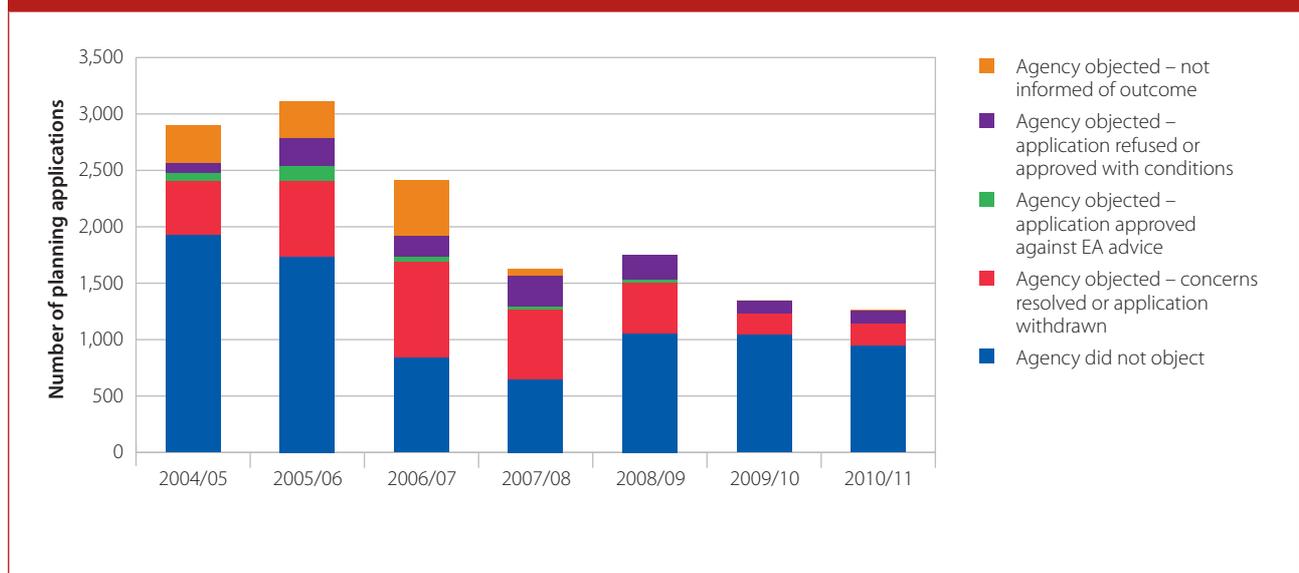
2.3.3 Uptake of actions: minimising flood risk to and from new development

This section examines whether or not floodplain development has been designed in a way that will make it safe and resilient to flooding. To do this, we assessed the outcomes of all planning applications that the Environment Agency Wales advised on in relation to flood risk between 2005/06 and 2010/11. The Agency assesses if applications in areas of flood risk have taken measures to:

- ensure human safety in the event of a flood, for example by including evacuation routes that do not flood (so-called 'dry routes');
- minimise damages from a flood event, for example by raising floor levels;
- manage surface water run-off, for example by requiring sustainable drainage systems; and
- allow for sufficient water flow during a flood event so as not increase risk downstream, for example by incorporating compensatory flood water storage areas.

The number of Agency objections on flood risk grounds has declined in absolute and relative terms (Figure 2.5). The Agency objected to over 1,000 applications on flood risk grounds in 2006/07, which was around 60% of the total number of applications in areas of flood risk. This fell to just over 300 objections (25% of the total) in 2010/11. This reduction partly reflects the general fall in development levels over that time. It also suggests that the quality of the applications has improved, for example due to developers carrying out detailed flood risk assessments and proposing mitigation measures. It may also show that developers are generally less keen to apply in areas where they are more likely to receive an Agency objection.

Figure 2.5: Outcomes of Environment Agency Wales advice on planning applications on flood risk grounds (2004/05 to 2010/11)



Source: Environment Agency Wales (2011): Annual Monitoring Report.

Notes: In some cases there may be a time-lag between an Agency objection and the outcome of the application being decided, and so the outcome may not be reported in the same year as the original objection. The Agency do not separately record the split between number of applications refused and applications approved with conditions, and so this is displayed as one category in the chart. Similarly, it reports Agency objects, but concerns resolved and objection not sustained or application withdrawn as one category.



Only a small number of development applications were approved in the face of a sustained objection from the Agency. In 2010/11, six applications (2% of objections) were approved despite a sustained objection from the Agency. This has reduced from 71 applications in 2004/05 (25% of objections) where the outcome was known.

Local planning authorities in Wales have also improved their performance in informing the Agency of the outcome of their objections. For the first three years of monitoring, the Agency was not notified of the final decision by the relevant local authority in 42% of its objections. It is possible that some of these applications may have been permitted contrary to the Agency's advice. Since 2007/08 there has been a marked improvement, with the Agency notified in nearly all cases. This is important for ensuring transparency in the planning process.

The Agency appears to be increasingly satisfied that the majority of development in the floodplain is acceptable. However, this development will still be subject to residual risk and will require on-going investment in flood protection. This is particularly the case in areas at significant risk of flooding today, where the risk is expected to increase substantially in the future with climate change.

2.3.4 Uptake of actions: investment in flood defences

Since 2003/04, the Environment Agency Wales has spent around £170 million on capital projects to reduce flood risk for over 8,000 properties. There still remain around 53,000 properties at significant risk of flooding, with an additional 400 properties being built in these areas on average every year (as noted above).

