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Llywodraeth Cynulliad Cymru
Welsh Assembly Government

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Climate Change Strategy for Wales



October 2010

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Ministerial foreword



Climate change is a huge challenge, but we have an opportunity here in Wales to lead the way, demonstrating how we can put the vision in *One Wales: One Planet* into practice and move decisively towards only using our fair share of the Earth's resources and doing so in a way that promotes a fairer and more just society.

This Climate Change Strategy, and the two delivery plans that accompany it, represent an important milestone in action on climate change in Wales.

The Strategy confirms our level of ambition in tackling the causes and consequence of climate change but it also recognises that the science demands even more of us - and of governments and populations around the world.

The Strategy and delivery plans confirm the areas where the Assembly Government will act to reduce emissions and enable effective adaptation in Wales.

They highlight the importance of UK and EU interventions to achieving our targets in Wales and make clear the critical contribution that people, communities, organisations and businesses across Wales will need to make to enable us to deliver on this agenda.

Reaching this point, being able to clearly set out the targets that Wales will seek to meet and the actions that will contribute towards achieving them, is important, but the next stages are hugely more significant, and more challenging.

We - and that is all of us here in Wales with the Assembly Government providing leadership - must now deliver and maintain that delivery year on year.


In the delivery plan for emission reduction, we have estimated the emission reduction that our policies and programmes should deliver but now we must ensure that those reductions are realised.

In the Strategy, we have set out a framework to enable effective adaptation in Wales and now we must ensure that this is embedded and enables organisations and communities to make themselves more resilient to the consequences of climate change impacts.

And even if we achieve everything that is set out in the Strategy; there is still more to do.

The evidence from the science demands even greater and more rapid emission reduction and we must find ways to achieve this.

The Committee on Climate Change's reports, the work that the Tyndall Centre undertook on behalf of the Climate Change Commission, the Climate Change and Land Use Group's report and the Centre for Alternative Technology's Zero Carbon Britain 2030 report all make clear that scale of change that is need but also, importantly, offer solutions.



We know there are additional costs associated with many of those options and these are significant. But, as Nicholas Stern said in his report of October 2006 the costs of inaction are greater.

We know there are challenges - in terms of technology, of public acceptability and the sheer deliverability of change on the scale demanded.

But these are challenges that we must confront because the alternative is to bequeath a legacy of climate change on a scale that will fundamentally undermine the wellbeing of future generations and many more vulnerable parts of the globe.

This Strategy is a critical step on a journey to meeting that bigger challenge and we are determined to deliver and be accountable. We will report annually on progress and update our delivery plans as we identify further action that we can take. This strategy has been formed with all party support, through the Climate Change Commission, and I hope that the importance of this agenda will continue to attract all party support in the years to come.



Jane Davidson AM
Minister for Environment
Sustainability and Housing



Foreword by the Climate Change Commission for Wales

Climate change is challenging the ideas and practices of industrial civilisation, putting at risk both lives and livelihoods, whilst also threatening the very survival of many species of plants and animals. It is, therefore, imperative that countries such as Wales act urgently and effectively to limit greenhouse gas emissions from human activities to within 'safe' and sustainable limits.

Currently, Wales, like many other nations, is living well beyond its environmental limits. We, as a nation, are heavily reliant on fossil fuels and have reached the point where we are consuming three times our share of wider global resources, including emitting unsustainable levels of greenhouse gases into the atmosphere.

We believe that, as a small and industrialised nation, Wales can play an important role in demonstrating leadership on the climate change issue.

The Welsh Assembly Government can and must provide leadership and continued commitment to tackling climate change - both by reducing emissions significantly and by adapting to the impacts and consequences that we cannot avoid.


The Welsh Commission on Climate Change recognises, however, that it is not only government that needs to act. Tackling climate change will require concerted action from all parts of society, and everyone has a role to play.

Acknowledging this, the Commission was founded - not only to provide independent advice to the Welsh Assembly Government, but also to provide guidance and advise on climate change issues across all sectors in Wales.

The challenge we all face is stark. Climate science shows clearly that, without immediate, radical and sustained reductions in global greenhouse gas emissions, there will be severe consequences for human society, as well as the biodiversity and ecosystems that provide essential services for human livelihoods. Moreover, economic analysis suggests that action now will substantially reduce future costs of cutting emissions. In terms of adapting to future climate impacts too, the earlier we start to prepare, by understanding our vulnerability and building our capacity to adapt, the better equipped we will be to respond appropriately.

We need to make some big and urgent changes - to how we travel, manage our land, heat our homes and run our economy. But a low carbon Wales can be prosperous, bringing many benefits beyond tackling climate change. It can mean cheaper, more reliable energy, better air quality and more comfortable homes. There are also major opportunities for businesses to thrive and take advantage of the new opportunities from the transition to a greener society.

This Climate Change Strategy and Wales' annual target for 3 % reduction in emission in areas of devolved competence, is an important statement of intent and is comparable with the more ambitious plans for emission reduction globally.



Nevertheless, we recognise that the 3 % target falls far short of the effort required of developed countries if globally we are to avoid a high risk of an increase in average temperatures of more than 2°C. Beyond 2°C, we pass the threshold of ‘dangerous’ climate change - that is climate change with very significant impacts, and where feedbacks in natural systems leading to greater emissions are triggered.

We commissioned a report by the Tyndall Centre to explore the implications of differing levels of annual emission reductions (of 3 %, 6 % and 9 %) linked to the need to limit temperature rise to a maximum 2°C to avoid dangerous climate change. The report identified the key sectors where emission reductions were needed and what policy interventions, regulation, financial incentives and penalties would be required to limit emissions.

Therefore, this Strategy and its delivery plans must be seen as a starting point from which to build, and the role of the Commission will be not only to make sure that the objectives and targets of the Strategy are achieved but to continue to push for greater ambition and, much more importantly, real delivery by every part of Welsh society - government, businesses, the public and third sectors alongside communities and individuals.

We will assess progress annually and recommend where more action is needed, but, importantly, we will also be championing action in our organisations and the sectors we represent and with all people across Wales.

Climate Change Commission for Wales

The Climate Change Commission was established in December 2007 to build a broad consensus on climate change, and to mobilise action across all sectors in Wales - as well as by individuals and communities. Its members represent the public sector, business and third organisations, academic institutions, expert bodies and political parties.

The Commission plays a key role in supporting the Assembly Government in delivering action on climate change and delivering its *One Wales* commitments. It has also made a key contribution to the development of this Strategy and will play an important role going forward in continuing to drive delivery in this area.

Further information on the Commission can be found at: www.wales.gov.uk/climatechange

Executive Summary

The Assembly Government has a clear role to play in tackling climate change. This Strategy, and the associated Delivery Plans, confirm our commitments and the areas where we will act, and where we will work with our partners, to reduce greenhouse gas (GHG) emissions and enable effective adaptation in Wales.

Our climate is changing. There is now a clear scientific case that this change is being brought about by human activity. The first part of this Strategy explains the current scientific evidence, the impacts we might expect to see across the globe, the case for urgent and sustained action to cut emissions, and the need to adapt to future impacts.


Chapter 2 explores the Assembly Government's role in leading and supporting action on tackling climate change, and looks at the role of key partners, including the Climate Change Commission for Wales and the UK Committee on Climate Change. Our vision for 2050, and how this Strategy supports the Assembly Government's Sustainable Development Scheme, *One Wales: One Planet*, is set out in Chapter 3.

The Assembly Government's strategic approach is explained in Chapter 4, and highlights the importance of everyone's contribution in tackling climate change. The core principles underpinning the actions set out in the Emission Reduction and Adaptation Delivery Plans (available at: www.wales.gov.uk/climatechange) are also set out:

- A comprehensive approach to behaviour change.
- Leading by example in the Assembly Government and wider public sector to consider climate change in all decision-making.
- Delivering increased energy efficiency, making low carbon transport a reality, and building the skills needed to ensure that Wales can make the most of opportunities from a low carbon economy.
- Making the most of opportunities to cut emissions and adapt to climate change where our natural resources, land management pattern, and economic position allow.
- Ensuring that our approach to R&D, technology, innovation and skills help Wales gain maximum benefit from climate change related business and research.
- Creating a framework to support effective adaptation that delivers for those most in need and those less able to adapt.
- Ensuring that land use and spatial planning promote sustainable development and enable a move towards a low carbon economy which takes account of future climate impacts.

The Assembly Government's commitment to review and update the package of actions in future, in addition to its commitment to provide an annual report on progress to the National Assembly for Wales, are also confirmed in this section of the Strategy.

The Assembly Government's key target - to cut greenhouse gas emissions by 3 % per year from 2011 in areas of devolved competence - is explained in Chapter 5. Details are also provided here on our specific targets for the transport, residential, business, agriculture and land use, public, and waste sectors.



In developing this Strategy, it became clear that there are a number of key areas that cut across the whole climate change agenda. Issues like behaviour change, energy generation, buildings and research are crucial to underpinning emission reduction action in each sector and in ensuring effective adaptation. Our approach to managing these cross-cutting themes is explored in Chapter 6.

Our approach to emission reduction is set out, on a sector-by-sector basis, in Chapters 7 to 13. Each chapter identifies the relevant sector emission trends, the opportunities for emissions cuts in the sector, and our focus for action. Areas for further work are identified, as is the specific behaviour change work needed to support delivery. Each chapter concludes with our sector vision, illustrating the outcomes that the Assembly Government wants to achieve by 2020. The accompanying Emission Reduction Delivery Plan, which provides detailed information on the specific actions we are taking forward, is presented on a similar sector-by-sector basis.

As a result of current emissions and those that have already occurred, we cannot avoid the impacts of climate change entirely. As a result, we need to consider how we are going to adapt to changes that will affect many aspects of our lives in the future. The anticipated climate changes for Wales, and our approach to managing them, are addressed in Chapters 14 and 15. The relevant statutory requirements of the Climate Change Act (2008) - and how we will meet them - are also explained here.