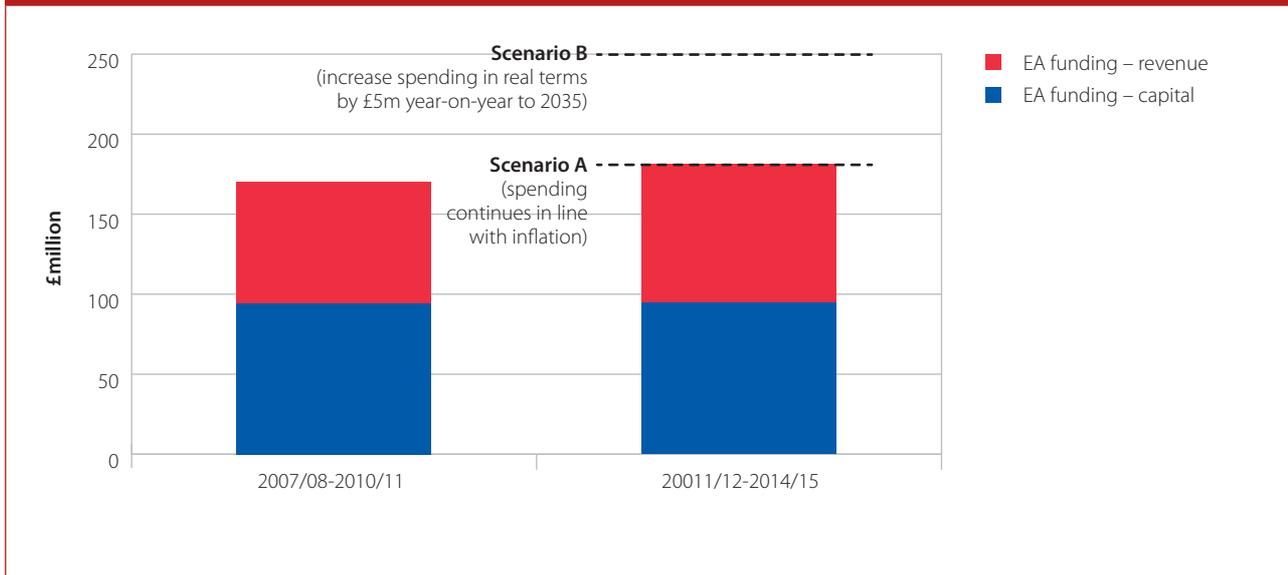
Funding for flood risk management has been maintained in real terms during the current spending review period (2011/12 – 2014/15). This is in contrast to England, where central Government investment in flood defences over the spending review period is set to fall once inflation is taken into account.²⁴ The safeguarding of the flood risk management budget is in the context of a 12% overall reduction in the Welsh Government's budget over the spending review period (real terms).

Current levels of investment are unlikely to be sufficient to manage the increased flood risk expected with climate change and sea level rise. Figure 2.6 shows the level of planned spending to 2014/2015, against the spending required to keep pace with climate change during this period, as assessed by the Agency.²⁵ In total, there is a gap of around £65 million over the current spending review period. Maintaining current levels of investment in line with inflation is likely to result in a 60% increase in the number of properties at significant flood risk by the 2030s, unless there were to be a substantial increase in the uptake of property-level measures. Investment in flood defences would need to increase by £5 million year-on-year to 2035 in real terms for the number of properties at significant risk to be reduced (Box 2.1).

²⁴ See ASC (2012). *Climate change – is the UK preparing for flooding and water scarcity?*

²⁵ Environment Agency Wales (2010). *Future flooding in Wales: flood defences – possible long-term investment scenarios.*

Figure 2.6: Capital spending on flood defences in previous and current spending periods compared to two long-term investment scenarios



Source: Environment Agency Wales (2010): Future flooding in Wales: flood defences – possible long-term investment scenarios, Welsh Government, ASC calculations.

Box 2.1: Analysis of two flood defence investment scenarios for future flood risk in Wales

To better understand the implications of current levels of investment for preparedness for future flood risk, we considered the outcomes of two investment scenarios and compared them against current levels of funding and uptake of property level measures.

Scenario A – spending continues in line with inflation

- The number of properties at significant risk in Wales could increase from 52,000 today to around 78,000 by 2035 (central estimate). Without any real-terms increase in funding, an increasing proportion of the Environment Agency flood risk management budget will go on maintenance of existing assets rather than constructing new defences.
- Increasing the uptake of property-level protection could play an important role in this scenario. Based on economic analysis we developed for England,²⁷ we estimate that nearly 60,000 properties in Wales would benefit from property-level measures.²⁸ Achieving this level of uptake by 2035 would require a ten-fold increase from current levels of around 180 households a year being fitted with property-level protection measures.

Scenario B – increase spending in real terms by £5 million year-on-year to 2035

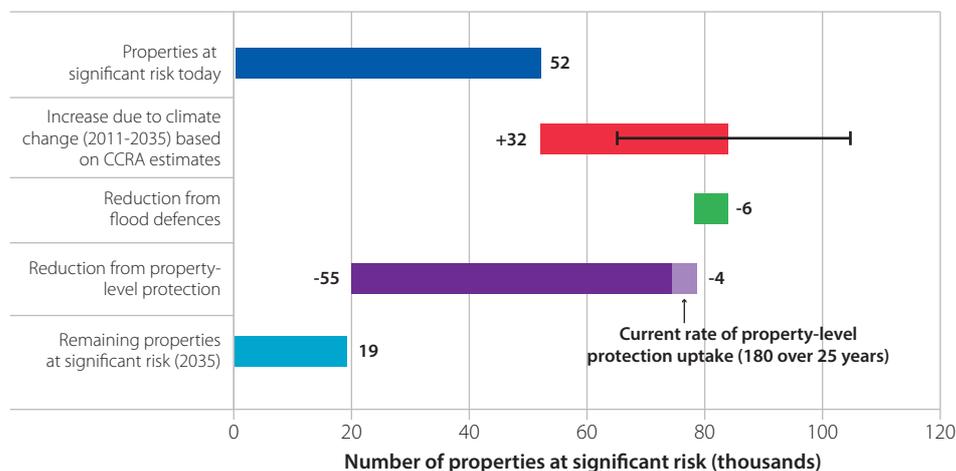
- In this scenario the number of properties at significant risk in Wales falls from 52,000 now to 45,000 in 2035, even after accounting for the likely impacts of climate change and sea level rise on flood risk.
- An additional 33,000 properties could be removed from significant flood risk through uptake of property-level measures. If this maximum potential was realised, it would leave 11,000 properties at significant risk in 2035.



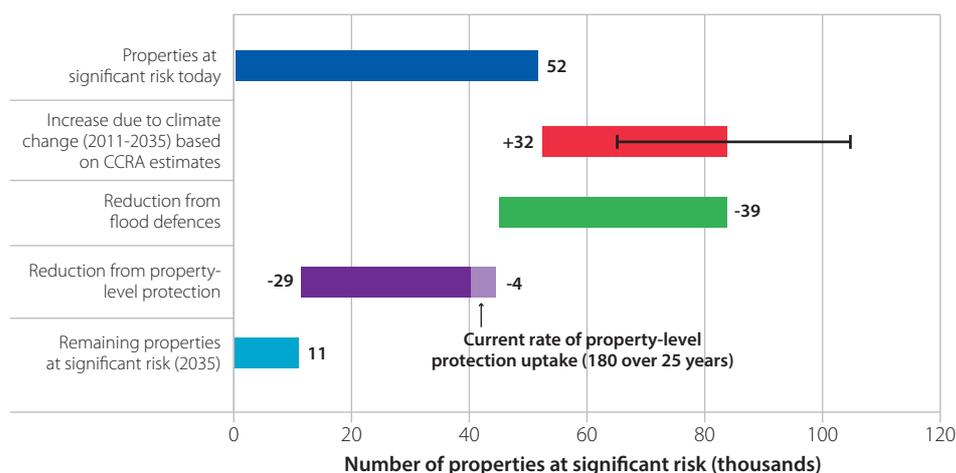
Box 2.1: Analysis of two flood defence investment scenarios for future flood risk in Wales

Figure B2.1: Comparison of two investment scenarios – impact on number of properties at significant risk of flooding by 2035

Scenario A: Spending continues in line with inflation



Scenario B: Increase spending in real terms by £5m year-on-year to 2035



Source: Environment Agency (2010), Future flooding in Wales: flood defences – possible long-term investment scenarios, HR Wallingford (2012). A climate change risk assessment for Wales’ ASC calculations.

Notes: Scenario A yields a net benefit of £18 billion (based on 100 year costs and benefits) and requires a spend of £1.1 billion (2009/10 prices) over the period to 2035. Scenario B has a net benefit of £24 billion (based on 100 year costs and benefits) – it requires annual spending to increase to £170 million by 2035 (2009/10 prices) and a total spend of 2.8 billion over the period to 2035.

26 The analysis carried out for England considered the cost of property-level flood protection against the potential benefits, depending on property type and level of flood risk. It is cost-beneficial to install these for properties that face at least a benefit-cost ratio of one (which we found to occur around the 1 in 50 annual chance of flooding).
 27 In Wales, 75% of the properties at significant risk are in the 1 in 50 annual chance category. This is the point at which property level measures (such as removable door and airbrick covers to prevent the entry of floodwater) become cost-effective according to the ASC’s cost curve.

2.4 Conclusions

This analysis has demonstrated that spatial indicators are an effective way of assessing trends in exposure and vulnerability to climate risks. These trends can help to identify where adaptation action should be targeted. In the case of adaptation to flood risk in Wales, the trends identified suggest that adaptation policy should focus on ensuring that the land use planning system is robustly accounting for future flood risk when deciding where new development should be located and in the design of the built environment. The indicators also highlight where further research is needed, for example gaining a better understanding of the trends in hard surfacing within urban areas and in the uptake of permeable paving and sustainable drainage systems.

The analysis has also highlighted the potential for a wider deployment of adaptation actions. Through innovative economic analysis, we have been able to show how current and future flood risk can be managed in part through the uptake of property-level flood protection measures. Given the expected increase in flood damages due to climate change, our analysis demonstrates that there is societal benefit from increasing uptake of these measures in those properties facing a certain level of risk.