The earlier Wales starts to prepare for the impacts of climate change, the better equipped we will be to cope with a changing climate. Consequently, as set out in Chapter 15, we have developed an Adaptation Framework to ensure that we understand the risks and opportunities these changes present, and to ensure that we are well-placed to adapt in a sustainable way. The Framework aims to address climate vulnerability by:

- **Building our evidence base** on future impacts.
- **Mainstreaming adaptation** to build capacity within organisations and communities.
- **Communicating** on adaptation to ensure that decision makers understand the risks and opportunities and are equipped to manage them.

Roles and responsibilities of the Assembly Government, and partner organisations, in tackling climate change impacts are set out in Chapter 15, in addition to an indicative timeframe for managing these impacts. The accompanying Adaptation Delivery Plan sets out the detailed actions to fulfil the objectives presented in the Framework.

An explanatory note is provided at Annex A on the methodology used in generating the emission figures used in Strategy and Emission Reduction Delivery Plan. Annex B provides further information on the UK Government's targets and Carbon Budgets.

To reduce the need for large numbers of hardcopies of the Strategy documents, we are encouraging use of the online versions wherever possible. The Climate Change Strategy and Delivery Plans can be found at www.wales.gov.uk/climatechange, along with an online library of relevant case studies to highlight achievements across Wales and to provide opportunities to share good practice.

Chapter 1

Climate change - the case for urgent action



Summary

- Our climate is changing and the scientific case for human induced climate change is clear
- No matter how effective policies are at reducing greenhouse gas emissions, we will experience some degree of climate change
- Urgent and sustained action to cut emissions is needed globally to avoid the worst impacts of climate change in the future

The scientific case that the climate is changing and that human activity is playing a significant role is clear.

It is that scientific case, and the evidence of the potentially catastrophic impacts that we could face if urgent and decisive action is not taken, that underpins the Assembly Government's policy on climate change.



What is climate change?

The balance of climate, between heating from the sun and cooling by infrared emission of the Earth to space, is maintained naturally by the greenhouse effect, the action of certain gases (carbon dioxide, methane, water vapour) to trap infrared heat energy within the atmosphere, so increasing surface temperature.

Human activity is increasing the concentrations of many of these gases at unprecedentedly high rates, through burning fossil fuels, global deforestation and increasing animal production. It is the very high rate of increase of greenhouse gases due to these activities that presents us with an extremely serious situation if rates of increase are not curbed.

Unchecked climate change is one of the most serious global threats the world faces because it disturbs the pattern of rainfall, sunshine, winds and currents in the oceans. It threatens the basic elements of life for people and environments around the world - for example access to water, food production, health and the use of land.

The Earth's climate has always undergone episodes of great change usually over long periods of time. Previously these changes have been driven by natural processes, such as solar activity, volcanic eruptions or the cycle of the Earth's orbit around the Sun. The problem today is that there is strong evidence indicating that the climate is changing very quickly and that the scale

Carbon dioxide and other gases, collectively known as 'greenhouse gases', act as a partial "blanket" that increases the amount of heat from the sun that is trapped by the atmosphere. Since the Industrial Revolution in latter half of the 18th Century, concentrations of greenhouse gases (GHGs) in the atmosphere have increased as we have burnt more and more fossil fuels. Strong scientific evidence indicates that this has led to reduced heat loss from the Earth, and resulted in warming of the Earth's surface and lower atmosphere.

of the increase in global average temperatures cannot be simulated using sophisticated global models of the climate unless the increase in the concentration of greenhouse gases in the atmosphere, resulting from human activity, is included.

What does the science say?



Scientists have been studying climate change for many years and there are publicly available, peer-reviewed studies by thousands of scientists across a wide range of disciplines exploring the issue. The most well-known international scientific body assessing climate change is the Intergovernmental Panel on Climate Change (IPCC) established in 1988 by the United Nations to consider scientific evidence in relation to human-induced climate change, the impacts of climate change and options for mitigation and adaptation.

As the Royal Society states, 'Climate science, like any other scientific discipline, develops through vigorous debates between experts, but there is an overwhelming consensus regarding its fundamentals.'

Climate science has a firm basis in physics and is supported by a wealth of evidence from real world observations.

It is certain that increased greenhouse gas emissions from the burning of fossil fuels and from land use change lead to a warming of climate, and it is very likely that these greenhouse gases are the dominant cause of the global warming that has been taking place over the last 50 years.'


Global effects of climate change

The effects of climate change will vary across the globe. The average global temperature is projected to rise by a few degrees but that change, and associated changes to rainfall, will be much greater in some places (and smaller in others) with significant impacts for people and the environment.

The impacts of climate change will be felt globally because we expect sea levels to rise as oceans warm and expand, putting millions of people at risk. Temperature increases, drought and flooding will affect people's health and way of life, and may cause the loss of many plant and animal species.

The main effects

No matter how effective policies are at reducing greenhouse gas emissions now, the world will still experience a significant degree of unavoidable climate change, because there are delays in the climate system between the increase of emissions and a temperature rise being manifested.



If emissions are not reduced significantly, there are likely to be far-reaching effects on all aspects of the world's environment, economy and society, including:

- **Rising sea levels**

Sea levels are expected to rise by 20-60cm by the end of the century, as the oceans expand due to rising temperatures and melting ice caps and glaciers. This is likely to threaten some small island states and put millions at risk of increased coastal flooding.

- **Flooding**

Flooding is likely to be of significance in many countries - particularly flash flooding resulting from more intense precipitation events. However, the poorest countries are likely to be the most vulnerable to the effects of climate change because of their lesser ability to adapt. Around 60 % of the estimated 80 million people at risk of flooding are in Southern Asia (Pakistan, India, Sri Lanka, Bangladesh and Myanmar), with 20 % in South East Asia (from Thailand to Vietnam, including Indonesia and the Philippines).

- **Food shortage and disease**

Africa is likely to experience significant reductions in cereal yields, as are the Middle East, India and China. By the 2080s, in a moderate to high emissions scenario,¹ an additional 220 to 400 million people could face an increased risk of malaria, particularly in China and Central Asia.

- **Severe water shortages**

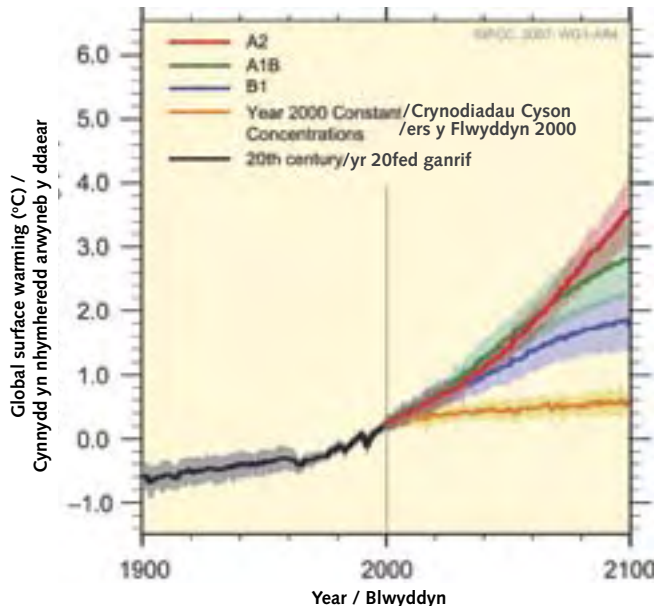
Some areas are highly likely to face severe shortages of drinking and irrigation water, due to less rain and the salination of coastal ground water by rising sea levels. They may also face an increased risk of drought and flooding. It is estimated that up to an additional three billion people could suffer increased water problems by 2080 if global average temperatures rise above about 3°C over pre-industrial averages. Northern Africa, the Middle East and the Indian subcontinent are likely to be the worst affected.

- **Loss of habitats and species**

Loss of biodiversity and ecosystems important for climate regulation and human wellbeing are likely. For example, by the 2070s, large parts of northern Brazil and central southern Africa, already depleted through logging, could lose their tropical forests because of less rainfall and increased temperatures. If this happens, global vegetation, which currently absorbs carbon dioxide at the rate of some 2-3 gigatonnes of carbon (GtC) a year, could become a carbon source, generating about 2 GtC a year by the 2070s (current global man-made emissions are about 6-7 GtC a year). These extra emissions will add to carbon dioxide built up in the atmosphere, which could result in even more severe changes in climate than those shown in the IPCC graph below).

¹ Computer simulations of climate change are typically made for high, moderate and low global emissions scenarios of greenhouse gases. These are broadly defined as the IPCC emissions scenarios A2, A1B and B2, respectively.

Fig 1 - IPCC graph of predicted temperature in the ('high', 'moderate' and 'low') emissions scenarios, relative to a 1980 to 1990 base period



Reference: IPCC Fourth Assessment Report: Climate Change 2007: Working Group 1: The Physical Science Basis

Urgent and sustained action to cut greenhouse gas emissions is needed globally to avoid the worst impacts of climate change in the future. Although a difference in average temperatures of a few degrees may not appear significant, it is. Global average temperatures now are only 5°C higher than they were at the peak of the last ice age.

If we follow high emissions scenarios we could be heading for a global temperature rise of over 5°C by 2100, compared with the pre-industrial period - which would be a larger

change in temperature than that experienced at the end of the last ice age. Climate change impact projections additionally show that a high emissions scenario could mean a summer daily maximum temperature rise of 6.1°C in Wales by the 2080s. Even under a low emissions scenario Wales could see a summer daily maximum temperature rise of 3.7°C by the 2080s.

These impacts are likely to have serious implications for our lives in Wales, particularly in relation to food supply and the availability of other resources, migration, the spread of disease and conflict. This is explored in more depth in Chapter 14.