The ASC is currently assessing preparedness for other climate risks. Our next report in 2013 will assess the preparedness of England's natural resources and ecosystem services for climate change. Future reports will undertake similar analytical approaches to review key trends and opportunities for adaptation in the energy and transport infrastructure sectors and in relation to health and well-being. The ASC's approach to assessing preparedness has the potential to be applied across the UK in order to assess progress in the implementation of adaptation programmes in the devolved administrations, if the Committee were requested to do so. We will work with the Welsh Government to consider how the Committee's future progress reports can continue to assess how well Wales is preparing for climate change.



Part 3: Assessment of legislative options for climate change mitigation and adaptation

1. Introduction

The Welsh Government is currently considering the scope of an upcoming Environment Bill in Wales, and to help inform this, requested the Committee to provide an assessment of legislative options on climate change mitigation and adaptation provisions that might be appropriate to include in the Bill.

To respond to this request we have:

- Considered the current and developing legislative landscape in Wales; and
- Assessed the provisions in the UK and Scottish climate change acts that currently do not apply in Wales.

Our views on the legislative options the Welsh Government may wish to consider also reflects our conclusions on progress in meeting mitigation and adaptation objectives in Wales and informal consultation with stakeholders (both within Wales and elsewhere in the UK) on the potential costs and benefits of climate change legislation and the appropriateness of each provision in a Welsh context.

Key messages

Our conclusions from this analysis are:

- Setting a statutory underpinning to Wales' climate change targets could help to provide certainty to policy-makers, businesses, investors, and wider society in Wales and strengthen incentives to reduce emissions.
- There is a case for considering longer-term targets, beyond 2020, given the long lead time for policy development and to help ensure long-term investments take account of carbon impacts.
- Statutory targets would need to be based on a robust and comprehensive assessment of the cost-effective emission reduction potential that is within Welsh Ministers' sphere of influence.
- Any legislation should also set duties to develop policies to meet targets but also build in flexibility – either in the nature of targets (e.g. carbon budgets) or allowing revisions on the basis of improved scientific knowledge and/or understanding of abatement potential for example.

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- Given the proposed Sustainable Development (SD) duty for public bodies²⁸ in Wales the Welsh Government should consider whether the duty could be strengthened to ensure that public bodies are clear on how they are contributing to the Welsh Government's emission reduction targets as well as adaptation objectives, or whether this is something to be considered further for the Environment Bill.
 - In either case, duplication of effort and reporting from public bodies should be avoided.

The analysis underpinning these conclusions are set out in more detail in the following sections:

2. Current and developing legislation

3. Assessment of legislative options

- 3.1 Legally binding emission targets (carbon budgets UK and annual targets Scotland)
- 3.2 A duty on public bodies
- 3.3 Supplementary provisions

2. Current and developing legislation

The UK Climate Change Act (2008) covers all of the UK, including Wales. Though most of the provisions in the Act apply at a UK level, it does have several provisions that specifically refer to Wales, and confer either duties or powers on Welsh Ministers:

- A duty to lay in the Assembly a report on their objectives, actions, and priorities in relation to greenhouse gas emissions and the impact of climate change in Wales
- Responsibility for publishing guidance for local authorities in Wales on climate change
- Powers to make trading schemes relating to greenhouse gas emissions through secondary legislation
- On climate change adaptation:
 - Powers to produce guidance for public bodies on adapting to the impacts of climate change; and
 - To require public bodies to produce a report setting out policies and proposals for addressing the current and future risks of climate change and assessing progress made towards implementing those proposals and policies (the 'reporting powers').

In our consideration of potential climate change provisions we are mindful of other upcoming legislation – namely the Sustainable Development Bill.

²⁸ The Welsh Government has recently launched a consultation on a Sustainable Development Bill, which proposes a new duty requiring specified public service organisations to embed sustainable development as their central organising principle. The consultation document can be found here: <http://www.waterbriefing.org/index.php/home/regulation-and-legislation/item/6681-welsh-assembly-consults-on-sustainable-development-bill>



The Bill proposes to strengthen the existing approach to sustainable development (SD) and legislate:

- A new duty to embed sustainable development as the central organising principle of selected public sector organisations in Wales
- Create an independent SD body for Wales

The consultation document for the SD Bill also proposes reporting and scrutiny arrangements to ensure that sustainable development is fully embedded within organisations.

An additional consideration relevant to adaptation is the possibility for the Environment Bill to make 'natural resource planning' a statutory provision. While the scope and definition of natural resource planning is still to be fully developed, it has been recognised that such an approach could potentially embed elements of climate change adaptation in a statutory manner within the planning system.

3. Assessment of legislative options

3.1 Legally binding climate change targets (carbon budgets UK and annual targets Scotland)

The key question here is whether having a statutory target in Wales would help to bring forward policies needed to meet targets.

Generally speaking, legally binding targets have benefits in terms of ensuring that targets are not changed (or easily changed) as the political environment changes, and in the increased certainty they bring to others in the public/private/third sectors.

However, consideration of legally binding targets requires consideration of:

- The basis on which targets should be set (short or long term? The carbon budget approach or annual target approach?), and what factors should be taken into account when considering the level of targets, including the scope of targets (i.e. all emissions, or emissions within Welsh devolved competence).
- The uncertainties in emission data, which can be larger at the devolved level – particularly in the agriculture sector, which forms a larger share of Wales' emission profile compared to the UK.
- The implications/sanctions of not meeting targets:
 - For the UK, exceeding carbon budgets requires credit purchase to compensate and a report to Parliament setting out corrective actions.
 - In Scotland, Ministers are required to publish a report in Parliament setting out how they will get back on track and policies to achieve required reductions, in the event a target is missed.

Given that the 3% target baseline has just been confirmed and that there is no data yet to measure performance against this target (the first target year is 2011, for which emission data will be available mid-2013), it is difficult to assess whether the non-statutory approach in Wales is sufficient, or whether an additional statutory provision might be necessary.

However, it is likely that statutory targets would provide certainty to policy-makers, businesses, investors, and wider society, and help to ensure that policies to meet targets are brought forward.

It would also be helpful to consider longer-term targets– firstly given the anticipated timing of the passing of the Bill, and secondly, to help ensure that decisions with long term carbon impacts fully take in to account longer term targets and appropriate pathways to long-term decarbonisation can be developed and planned for now.

To the extent that statutory targets are considered by the Welsh Government, it will be crucial that these are based on robust evidence and analysis of the cost-effective level of emission reduction within Wales.

Any legislation should also set duties to develop policies to meet targets but also build in flexibility – either in the nature of targets (e.g. carbon budgets) or allowing revisions on the basis of improved scientific knowledge and/or understanding of abatement potential for example.

Consideration of targets should also include clear provisions on what the sanctions are for missing targets (e.g. a report to Parliament setting out how Ministers will get back to track), and set out requirements for reporting annually, in this case to the Welsh Assembly.

Currently, the Welsh Government has a reporting cycle in place (report from the UK CCC, followed by a report from the Climate Change Commission for Wales, and then the Welsh Government’s own report is produced subsequently, updating the strategy and responding to recommendations in the former two reports).

A statutory provision might be helpful to ensure that this cycle is maintained, and to clarify institutional set up in terms of the purpose of reports, who is reporting on what, and timescales for Ministers to report.

3.2 A duty on public bodies

The Scottish climate change act places a statutory duty on public bodies in Scotland to carry out their functions in a way that meets Scotland’s emission reduction and adaptation objectives, and also in a way that is most sustainable. In Scotland, this duty has been viewed by some stakeholders as being essential to keep climate change on the agenda, and to bring the issues to board level in public bodies.

Such a statutory duty might be a helpful way of encouraging the ‘wider contributions of others’ which are set to deliver around a third of the 3% target in Wales, but are currently not well defined.



On adaptation, the Welsh Government has produced guidance (primarily for reporting authorities, but in practice applicable to any organisation); however there is currently no requirement for public bodies to demonstrate that there are implementing the guidance. There is a question as to whether the Environment Bill could require public bodies to demonstrate how they are contributing to the Welsh Government's adaptation objectives and using the guidance as the basis.

However, on both of these issues, it is difficult to see how a Sustainable Development duty could be met without demonstrating that emission reduction and adaptation objectives are being met. There is therefore a question as to whether the SD duty could be strengthened to ensure that public bodies are clear on how they are reducing their own emissions, as well as how they are contributing to the 3% target more widely, and adaptation objectives, or whether this is something to be considered further for the Environment Bill.

In either case, we would recommend that duplication of effort and reporting from public bodies was avoided.

3.3 Supplementary provisions

Scotland's climate change act also has a number of supplementary duties on Scottish Ministers:

- Report to Parliament on carbon assessment of the Scottish Government's budget
- Report on power sector carbon intensity/carbon impact of decisions relating to the power sector
- Publish a plan for promoting energy efficiency
- Publish a plan for the promotion of renewable heat

If the Welsh Government decides to include statutory emission reductions in the Environment Bill, some of these supplementary provisions could be a helpful for ensuring that the required policies are brought forward. For example, we noted that Wales currently lacks a renewable heat strategy or targets, and a statutory requirement to develop one and/or set targets for renewable heat could help bring this forward.

Annex A: Welsh Government request for advice

The Welsh Government wrote to the Committee requesting that it provide the Welsh Minister for Environment and Sustainable Development with the following:

- An assessment of the Welsh Government's progress on implementation of the measures outlined in the Strategy's Delivery plans, including:
 - Public and business sector
 - Residential emissions
 - Transport
 - Agriculture, land use and waste
 - Wider sectoral contributions (including the Climate Change Engagement Strategy where appropriate)
 - Adaptation
- A critique of the Welsh Government's methodology to define the central 3% emission reduction target, including:
 - The overall Wales Greenhouse Gas Inventory based methodology, as well as issues relating to allocating emissions based on IPCC sector and sub-sector codes, reconciliation of EU ETS and DUKES, and annual changes to inventory methodology (and figures). The Committee's views would be welcome as to whether the quality assurance steps included to ensure accuracy are suitable and robust.
 - An assessment of the implications of the methodology to derive the baseline and target on what the target is covering. How to account for emissions moving from non traded sector to traded sector and account for/explain contextual factors.
- An assessment of legislative options on climate change mitigation and adaptation drawing on examples and good practice adopted elsewhere.
- A review of the Welsh Government's performance indicators development in relation to the Emission Reduction Delivery Plan.
- An assessment of the outputs of HR Wallingford recent research in relation to flood risk in Wales.
- A review of the Welsh Government's work to date on development of adaptation indicators, and an assessment of the compatibility with the Adaptation Sub-Committee's framework and the indicators produced by HR Wallingford.
- A critique of the Welsh Government's processes for development of its Sectoral Adaptation Plans.