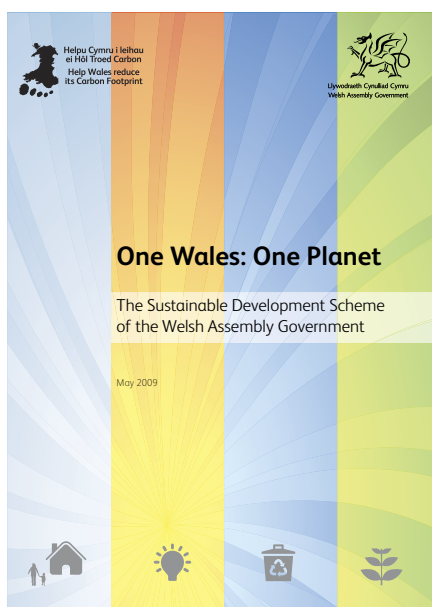
Chapter 2

Our response to the challenge of climate change



Summary

- The Assembly Government is committed to tackling both the causes and consequences of climate change
- Our response is based on the principles of fairness and our policies will promote social justice
- Everyone has a role to play and in ensuring that Wales can meet its targets
- The Climate Change Commission for Wales has a critical role to play in building a consensus on the action required and in providing leadership across Wales
- Climate change cannot be tackled by one country alone, but Wales is taking action and supporting others in doing so



Climate change is one of the greatest challenges facing the world - and one that requires concerted action by us all.

As the opening of this Strategy makes clear, the scientific case for action to tackle climate change is ever more compelling. As the UN's Intergovernmental Panel on Climate Change (IPCC) reported in November 2007, the evidence for warming of the climate system is now unequivocal.

Climate change threatens the basic elements of life for people around the world - access to water, food production, health, and use of land - it also threatens our wider environment.

It is a true sustainable development challenge. It has come about as a result of unsustainable choices in the past, choices that we continue to make even now. Our approach to climate change is set within the context of the Assembly Government's *Sustainable Development Scheme: One Wales*

One Planet, and is a crucial element of putting the scheme and our commitment to sustainable development into action.

Globally, individuals, whole communities, local and regional governments and nations are taking action to address climate change. That global effort has its focus in the United Nations Framework Convention on Climate Change (UNFCCC) and associated agreements. The Kyoto Protocol was a critical first step in developed nations taking responsibility for emission reduction and the Welsh Assembly Government, like the UK Government, has been an active in supporting work to secure a binding climate deal from 2012 onwards.

In Wales, we have set a target to reduce emissions by 3 % per year. This can only be achieved if everyone - government at all levels, people, communities and organisations - all play their part.

We must tackle both the causes and consequences of climate change. We must act, and act urgently, to cut emissions of greenhouse gases, but we also need to respond to the impacts of changes in the climate which will occur as a result of past and current emissions.

Action to both reduce emissions and adapt to unavoidable impacts is vital and should be designed to be complementary.

We must ensure that when we take action to reduce emissions, for example in changing build design, that we also ensure that those buildings are adapted for our future climate. Similarly, when we are taking action to adapt to the impacts of climate change, we need to ensure that we are not doing things that are going to cause emissions to increase.

Concerted, urgent effort is needed to curb emissions. Greenhouse gas emissions have already pushed up global temperatures by 0.7°C.

Because there are processes in the climate system (for example the deep oceans) which cause significant (years) delays between more heat being trapped by increasing greenhouse gases and surface temperatures actually rising, even if increases were instantaneously stopped, we would be committed to further temperature rises. Continued high or median carbon growth will, by mid-century, have taken greenhouse gas concentrations in the atmosphere to a point where the Earth will be committed to several degrees more warming and a major climate disaster would be very likely.

Urgent action is needed globally to get us on an emissions trajectory where the increase in atmospheric concentrations of greenhouse gases can be limited to levels which avoid dangerous climate change.

We recognise that our target to reduce emissions by 3 % per year in areas of devolved competence is a political target and that even higher levels of reduction will be needed globally in order to limit the temperature increase to within 2°C, which is recognised as the threshold at which dangerous levels of climate change become unavoidable. We also recognise that, with a global position where a 3 % reduction per year is at the maximum being agreed and, in many places, the commitment is lower, the evidence suggests that we are committing future generations to a prolonged period of “dangerous climate change”.

We also recognise that our target, like the UK carbon budgets and the targets that underpin global agreements on climate change, are based on the emissions we produce here in Wales but in reality we are responsible for a much larger proportion of global emissions because of the goods and services we consume but which are made elsewhere. Taking a sustainable



development approach means that we must have a strong focus on our wider consumption and its impacts as well as our direct emissions; we have adopted the ecological footprint as one of our headline indicators to measure our progress on sustainable development and will build this into reporting progress on climate change action.

The economic case for action is equally clear. As shown by the Stern Review on the economics of climate change, published in October 2006, and more recently by UN work on financing and investment flows, the cost of doing nothing are significantly greater than the expected costs of co-ordinated global action to reduce greenhouse gas emissions. A two to three degrees Celsius rise in temperature could reduce global economic output by 3 %, and if temperatures rise by five degrees Celsius, up to 10 % of global output could be lost. To stabilise at manageable levels, global emissions would need to stabilise in the next 20 years and fall between 1 % and 3 % after that. The Stern Review Report stated that this would cost 1 % of GDP.

Climate change is a social justice issue. Globally, and here in Wales, we can expect its impacts to disproportionately affect those least able to manage them and who are, at the same time, least responsible for causing the problem.

Our response to climate change must be based on the principle of fairness and costs should reflect the ability to pay and the extent to which people are making low carbon choices. We also need to ensure that the social equity is at the centre of policies to manage the impact of climate change, for example in how we manage increased flood risk.

We will ensure that our policies to tackle climate change also promote social justice.


Climate change will profoundly impact on the natural environment. Our species is not the only one that will be affected by climate change. Habitats and species, and wider ecosystem services, which are already impacted on by a combination of other pressures, will be affected by climate change both on land and at sea.



Whether the impacts are changes in the seasons affecting plant and animal growth, changes in river flow levels in summer or changes in ocean acidity and temperature, they will affect the natural environment.

We will ensure that our policies on climate recognise and address that impact on the natural environment.

Climate change is already happening. While we must take measures now to curb greenhouse gas emissions, we also need to respond to the changes that are already locked into the climate system as a result of previous emissions. Changes to our climate over the next 30 to 40 years caused by past emissions are largely unavoidable.



If we do not prepare for the inevitable impacts we will have failed to act responsibly in the light of evidence that our climate will change significantly over the coming century. The latest UK Climate Projections², published in June 2009, showed the changes in climate that we can expect in Wales, and we know that other parts of the world will experience even more severe impacts.

We need to plan for these local and global impacts and understand what they mean for the future.

The impacts of, and solutions for, climate change will vary in different parts of Wales.

Tackling climate change will require a spatially differentiated approach which is flexible and reflects the opportunities and challenges in different parts of Wales.

Low Carbon Regions will provide a focus for action on climate across Wales in each of the Spatial Plan areas and we will ensure that emission reduction and adaptation are a key focus in the overall strategy for each area.

Every sector has a role to play and public engagement is crucial, with the Assembly Government providing leadership. A successful response to climate change requires action by everyone including by the EU and the UK Government, and Wales' climate change targets will only be met if everyone plays their part.

Business, the third sector, local government and other organisations have all made commitments to play their part in tackling climate change and the Climate Change Commission for Wales enables us to build common purpose.

The Assembly Government is the lead body in Wales to encourage society to change its behaviour and attitude towards climate change and to support action through its policies and programmes, but we also rely on action by the UK Government, businesses, organisations and communities to deliver the 3 % target.

Enabling people to act. Individuals and communities across Wales have a crucial role to play in the response to climate change and in ensuring that Wales can meet its climate change targets. Each of us can make different choices that can help reduce emissions or build resilience to the impacts of climate change.

We need to support behaviour change and enable people to take action: engaging people about why climate change matters and what they can do; providing information, advice and tools that help people see how their actions can make a difference and removing barriers, incentivising action and making it easier to make better choices.

Role of the Climate Change Commission for Wales. The cross-party, cross sector Climate Change Commission for Wales has a critical role to play in building a consensus on the action required in response to climate change and providing leadership across Wales.

² <http://ukclimateprojections.defra.gov.uk/>

The Commission and its Sub Groups have already made an important contribution to the developing climate change policies in Wales.

The Commission is not just about informing what the Assembly Government can do. The Assembly Government can provide a framework for delivery and address barriers to progress through its policy and programmes, but addressing climate change requires society as a whole to take action. The Commissioners also ensure the engagement and active participation of the sectors and key organisations that they represent.

Think beyond business as usual. The advice of the Committee on Climate Change makes it clear that we need to think about operating in a world which is increasingly carbon constrained and identify how our policies, programmes and services need to change as a result. This means thinking about some of the core assumptions around current policies and priorities not just looking at 'add on' actions. However, we also need to acknowledge that this transformation will take time and we need to phase action to deliver sustained emission reduction over time.


This is why the Climate Change Commission for Wales asked the Tyndall Centre to explore scenarios for emission reduction of 3 %, 6 % and 9 %. This scenario work helps us understand the type and scale of action that is needed to reduce emissions at the speed that the science really requires and challenges us to look again at the options available to us.

The need to challenge current assumptions and practice is also fundamental to effective adaptation actions. We need to ensure that we are factoring the risks posed by a changing climate into our decisions and business planning.

Wales has a leadership role to play in tackling climate change. The Welsh Assembly Government has a legal duty to have a Scheme setting out how it will promote sustainable development in all that it does, and this gives us a great opportunity to lead from the front.

We have a responsibility as a small developed nation with a higher number of emissions per head to lead the way. It is not easy and that is why we must become a model that others can follow.





We are active members of the Network of Regional Governments for Sustainable Development (NRG4SD), we continue to work hard to promote the role that sub national governments and regions play in tackling climate change. We are also sharing the actions that we are taking and, in turn, learning from others across the world. This global exchange of experience is vital in enabling us all to quickly adopt policies that work.

Climate change cannot be tackled by any country alone but Wales can play a role in global effort to reduce emissions.

As the world works towards achieving and then delivering against a global agreement on climate change, Wales has a real opportunity to help progress that global effort.

By making clear commitments, developing a realistic delivery plan that encompasses the actions of society and government and then achieving against those commitments, we can provide a powerful demonstration that successful action is possible and provide an approach that other countries can consider and apply at home.

Sharing experience and learning on this challenging agenda is vital and we are committed, through our Wales for Africa programme, to working with communities in other parts of the world in responding to climate change.

In Wales, we have a strong link with Mbale in Uganda, which began through the community organisation 'PONT' based in Rhondda Cynon Taff. Mbale is an region of extreme poverty with the majority of the population living on less than \$1 per day as subsistence farmers. They are particularly vulnerable to Climate Change. Wales and Mbale were selected as two of the pilot regions for the UN Development Programme (UNDP) Territorial Approaches to Climate Change project. This project will use Welsh expertise to develop an Integrated Territorial Climate Plan for Mbale which will then be used to draw in funds to help Mbale adapt to their changing climate - through the planting of shade trees, distribution of fuel efficient stoves and water management techniques.

There are opportunities arising from the response to climate change. We have to respond to climate change but in doing so there are opportunities. These include creating jobs and economic benefit from low carbon technology.

Chapter 3

Vision for 2050



Summary

- Enhancing the long-term wellbeing of people and communities in Wales is central to our approach to sustainable development
- Our Sustainable Development Scheme, One Wales: One Planet confirms our vision for Wales using only its fair share resources, and becoming a fairer and more just society
- This Strategy and the Delivery Plans set out our actions to help us to achieve this vision of a sustainable Wales

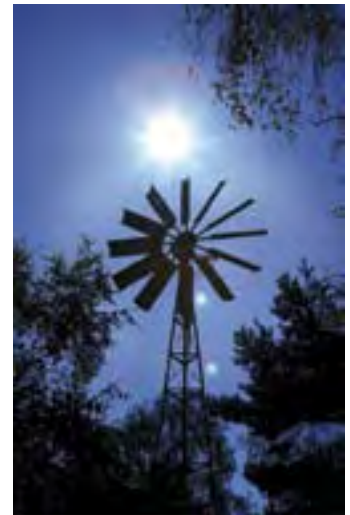
The world needs to demonstrate that it can find a level of sustainable development that allows a future in which the earth's resources are managed so that climate change does not become a crisis. In Wales, we can set an example to other nations as to how this might be achieved.


Our Sustainable Development Scheme, One Wales: One Planet confirms our vision for a sustainable Wales, based on Wales using only its fair share of the Earth's resources and becoming a fairer and more just society. We also set out our vision of how a sustainable Wales will look in the future.

A key feature of achieving this vision will be that effective action to tackle both the causes and consequences of climate change is being taken and responsibility for addressing the challenge of climate change is acknowledged and shared across society.

It is a vision that reflects the approach set out in the Centre for Alternative Technology's *Zero Carbon Britain* Report - one based on climate security, energy security, economic security and international security.

This vision is not a blueprint for what will happen or a list of specific actions, instead it paints a picture of how a more sustainable, low carbon Wales would be different to the Wales we live in now.





The Climate Change Strategy and associated Delivery Plan map out the approach and specific actions intended to enable us to achieve that vision.

We have also tested this vision by examining scenarios for higher levels of annual emission reduction, leading to more rapid decarbonisation. These scenarios for reductions of 3 %, 6 % and 9 % per year were prepared by the Tyndall Centre on behalf of the Climate Change Commission for Wales. We are using them to ensure that we not making choices that lock us out of greater emission reductions in the future and to challenge us to think radically about what more we can do now. These scenarios complement the work that the UK Committee on Climate Change has done to explore costs and benefits of different emission reduction pathways.

What a sustainable Wales could look like

Across society there is recognition of the need to live sustainably and reduce our carbon footprint. People understand how they can contribute to a low carbon, low waste society, and what other sectors are doing to help. These issues are firmly embedded in the curriculum and workplace training. People are taking action to reduce resource use, energy use and waste. They are more strongly focused on environmental, social and economic responsibility, and on local quality of life issues, and there is less emphasis on consumerism. Participation and transparency are key principles of Government at every level, and individuals have become stewards of natural resources.

We have strong, active, resilient and supportive communities where people take responsibility for their own actions and how they affect others. Wales is a bi-lingual society, is fairer and more equal, and there is a reduction in the gap between rich and poor. Employment levels are high, and people enjoy a greater work-life balance, with more opportunities for volunteering. People work closer to home.

Many communities are taking action locally to reduce emissions and have developed local carbon budget programmes. Action has been taken to ensure that reducing greenhouse gas emission and the impacts of climate change do not increase social exclusion in Wales. People are active in maintaining the quality of the local environment where they live.

Economic regeneration is undertaken with sustainable development at its core, and promotes low carbon, low waste ways of working. There has been a huge growth in businesses that supply the goods and services needed to support a sustainable economy, including within the third sector. This growth has been underpinned by the development of training and qualifications in key sectors and in key skills needed for the production of low carbon, low waste goods and services. Wales is home to a number of world-leading technology development companies and manufacturing plants. The emphasis is on durable, recycled, recyclable and re-usable goods, and goods which are low carbon. These products are used locally and exported. Much more freight is moved by rail.

The energy intensity of society has decreased significantly. There has been a consistent drop in energy and water demand. There has been a major increase in renewable energy generation, offshore and onshore. All remaining fossil fuel plants have much improved energy efficiency, use their waste heat productively, and have carbon capture and storage fitted. Heavy industry and the power generation sector have greatly improved the energy efficiency of their processes and reducing the embedded carbon in their products. Large, energy intensive sites are maximising the productive use of waste heat and supplying other businesses and homes.

Waste - whether of energy or other resources is taboo - both from a cost and societal impact. There is less light pollution. Resources are valued and as a result there has been a huge reduction in waste production and a much greater emphasis on reuse. Composting and recycling are at very high levels, and the third sector is active in providing services to enable reuse and recycling.

Walking and cycling are much more commonplace. There is greatly enhanced provision for cyclists and pedestrians within towns and cities, with improved walking and cycling networks as well as better street design and traffic management measures. There are fast, reliable, affordable public transport services connecting major settlements. There are frequent, reliable mass transit services within cities and more heavily urbanised regions. There is a coherent network of sustainable transport options within rural Wales. Travel Plans are part of all new developments. All employers develop and implement Travel Plans.

The 'school run' has been replaced by organised school transport or group walking / cycling. Petrol and diesel prices remain high, engine efficiency has increased with the widespread take-up of hybrid vehicles. People buy smaller, more efficient cars, and lift-sharing is a common way of travelling. The carbon content of transport fuels has reduced. The rate of growth in air travel has slowed down and it is no longer regarded as a necessity.

Good quality housing for all is the norm. Homes and businesses are far more energy efficient and sustainable - all existing buildings at least meet Energy Performance Certificate standard C and many are on the way to becoming carbon neutral. All new buildings are constructed to the highest standards of energy and water efficiency, and are zero carbon. New development and infrastructure is located, designed and constructed for the climate it will experience over its design life, and to minimise travel needs.

The public sector has led the way in this area, and sustainable development is the central organising principle of public service. Public buildings, schools, further and higher education institutions, hospitals and community buildings have been early, visible demonstrators of greater energy efficiency and renewable technology. They have also pioneered staff and service delivery approaches that minimise the need to travel. Many services are available locally and IT is used extensively to connect to specialist services.

Sustainable development and global citizenship is firmly embedded into all levels of educational provision and lifelong learning in Wales, and all schools are Eco and Fair Trade schools. Levels of educational attainment are high.

There is a much greater emphasis on preventative health care throughout society, and many more people are living healthy lives through eating better and getting exercise more regularly as part of their everyday lives. Increased localisation means that people are eating more seasonal, fresh local produce and this has stimulated agriculture and horticulture in Wales and there is much greater consideration given to the provenance of food. Much more food is traded locally where possible and fairly with the developing world when not. There is a huge expansion in allotments and community gardening. The agricultural industry has adapted to a changing climate, including making provision for the impacts of warmer summers, and changes in land use and management.

Wales' historic landscapes have been preserved and we have learnt lessons from our past which inform our future management. We are now also managing land for the wider ecosystem services it can deliver, including carbon storage, water quality, flood management, and landscape quality and connectivity for wildlife to adapt to climate change. As a result the loss of biodiversity has been halted and there is a greater number, range and genetic diversity of wildlife. There is a greater understanding and appreciation of our inter-dependence with the other species we share the planet with.

The marine environment is managed sustainably on an ecosystem approach, and there is an ecologically coherent, representative and well managed network of marine protected areas. Many more people enjoy sustainable access to enjoy the countryside and coast. Wales' historic environment and heritage is sustainably managed and is accessible to all, sustainable transport options for visitors are more commonplace, and this underpins Wales' brand as a sustainable tourism destination.

Wales is recognised internationally as a leader in sustainable development, and learns from, and exports its learning to, other small nations and regions in Europe and wider afield.



Chapter 4

Turning this vision into reality



Summary

- Action focuses on where we can make the greatest difference in Wales
- Cutting greenhouse gas emissions and ensuring effective adaptation will have wider benefits for our economy and environment, and for people's well-being
- We will work with the UK Government to ensure that UK policies support our climate change objectives in Wales
- We will regularly review our actions and provide annual progress reports to the National Assembly for Wales
- We will put in place a robust governance framework to oversee delivery of this Strategy and its Delivery Plans, which will include independent support and challenge from the Climate Change Commission for Wales

There is no silver bullet for tackling climate change. The processes which produce greenhouse gas emissions are ubiquitous and central to the way we currently live our lives, and so reducing these emissions will not be easy. Similarly, the impacts of climate change will touch on almost every aspect of our lives and have profound impacts on the natural environment. If we are to have any chance of avoiding the dangerous and wide-ranging effects that these emissions threaten to produce, we must reduce them drastically and as soon as possible.

This requires us to consider the climate change implications of all our activities and to make decisions informed by those consequences. It also requires the development of policies and programmes that address the issues for different sectors and places to deliver emission reduction and effective adaptation.

The Assembly Government has a clear role to play in leading action to tackle the causes and consequences of climate change, but we will only succeed by working with businesses, local government and the wider public sector, the third sector, communities and individuals. Everyone has a role to play and an important contribution to make.

Local Authorities have the opportunity to occupy a key leadership role at a local level, and indeed many already do; the third sector has excellent grassroots contact with Welsh society at all levels, and the work of the third sector already provides many examples of organisations working to tackle climate change; businesses have a key role to play and many opportunities to exploit in a greener economy. Most importantly, individuals and communities throughout Wales have the ability to take action themselves and to put pressure on all of these organisations and make change happen.