Annex B: Review of the 3% target methodology

As part of this progress report, the Welsh Government asked the Committee to review its inventory based methodology for defining the 3% target, and address a number of particular issues:

- Assess the implications of including non-CO₂ emissions produced by the traded sector;
- How to account for the increased scope of the EU ETS from 2013 onwards and account for/explain annual changes to the greenhouse gas inventory and contextual factors;
- Issues relating to allocating emissions based on IPCC sector and sub-sector codes, reconciliation of EU ETS and DUKES; and
- The quality assurance steps taken in relation to measuring the 3% target

We conclude in the main report that the overall approach to defining the emissions within the 3% target was sound – i.e. using the by source, electricity end-user and traded/non-traded parts of the inventory to capture the emissions deemed to be within devolved competence.

However, we also noted that within the methodology, there are some complexities that require further consideration. These are outlined below.

Non-CO₂ emissions

The Welsh Government has chosen to include non-CO₂ emissions from EU ETS sectors in the definition of the 3% target, whilst recognising that in practice it has limited influence over these emissions. We support the decision to include them, as they are not currently covered and traded under the EU ETS.

However, in 2013 the scope of the EU ETS is set to broaden to include additional gases (non-CO₂ gases), as well as new sectors/industries that will increase the CO₂ coverage of the scheme. The Welsh Government has estimated that moving these emissions from the non-traded to the traded sector could reduce the emissions reported in the 3% target by up to 0.37 MtCO₂e in 2013. This represents over a third of the total reduction target for a year, therefore making a significant impact on the reporting of the target, and to assessing whether it is met or not.

We considered two alternatives to this approach:

1. Remove these emissions from the baseline retrospectively and do not include them in the performance reporting.

A problem with this approach is that because these emissions were not reported to the EU during the baseline period, it is impossible to identify their level from the inventory. We could

consider applying a percentage split to the inventory data using 2013 data (percentage traded and non-traded) but as the balance between traded and non-traded fluctuates considerably from year to year, this is likely to introduce a large margin of error to the baseline.

2. Keep these emissions in the baseline, and continue to include them in the monitoring framework.

This would tie the definition of the 3% reduction target to non-traded sector emissions in the baseline period. It would remove the anomaly of reducing emissions simply by moving them from one sector to another, and also encourages the Welsh Government to consider if there are any policies to support emission reduction (on a gross basis).

However in practice while it should be straightforward to identify the non-CO₂ emissions that are now traded (as they are different gases to CO₂ and were not previously reported to the EU ETS), it is more difficult to separately identify the additional CO₂ that will be traded as a result of an increase in the scope of the EU ETS.

Therefore we recommend that the Welsh Government choose between two options:

- Remove all the new traded gases from the 3% monitoring (even though they are in the baseline) and explain that there is a step change in the emissions being reported due to more emissions moving to the traded sector.
- Investigate ways to identify any new traded gases and to the extent these estimates are robust, keep them within the 3% monitoring, on the basis that they were non-traded at the time the 3% baseline was set. The Welsh Government would still need to explain that there is an increase in the scope of the traded sector that may be a significant factor in any observed emission trends.

The latter option would be preferable, given that it helps to pin the monitoring of the target to the baseline on which it was set.

Inventory changes

Each year when the greenhouse gas inventory is produced, there are revisions to the figures backdated to 1990, as new and improved data and methodologies are developed. This means that each year, the emission data for the baseline – and the level of the 3% target itself – fluctuates. There is a question of whether it is more helpful to fix the baseline and the emission reduction targeted each year, rather than update it each year, so that the baseline and target is a known amount each year.

However, fixing the baseline would mean that the emission data used to measure progress would be measured on a different basis than the baseline. It is our view that the baseline and target should be updated to reflect the most up-to-date information each year, with the relevant explanations provided.



Reconciling EU ETS and DUKES data

A key part of the 3% methodology involves separating traded and non-traded emissions within the greenhouse gas inventory. The verified emission data from the EU ETS provides installation level emission data, allowing traded emissions in Wales to be identified. This can then be subtracted from the greenhouse gas inventory (GHGI) for Wales, which covers emissions in both the traded and non-traded sectors. The inventory is based on the Digest of United Kingdom Energy Statistics (DUKES) which estimates the annual consumption of all fuels in the UK and is the basis for estimating emissions from fuel use in Wales.

However this is currently problematic as each of these sources uses different methods to measure emissions²⁹ and different classifications to report emissions and they therefore do not match or map directly to each other.

In order to allow comparisons between the EU ETS and inventory DUKES-derived data, the inventory categories are split or aggregated across inventory sectors. This process can produce inconsistencies in the data (e.g. in some instances the EU ETS emissions for a sector exceed the reported inventory emissions, either due to misreporting or gaps in the DUKES data). Currently the Welsh Government takes a cautious approach and limits EU ETS emissions to 100% of the inventory emissions where there is a known gap in the inventory, so that emissions are not erroneously removed from the 3% target. The Welsh Government also currently undertakes checks, which should be maintained, on the remapping across sectors to ensure that cross-sector misallocations are corrected.

Summary/conclusions

On the whole, the method to derive the emissions in the 3% target reflects its intended definition, and there are a range of steps the Welsh Government has taken to ensure the robustness of the method (checks within the workbooks, external verification of the method, and plans to publish the various calculations and a paper explaining the full methodology).

However, given the annual changes to the inventory, and the continued impact of the changed scope of the EU ETS from 2013 onwards, this will require clear explanation of the emissions level each year. It is also important for the Welsh Government to set these changes in the context of wider contextual factors that impact emissions from year to year – i.e. weather and economic growth for example.

A key decision on the methodology is in relation to the treatment of non-CO₂ emissions that will be brought within the scope of the EU ETS in 2013. To the extent that these are identifiable, as they are included the baseline, the Welsh Government should consider including them in the monitoring of the 3% target. The Welsh Government will still need to explain that there may be CO₂ emissions moved out of the scope of the 3% target that are however, in the baseline.

²⁹ For example, the EU ETS reports all activities – and emissions – from an installation collectively, whereas the inventory separately reports different activities and emissions under each installation. EU ETS data is based on actual site-specific fuel use whereas the inventory is based on national average activity and emission factors.

Annex C: Review of the Welsh Government's monitoring framework

The main report (section 1.2) provided our recommendations on the overall approach to monitoring performance reducing emissions. We also made some specific sector level recommendations in the section reviewing progress (section 3 in Part 1) where relevant.

This Annex brings together all of our recommendations/comments on the monitoring framework.

Comments on the overall approach

- Emissions in the 3% target are comprised of direct emissions for each sector, plus the indirect emissions associated with electricity use in each sector. These are currently presented as one total. However it could be helpful to present these separately. This would help identify increases/reductions in emissions in each sector therefore where reductions are on or off-track.
- Around 40% of the emission reductions required by 2020 are to be met through the implementation of UK Government measures in Wales which will impact direct emissions in the transport, residential, business, and public sectors. They will also affect end-user emissions through power sector policies. The exceptions are waste and agriculture and land use, which are devolved policy areas (though there is a small element of electricity use in agriculture).

However, transport is the only sector where UK measures are currently presented in the indicator document (for new car efficiency). In this instance it is only the implementation at the UK level, rather than in Wales, that is being tracked.

It is important for the Welsh Government to track not only progress at the UK level of each policy relevant to Wales, but also whether the implementation of that policy in Wales is at a level that is consistent with the estimated reductions from UK policy in Wales (for example the number of Green Deal/ECO measures implemented in the UK and in Wales).

Indicators for these UK Government measures should be included in the framework, with where possible, indicators tracking the implementation in Wales. This is particularly important for the power sector, which is due to account for 10% of the emission reduction required by 2020.



- The Welsh Government estimates that ‘wider contributions from others’ will contribute around a third of the targeted reduction in emissions by 2020. We recommended in our 2011 progress report that further detail on these should be provided, and the contributions better defined to provide more confidence these reductions will be delivered. The indicator framework currently does not include indicators on the wider contribution of others – however if and when these contributions are more clearly defined, it will be important to set out how these will be monitored within the indicator framework.
- The 3% annual reduction target is set as a reduction against average emissions over 2006-2010. Therefore the indicator framework has been designed to measure progress from the first target year, 2011, relative to the 2006-2010 baseline average. However the 3% target is set out to 2020 and it would be useful to be able to measure progress towards that point by defining a level of ambition for the policies set to deliver the required reductions by 2020 (e.g. number of cavities and walls insulated) and set an annual trajectory towards this that can be used to measure progress each year. This would be subject to data availability and modelling requirements across various sectors, but is something the Welsh Government could consider exploring further.
- For each sector, there are indicators on emissions and on activity – i.e. volume of road traffic for the transport sector, fuel consumption in the business sector. Where appropriate it might be helpful to combine these indicators to allow an assessment of emission intensity to be tracked – though this may have to be fairly disaggregated to be meaningful (e.g. presented separately by mode for transport).
- Currently, indicators are presented for the 3% target only – this means that only activity relating to direct emissions outside the EU ETS and to end-user electricity emissions is being tracked. However, the Welsh Government’s climate change strategy also sets a target to reduce emissions from all sources in Wales, by 40% by 2020. The Welsh Government should consider indicators to track progress reducing economy-wide emissions towards this important target. Though the policy drivers will be largely outside of Welsh Government control (i.e. EU ETS and EMR), the Welsh Government can work with the UK Government on policy development in this area, and take actions to support delivery.

Sector level recommendations

1. Transport

- Indicator on ‘Volume of road traffic – all motor vehicles’. Given different modes have different g/km, and higher traffic for some modes (car) is undesirable, while for others (bus) is desirable, it would be helpful if data on traffic by mode could be presented alongside the chart showing the total to provide a fuller picture of underlying travel demand trends.
- If possible, the Welsh Government should track the number of people actually receiving in-car eco-driving training – the Committee’s view is that only practical training is worth measuring to provide confidence that emission reduction potential is being addressed.

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- It would also be helpful to be able to track the proportion of drivers exceeding the 70 mph speed limit – however currently the data on this is only available at a GB-level and regional analysis is not possible.
 - Data on sales of electric vehicles in Wales is available and should be tracked (and installation points if available).
 - The indicator framework currently tracks UK-level new car CO₂, however this data is available for Wales and should be tracked.
 - Data on new van CO₂ should be available next year as it will be required by EU reporting – and should also be tracked.
 - Fuel duty should also be tracked, given it is in the strategy as an emission reduction measure (at the UK level).