Our Delivery Plans - for Emission Reduction and Adaptation - set out the actions that the Assembly Government, UK Government and other partners are to take in response to climate change. More detail about these actions is set out on our website at <http://www.wales.gov.uk/climatechange>.

We have focused our action on where we can make the greatest difference, using the responses to the consultation on the Programme of Action and the advice of the Committee on Climate


Change to inform what we are doing. Key areas for action include:

- developing a comprehensive approach to behaviour change - an approach which will rely on us working with partners across Wales so that we can stimulate behaviour change across as wide a range of people and organisations as possible;
- leading by example and embedding consideration of climate change into decision making in all aspects of Assembly Government activity and this forms part of our commitment to sustainable development as a central organising principle for the Assembly Government;
- delivering increased energy efficiency in businesses, homes and the public and third sectors, making low carbon transport a reality and building the knowledge and skills to ensure that people in Wales are well placed to make the most of the opportunities from a low carbon economy;
- areas where our natural resources, land management pattern or economic structure enable us to make a major contribution to emission reduction and adaptation, for example renewable energy generation including marine energy and wind energy; and land management, agriculture and soil carbon management;
- ensuring that our approach to R&D, technology, innovation, skills and green jobs support our Climate Change Strategy and position Wales to gain maximum benefit from climate change related business and research opportunities;
- creating a framework to support effective and socially just adaptation to the impacts of climate change;
- ensuring that land use planning, spatial planning and marine spatial planning all promote sustainable development and enable the move towards a low carbon economy that takes into account the impacts of climate change.



We will also work with the UK Government to ensure that the policy framework at UK level supports our climate change objectives here in Wales.

Additional policies and programmes will be needed to meet the challenging targets that we, and the UK Government, have set and to respond to the scale and urgency of the challenge that the science shows us that we are facing. This Strategy is only the start of our long-term response to reducing emissions and adapting to the impact of climate change.



To reflect the ongoing nature of the challenge, we have confirmed areas where we know we will need to continue to put in effort to deliver reductions and the outcomes of the UK National Risk Assessment in 2012 will require us to revisit our action on adaptation.

We will regularly update the actions we are taking to tackle climate change and reflect our new proposals in an annual report to the National Assembly for Wales, as required under section 80 of the Climate Change Act 2008. We will also reflect on the progress we are making in our statutory Sustainable Development Annual Report.

How does our work on climate change link to other policy priorities?

Our Sustainable Development Scheme sets the framework within which our Climate Change Strategy operates. With sustainable development as our central organising principle, we must take an approach that involves ensuring that we are living within our share of global resources, promoting a fairer and more equal society and increasing long-term wellbeing for people and communities in Wales.

Tackling climate change by cutting greenhouse emissions and ensuring effective adaptation to the impacts of climate change has wider benefits beyond addressing the challenge of climate change. Many of the areas for action are cross-cutting and need to be integrated with other policy initiatives, for example:

- Creating a low carbon, innovative economy provides major opportunities to develop new business opportunities and create jobs and the drive to reduce energy use and subsequent emissions will often help secure cost savings and make businesses and the public sector more efficient.
- Promoting sustainable transport options like walking and cycling offer major health and environmental benefits, as well as helping to tackle traffic congestion. Also by recognising the risks posed by the impacts of climate change, for example as a result of extreme temperatures or increased flood risk, we can manage them and the consequences for health and wellbeing.
- Efforts to promote health and wellbeing need to take into account the potential damage arising from climate change, for example as a result of extreme temperatures or increased flood risk.
- By targeting our support for energy efficiency we can also reduce fuel poverty and help achieve the objectives of our Fuel Poverty Strategy. All our action on climate change must reflect the principle of social justice and promote wellbeing and avoid exacerbating poverty or inequality.
- Many of activities, for example in relation to transport, skills, green job creation and energy efficiency will also make a contribution towards delivering our Child Poverty Strategy and implementing the Communities First Programme in the short and longer term.
- Measures to reduce emissions from land can also benefit biodiversity while environmental protection measures can reduce emissions too. Adaptation also provides opportunities to bring benefits for biodiversity which in turn may also assist us in building resilience to climate change.

- The natural environment faces serious challenges from climate change, the Natural Environment Framework will set out the how we make make long term sustainable decisions on managing our ecosystems and the services we provide.

We need to make these links and ensure that our approach is not just mutually supportive but actively promotes maximum benefits across as wide a range of objectives as possible.

There will be issues where priorities will pull us in different directions but sustainable development provides us with a framework to work through these challenges.

Ensuring that the Climate Change Strategy is delivered

Governance

The Cabinet Committee on Sustainable Future and its supporting Officials Group will oversee the delivery of the Climate Change Strategy and ensure that progress is made.

The independent Climate Change Commission for Wales will provide external support and challenge to our delivery and leadership on climate change across Wales.

The Commission's current Sub Group's - Land Use and Climate Change Group, the Wales Low / Zero Carbon Hub, the Adaptation Task and Finish Group and Business and Transport Sub Group - may change over time but, regardless of the detail, the role of these arrangements will be to provide real expertise and focus in a particular area.

The Climate Change Commission will provide an annual report on progress and priorities for future action which will form part of the report that the Assembly Government lays before the National Assembly for Wales.

We have asked the UK Committee on Climate Change to review our progress and provide advice on an annual basis to inform further action.

Regular reports to National Assembly for Wales on our climate change objectives, priorities and policies, as set out in the Climate Change Act 2008, will ensure proper scrutiny of progress. The first report will be made in 2012.

A schematic reflecting the proposed governance arrangements is presented at Fig 2.

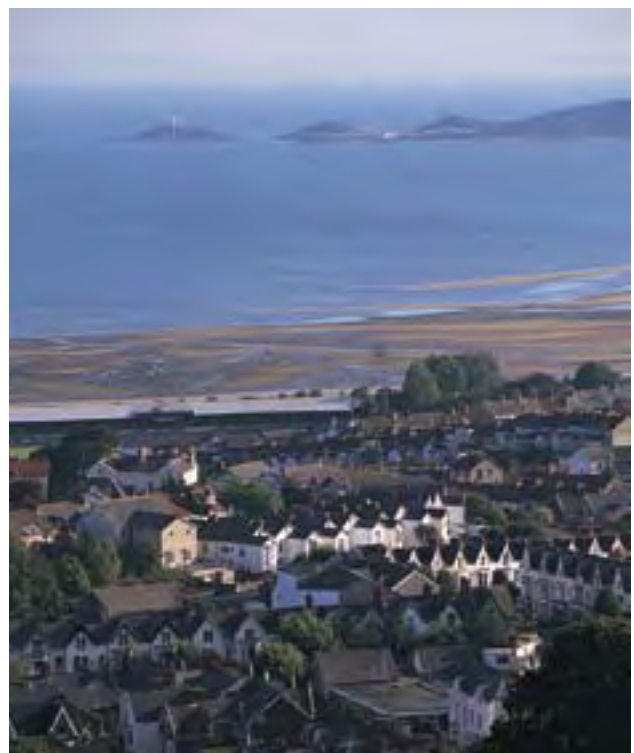
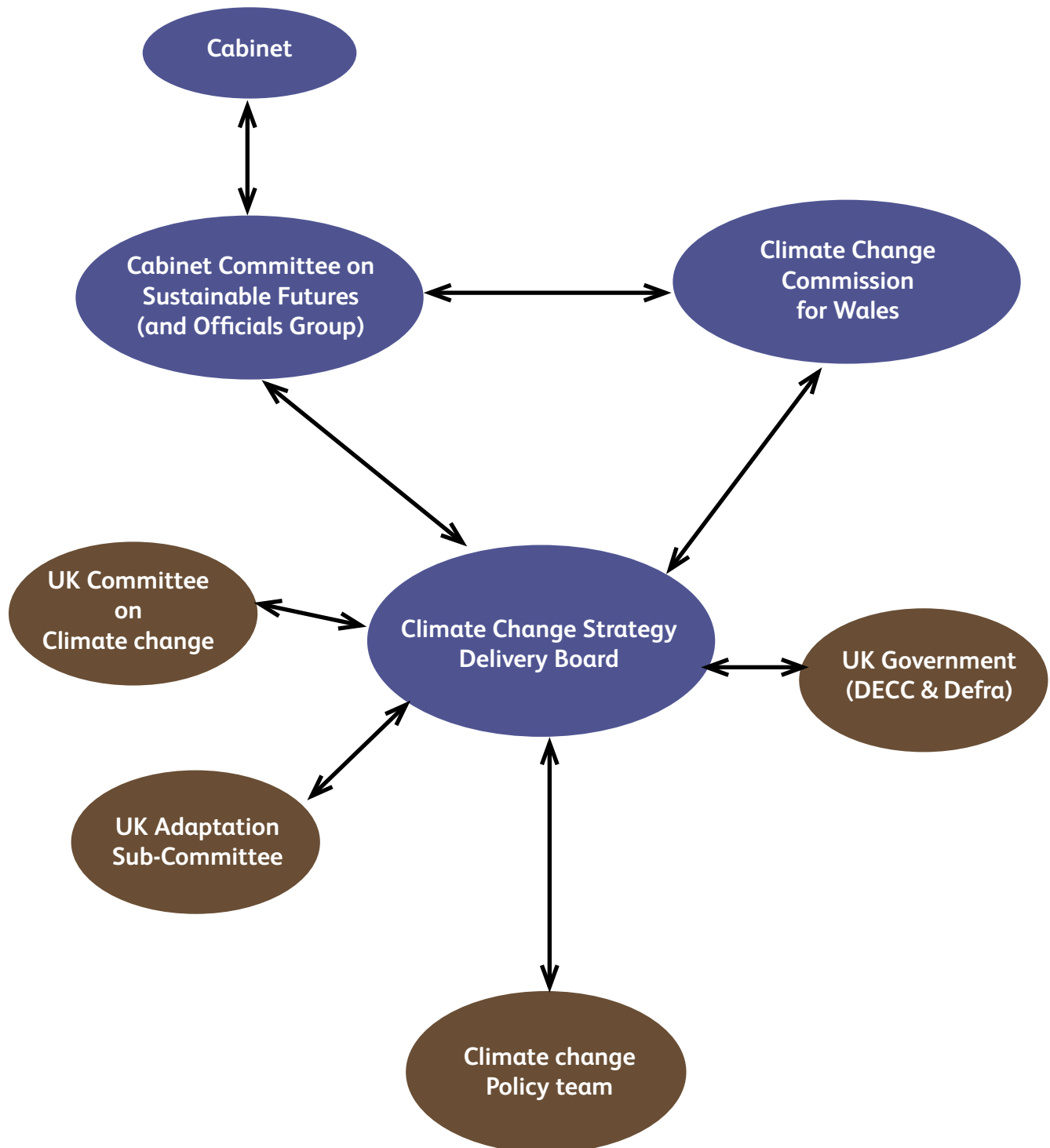