2. Business

- Data on the CRC Energy Efficiency Scheme is now available, however it is not possible currently to identify all Welsh businesses within the dataset as only businesses headquartered in Wales are identifiable.
- We considered data on Feed-in Tariffs by location and type of installation. While this shows around 6 MW of installed capacity in the non-residential sector in Wales (as at end of September 2012), unfortunately the majority of the installed capacity in the commercial and industrial sector (312 MW) is not identifiable by location, therefore we are not able to comment on the relative progress of implementation of this policy in Wales. The Welsh Government should explore (with Ofgem) whether this data can be identified for Wales.
- We noted in the 2012 progress report to the UK Parliament that we are unable to access data on the sale of efficient appliances due to lack of monitoring by government or industry. Therefore it is not clear at present how this policy could be tracked.
- The latest data on the Renewable Heat Incentive shows that after six months of the scheme operating, 49 MW of renewable heat capacity had been accredited by Ofgem across GB. 6.4 MW, or 13% of this total, is shown to be in Wales. However, because there is no Wales-specific data available on total heat demand, or heat demand in the commercial and industrial sectors, we are not able to comment on the significance of this capacity. There are no targets for renewable heat in Wales to assess progress against.
- If possible, provisions of the EPBD could be tracked, such as the number of buildings with EPCs and DEC, SAP ratings of new build.



3. Residential

- The energy performance of social housing cannot be tracked directly, due to the lack of a detailed house condition survey in Wales (i.e. one carried out by qualified building surveyors). Instead, the number of households receiving energy efficiency measures is used as an indicator instead. On a similar point, the indicator tracking the SAP rating of new homes is not particularly useful given it is likely to just be tracking what building regulations require anyway. It would be preferable to track SAP ratings and energy performance across the Welsh housing stock, but again the absence of a detailed house condition survey means this cannot currently be done.
- Indicators on behaviour change are still under development. In our 2012 progress report to the UK Parliament we tried to source this data at the UK level, but found no data available to measure the implementation of behaviour change measures.
- The indicator document currently lists domestic energy prices, household disposable income and household numbers as contextual factors to be tracked. We recommend that temperature should also be tracked as a contextual factor, given it is a key driver of energy demand and crucial in explaining emission trends, particularly in the residential sector. However there are various ways of illustrating temperature trends and consideration is required on the most appropriate method to reflect the potential impact on emissions. For example, we have presented two approaches in this report – heating degree days (see Figure 1.3) and temperature adjusted gas demand (see Figure 12).
- The Welsh Government should track the progress of the Renewable Heat Premium Payment in Wales, given the data is available.

4. Agriculture and land use

- Overall the indicators broadly capture the activity underpinning land use and agriculture emissions, with the exception that livestock is not included. Though not included in the published technical annex, the workbooks provided to us do include an indicator for livestock.

We understand that following the completion of the agriculture greenhouse gas inventory improvement project there will be much more Wales-specific data available to help develop more detailed/robust indicators for agriculture. Furthermore, it is anticipated that Glastir will have a comprehensive monitoring programme in place, as set by EU regulations, which may provide additional data that could help develop indicators in future.

The Committee's monitoring framework for agriculture contains a number of indicators that it might be useful to track Wales also, should be data become available. These include:

- The emission intensity of livestock output – i.e. the emissions per volume of meat output by type.

- On the crop production side, it may also be preferable to link the output to emissions – i.e. to track the emission intensity of potato and cereal output. If data is available it would also be better to split out nitrogen application rates for crops and grass. This is because external events can mean that impacts move in different directions (e.g. in the UK as a whole poor weather in 2010 meant that crop output reduced and emission intensity increased. However, the grazing land for livestock was not impacted as strongly, and emission intensity of livestock output improved.
- Where there are data gaps, it would be helpful for the framework to set out holding places for the indicators that it would be desirable to track and where data could in future be developed.

5. Waste

The indicators set out by the Welsh Government provide a good indication of the amount and type of waste being sent to landfill and are consistent with the indicators being used for the waste sector in the Committee's indicator framework.

However, it would also be helpful to provide indications of recycling, composting and AD rates to provide a full picture of waste management, and to help track how food waste and residual waste is being treated.

These could be set in the context of the total amount of waste being produced in Wales by source and also possibly type. Tracking trends in overall waste arisings will be useful to determine the impact of economic trends and effectiveness of waste minimisation strategies. In summary additional Tier 2 indicators to potentially track include:

- Amount, proportion, and type of waste sent to landfill and to alternative treatments (recycling, composting, energy-from-waste, AD)
- Municipal recycling rates
- Total waste arisings (by type and source if possible)

The framework states that there are currently no indicators for the Welsh Government policy to reduce further existing GHG emission at landfills – but there is an indicator on methane capture – which in our view would fall under this policy area.

One contextual factor is noted for waste – the landfill tax rate. However other factors could include the number of local authorities meeting Welsh Government recycling targets and number of local authorities providing for separate food waste collection for example.

6. Public sector

- An additional source of information to track progress that the Welsh Government could consider is the local authority emission data (available from DECC³⁰). Although this contains emissions in the area, rather than just those associated directly with the public sector, it would provide a good indication of what is happening at the local level.

³⁰ DECC (2012): *Local authority carbon dioxide figures*.



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