Fig 2. Proposed governance framework for implementation of the Climate Change Strategy





Reporting on progress

The Climate Change Act (2008) requires the Assembly Government to provide a report to the National Assembly for Wales on:

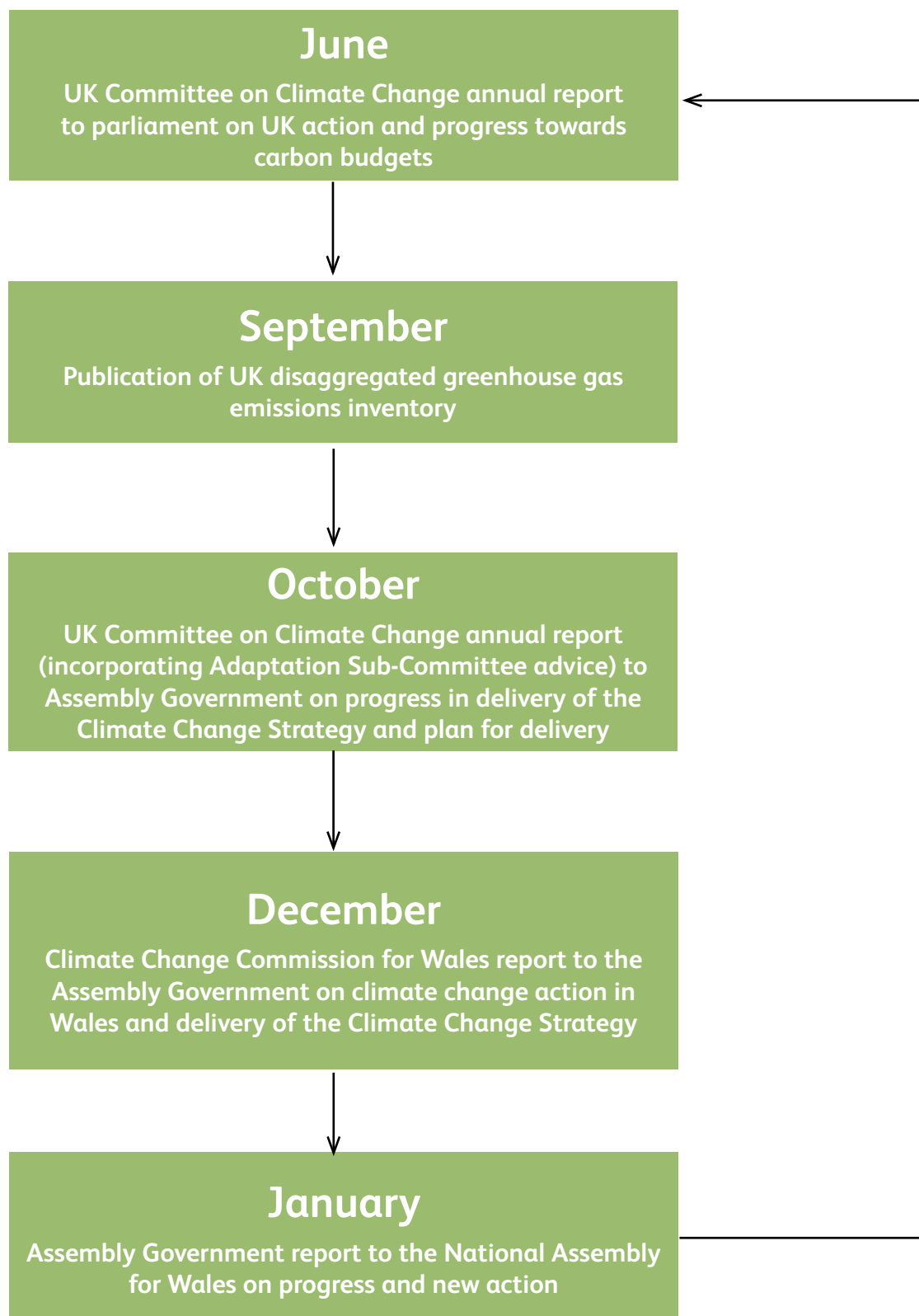
- the objectives of the Assembly Government in relation to greenhouse gas emissions and the impact of climate change in Wales;
- the action that has been taken by the Assembly Government and others to deal with emissions and climate change impacts;
- the future priorities for the Assembly Government and others for dealing with emissions and climate change impacts.

The Assembly Government will submit this Climate Change Strategy and the Delivery Plans for Emission Reduction and Adaptation as the first report to the National Assembly for Wales under these requirements.

Future reports will be submitted annually setting out progress against the Assembly Government's objectives on climate change, delivery of policies and programmes, and clarifying future priorities. Each report will take account of advice and recommendations made by the Committee on Climate Change and its Adaptation Sub-Committee, and the Climate Change Commission for Wales' annual report on progress.

The expected annual reporting cycle is presented in Fig 3.

Fig 3. Anticipated annual progress reporting cycle for the Climate Change Strategy



Chapter 5

Our targets



Summary

- Reduce greenhouse gas emissions by 3 % per year from 2011 in areas of devolved competence, against a baseline of average emissions between 2006-10
- Achieve at least a 40 % reduction in greenhouse gas emissions in Wales by 2020 against a 1990 baseline
- The 3 % target will include all 'direct' greenhouse gas emissions in Wales except those from heavy industry and power generation, but including emissions from electricity use in Wales by end-user
- We have set target ranges for sectoral emissions reduction

Annual 3% reductions

Through *One Wales* we are committed to 3 % annual reductions in greenhouse gas emissions in areas of devolved competence from 2011.

We consulted on the definition of the 3 % target as part of the Climate Change Strategy - High Level Policy Statement Consultation at the start of 2009. There was general support for our approach to definition and measurement and the approach we will take is confirmed below and in more detail in Annex A.

We are also committed to achieving at least a 40 % reduction in all emissions in Wales by 2020 on a 1990 baseline.



Defining the 3% target

What's included?

The 3 % target relates to emissions of the basket of six greenhouse gases.

The target will include all 'direct' greenhouse gas emissions in Wales except those from heavy industry and power generation, which are being broadly defined as those installations covered by the EU Emissions Trading Scheme (EU ETS).

Emissions from most large power plants are covered by the EU ETS. However, because we recognise the importance of reducing electricity consumption in order to reduce emissions, we will also be including these emissions within the 3 % target by assigning them to the end-user of the electricity. A UK-wide carbon intensiveness factor will be used to convert this electricity use into tonnes carbon dioxide equivalent (CO₂e).

This means that the direct emissions from transport, the residential sector, the public sector, waste, agriculture and land use change will be included with the scope of the emissions that we are trying to reduce through the target, along with all business and industrial emissions that are not subject to the EU ETS. In addition, the emissions resulting from electricity consumption in each sector will also be included.

We will use the disaggregated greenhouse gas inventory, which reports Wales-specific emissions, as the main data source to set the baseline and measure progress, but will supplement this with other data sources as required.

Baseline

To measure the target, we will compare the relevant emissions in each year from 2011 onwards to a baseline. This baseline will be an average of the relevant emissions between 2006 and 2010.

Beginning with 3 % in 2011, the target is to reduce greenhouse gas emissions by an additional 3 % of the baseline in each subsequent year. The baseline has been selected to ensure that it is as up to date as possible, and representative of our emissions levels at the start of the target period.

Measuring progress

Progress against the target will be assessed by a simple comparison between the level of emissions and the baseline. We will not use any complex accounting systems or include offsetting of emissions.

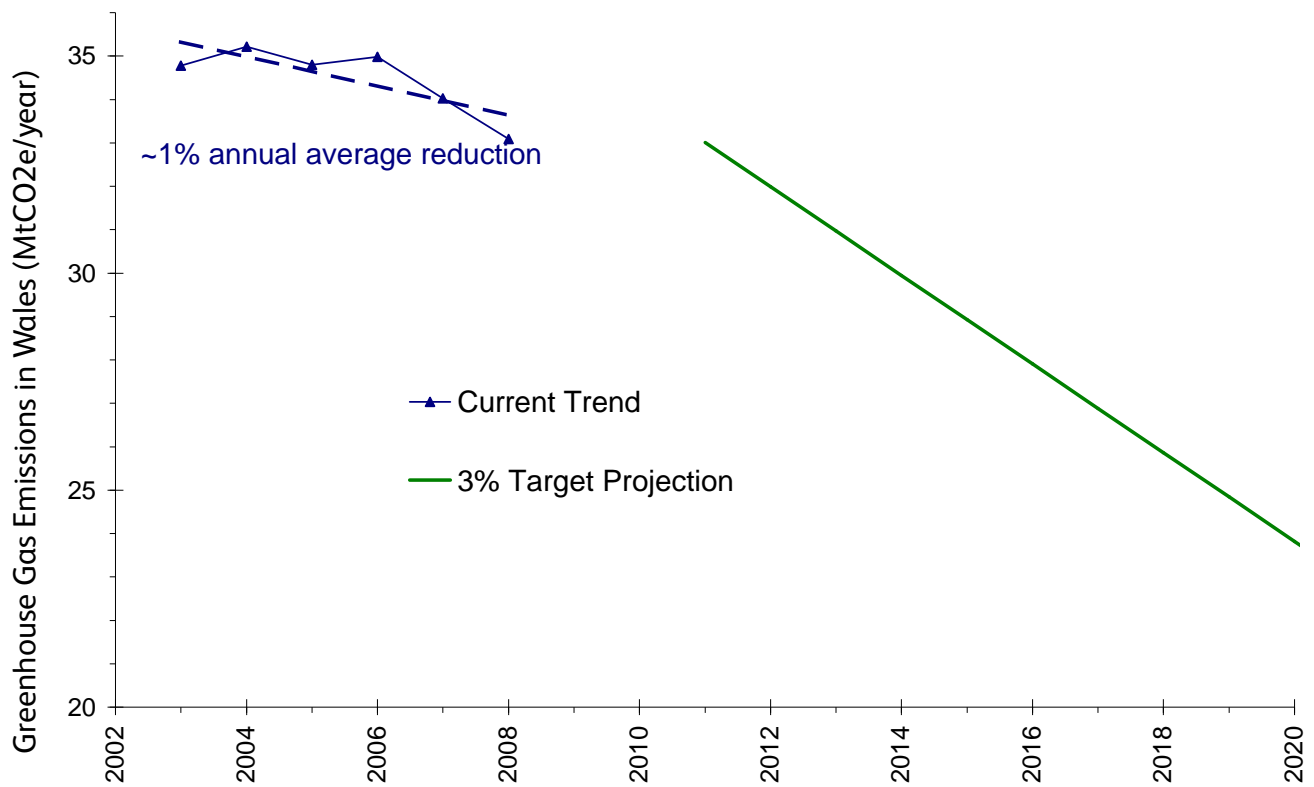
Progress will be reported annually. At present the disaggregated greenhouse gas inventory is released around 21 months after the end of the year on which it is reporting.

For this reason, the first progress report on the 3 % target able to make a direct assessment of progress using our baseline will be in 2013.

Current emission trends

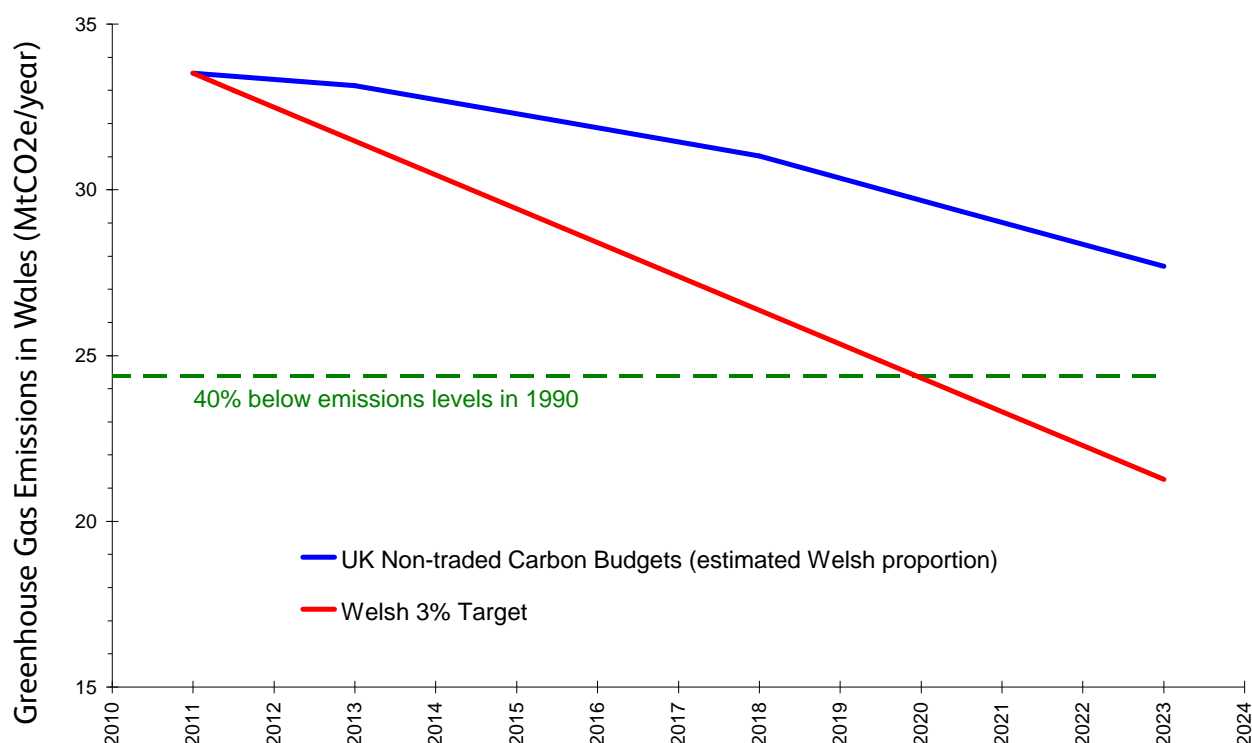
The emissions included within the 3 % target are presented below, alongside an indication of the emissions trajectory required to meet the 3 % target. Whilst the emissions presented are for the years 2003 to 2008 only the emissions for the currently available 3 % target baseline years (2006 and 2008) have been used to calculate the emissions trajectory necessary to meet the 3 % target. Until the emissions data for the entire baseline (2006-2010) is available this 3 % target projection remains an estimate:

Fig 4. Graph showing trend in baseline emissions to date and projected trend required to meet 3% target



In response to both consultations on the Climate Change Strategy, people wanted to see how our Welsh targets related to the level of ambition in UK targets and carbon budgets. The graph below illustrates the level of reduction implied by our target and UK targets. It is not a direct comparison because the UK non-traded targets do not include electricity consumption whilst ours do, also the UK targets allow for a degree of offsetting of emissions.

Fig 5: Graph showing trajectory of Welsh 3% target and estimate of the likely trajectory of the non-traded component of the UK Carbon Budget



Details of the UK Government's targets and the level of the UK Carbon Budgets is set out at Annex B.

Sector targets

We consulted on a number of sector targets as part of the *Climate Change Strategy - High Level Policy Statement Consultation* at the start of 2009. We have revised our approach in the light of the comments received, in particular to ensure that we cover all emission sectors in Wales and that we adopt a more consistent approach to definitions.

Defining the sector targets

To provide challenging targets, while at the same time retaining flexibility for each sector to identify and adopt new measures, we have decided to set target ranges for the minimum level of emission reduction we would expect to see from each sector and which we would hope to see exceeded over the period.

For the public sector's direct emissions from its buildings, a maximum emission level for 2020 has been set to reflect the Assembly Government's commitment for the public sector to lead by example in efforts to curb emissions. We will also expect the public sector to influence emission reduction much more widely through the delivery of their services, through procurement and their community leadership role and we expect the public sector to maximise this wider contribution.

The ranges reflect the maximum emissions we would want to see by 2020 in each sector.

As new measures are identified and implemented, there will be potential for the target ranges to be reduced. Future adjustments to these ranges will be reflected in the Assembly Government's annual report to the National Assembly for Wales.

Sectors covered

- Transport
- Residential
- Business (within the 3 % target as defined earlier)
- Agriculture and land use
- Public sector
- Waste sector.

Level of emissions reduction

Current and future actions will focus on reduction of emissions to defined levels by 2020 as follows:

- **Transport** emissions reduced to between 5.21 and 5.78 MtCO₂e against a baseline of 7.14 MtCO₂e.
- **Residential** emissions reduced to between 5.46 and 6.04 MtCO₂e against a baseline of 7.48 MtCO₂e.
- **Business emissions** (that fall within Wales' 3 % target) reduced to between 8.33 and 10.30 MtCO₂e against a baseline of 11.24 MtCO₂e.
- **Agriculture and land** use emissions reduced to between 4.07 and 4.97 MtCO₂e against a baseline of 5.57 MtCO₂e.

- **Waste sector** emissions reduced to between 0.64 and 0.95 MtCO₂e against a baseline of 1.30 MtCO₂e.

Direct emissions from the **Public sector** reduced to a maximum of 0.83 MtCO₂e against a baseline of 1.13 MtCO₂e. We would anticipate a greater contribution from the public sector to emission reduction in other sectors as a result of their ability to influence wider emissions as described above.

In taking forward our *One Wales* commitment to set targets for the carbon neutrality of public buildings, our focus is on making real reductions in the carbon footprint of public sector buildings in Wales rather than seeking to offset emissions. We have set a clear greenhouse gas emission reduction target for the public sector by 2020 and are developing an accurate baseline for current emissions. We will report on progress as part of our Annual Report on the Strategy.

Consumption emissions and ecological footprinting


Wales' contribution to global greenhouse gas emissions is not limited to its own geographical area.

By importing and consuming goods and services from elsewhere in the world, people and organisations in Wales are encouraging the production of greenhouse gases in other countries.

According to research commissioned by Defra, *Development of an Embedded Carbon Emissions Indicator: A research report to the Department for Environment, Food and Rural Affairs by the Stockholm Environment Institute and the University of Sydney*, taking imports, exports and international transport into account, overall CO₂ emissions associated with UK consumption of goods and services increased by nearly 115 MtCO₂e (18 %) between 1992 and 2004.

These diverging trends demonstrate the importance in looking at both production and consumption measures for a full picture of the global impact of our lifestyles here in Wales.





It is also clear from these trends that reducing Welsh emissions from production alone is not sufficient to bring down global emissions. It is important that work continues to influence the attitudes and behaviour of Welsh consumers to overcome this problem.

We will report separately on Wales' total consumption emissions in our annual progress reports on the Climate Change Strategy alongside reporting on the 3 % target using the ecological footprint, which is one of the headline indicators for the Sustainable Development Scheme.

We will also continue to report the ratio of CO₂ emissions to GVA at current prices within our overall suite of Sustainable Development (SD) indicators.

We will also continue to report on Wales' annual emissions of greenhouse gas emissions as part of our State of the Environment reporting against our suite of Environment Strategy outcomes.

Working with heavy industry and energy generators

Although the heavy industry and energy generation sector does not form part of the 3 % target, action in this area is important and we will continue to work with energy generators and energy intensive businesses to support them in reducing emissions and report progress.

There are also significant opportunities to deliver emission reduction through the supply chain.

Adaptation

Unlike emission reduction, there is no single quantitative measure for effective adaptation.

We are not setting overall targets for adaptation because adaptation is a process that involves assessing and taking action to address the risk and consequences in a specific area. Over time the risk for different sectors and organisations will change and the risks will vary from place to place.

The sector adaptation plans, which are described in more detail in the Chapter 14, will highlight specific performance indicators to measure progress in specific areas.

Once these are agreed they will be included in future annual reports on progress to the National Assembly for Wales.

In common with our approach to emission reduction, we expect the public sector to provide leadership on adaptation and the provisions of the Climate Change Act 2008 to provide a mechanism to ensure that leadership role is being fulfilled effectively.

Chapter 6

Cross-cutting themes



Summary

- Supporting behaviour change by helping people to minimise resource use and enable them to consider the risks posed by climate change
- Research and good practice: the low carbon economy is a priority research area for the Assembly Government
- Innovation and skills: helping Welsh businesses develop and innovate through our 'Economic Renewal: a new direction' programme
- Buildings: we have strengthened Wales' planning policy to reflect our commitments on climate change, and extended our powers to enable us to set ambitious standards for new build
- Energy generation: we will drive reduced energy consumption and improve energy efficiency, and maximise renewable and low carbon energy generation in Wales
- Food: take a broad view on the production, distribution and consumption of food in Wales so that we can address the associated climate change impacts

Introduction

In developing this Strategy and talking to people across Wales, it became clear that there were a number of key areas that cut across the whole climate change agenda.

Issues like behaviour change, buildings and research are crucial to underpinning action in each emission sector and in ensuring effective adaptation. Others, like energy generation, are fundamental to most emissions sectors.

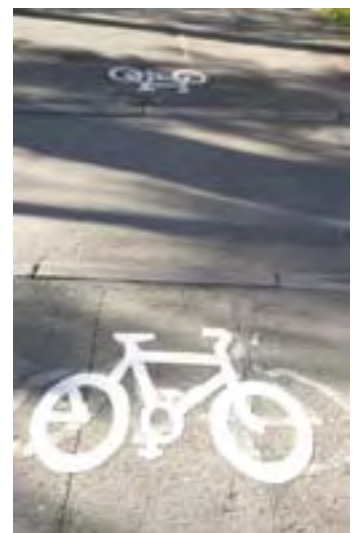
This chapter brings together these issues and summarises our approach to them. There is more detail specific to a particular topic in the relevant chapter.

Developing a comprehensive approach to behaviour change

People, communities and organisations making different, more sustainable, choices will be key to making Wales a sustainable nation and to addressing climate change in particular.

The need for a comprehensive approach to promoting behaviour change was a strong message from both consultations and from the Climate Change Commission for Wales.

A key focus will be on supporting people to minimise resource use, whether in terms of energy, water or materials, and making any resource use more efficient. It will also focus on enabling people to consider the risks posed by climate change impacts, for example increased flood risk, and what they can do to make themselves, their community or their organisation more resilient.



The Assembly Government is already supporting significant practical action in this area, but we need to bring this together and articulate why we are doing it and what is being achieved. Even more importantly, we need to connect our activity much more directly and meaningfully with the efforts of people, communities and organisations across Wales.

We recognise that we, as Government, have a critical role to play but we also recognise that we can only enable action on the scale required by working with others.

We have adopted the Exemplify, Enable, Encourage, Engage model ('4 Es Model') for our approach to behaviour change. It is an existing and credible framework and is embedded in the guidance for those organisations signing up to our Sustainable Development Charter, and in our Sustainable Development Advice Note for Community Strategies.

Our objective in adopting this approach is to **catalyse** action - that is to get people, communities and organisations to change their behaviour and make different, more sustainable and climate change friendly choices.

As outlined in the Sustainable Consumption Roundtable's report, 'I will if you will' - Towards sustainable consumption, our approach will need to broadly encompass the many of the following:

Exemplify	Engage
<ul style="list-style-type: none"> • Leading by example • Achieving consistency in policies 	<ul style="list-style-type: none"> • Community action • Co-production • Deliberative fora • Personal contacts / enthusiasts • Media campaigns / opinion formers • Use networks
Enable	Encourage
<ul style="list-style-type: none"> • Remove barriers • Give information • Provide facilities • Provide viable alternatives • Educate / train / provide skills • Provide capacity 	<ul style="list-style-type: none"> • Tax system • Expenditure - grants • Reward schemes • Recognition / social pressure - league tables • Penalties, fines and enforcement action

We will test our approach in all sectors against these headings to ensure that we have full coverage when trying to promote behaviour change.

The Assembly Government and the wider public sector will have a critical role to play in exemplifying the behaviour changes that we want to encourage.

Research and good practice

Tackling climate change will demand a response that goes beyond incremental change. For example, the Committee on Climate Change envisages the wholesale decarbonisation of electricity generation and research and development is needed to find the right technologies and to enable the behavioural changes necessary to achieve this. Adaptation will also require us to develop radical solutions to new problems, for example we are already changing the design of drainage systems in part to manage enable us to manage high intensity rainfall events better.

The Assembly Government has identified four research priorities to focus funding to get the best return on investment, and one of the four is the Low Carbon Economy (including emission reduction and adaptation issues).

We are developing our research capacity in this area and bringing expertise together across Wales.

The Low Carbon Research Institute (LCRI), which the Assembly Government has committed to fund to 2013, has four main streams of activity:

- Low carbon energy generation, storage and distribution
- Energy demand reduction including zero-carbon built environment, and work on large scale power generation
- An energy Graduate School
- Partnerships with industry, research organisations and government.

The Climate Change Consortium Wales (C3W) brings together research expertise in Aberystwyth, Bangor, Cardiff and Swansea Universities with the aim of becoming a leading research centre for the study of climate change, past, present and future. C3W research effort is focused on four main areas, three of which relate to climate change and natural systems - terrestrial, marine and cryosphere (ice) - and the fourth on the human dimensions of climate change.

We are also partners in a number of UK initiatives.

Living With Environmental Change (LWEC) brings together organisations funding, undertaking and using environmental research, including the Research Councils, government departments, devolved administrations and delivery agencies. LWEC is a ten-year programme, running from 2007 to 2017, which aims to provide decision makers with the best information to manage and protect ecosystem services in the context of climate change and a range of other pressures.

The UK Climate Change Risk Assessment (CCRA), which is a requirement of the Climate Change Act 2008, takes the data that we have about the likely changes in the UK's climate to provide information about what this means and how we should best respond. The first CCRA and associated Adaptation Economic Analysis will be completed by January 2012 and will be updated every five years.

More generally there are examples of good practice from all sectors which we want to disseminate and see replicated elsewhere. Cynnal Cymru are the hub for communities to share good practice in putting sustainable development into action. Carbon Trust and Business in the Community both bring together examples of good practice in the business sector. The Local Service Board

Innovation Networks are bringing together good practice in action on climate change and wider sustainable development across the public sector.

Innovation and skills

Business innovation and the deployment of new technologies will be crucial in ensuring an effective response to climate change and it offers real opportunities for business creation and growth.

Through the 'Economic Renewal: a new direction' we are providing the right environment in which Welsh business can develop and innovate.

There are specific programmes in place to support innovation including Innovation Vouchers which enable businesses to access external expertise from the private sector or Universities and Colleges.

We are also working to ensure that people have access to the right training, skills and accreditation required to prosper in a low carbon, well adapted economy.



Buildings

The built environment is important in relation to reducing emissions in the business, residential and public sectors and enabling effective adaptation to the impacts of climate change. Buildings, and energy use in buildings, are responsible for over 60 % of the emissions covered by the 3 % target.

The existing stock of buildings in Wales is our greatest challenge because most of these buildings will still be with us in 15, 20 and even 50 years time and they have not been designed to either minimise their carbon footprint or to maximise their resilience to the impacts of climate change. Encouraging people to make improvements that enhance both these aspects will remain a key priority within our overall approach to climate change.

Land use planning has a critical role to play in ensuring that, for the future, we have low carbon developments that are built in sustainable locations and are resilient to climate change. The recently strengthened planning policy in relation to climate change emphasises the priority the Assembly Government places on tackling climate change and the need for the planning decisions to reflect this. These national planning policies are being reflected in Local Development Plans (LDPs) and will be reflected in the development control decisions made in the context of the LDPs. Other changes include Technical Advice Note 6 on Sustainable Rural Communities which enables low impact development.

With the full devolution of Building Regulations from 2012, the Assembly Government will be able to set ambitious standards for new build in Wales and a comprehensive programme to gather the evidence to inform any changes to the legislation and support the construction industry in adopting these new standards is underway. There will also be opportunities to encourage improvements for the existing stock by requiring consequential improvements in energy performance or the resilience of a building to climate change impacts when dealing with applications for extensions and other work.

Energy generation

Although energy generation is not included in the 3 % target, we have included energy consumption by end-user. This means that promoting low carbon energy generation has an important role in meeting the 3 % target, and achievements in this area will be taken into account in the annual progress report to the National Assembly for Wales. Maximising the amount of renewable energy produced in Wales will also make a significant contribution to delivering a 40 % reduction in total emissions by 2020 and towards the UK Carbon Budgets.

Low Carbon Revolution - Wales' Energy Policy Statement, published in 2010, sets out the Assembly Government's ambitions for low carbon electricity in Wales. It explains our aim to renewably generate up to twice as much electricity annually by 2025 as we generate today and by 2050, at the latest, be in a position where almost all of our local energy needs can be met by low carbon electricity production.

Our approach will be to reduce energy consumption and improve energy efficiency first and maximise renewable and low carbon energy generation at small and large scale across Wales. This will include a major role for marine renewable technology.

Food

Food, and its contribution to emissions, (when they are considered on a consumption basis), was a major theme of the response to both consultations on the Strategy.

Reducing emission from food is one of the more complex areas of emission reduction and the approach taken - for example whether to focus on direct emissions or to look at the impacts of the wider food chain and potential displacement of emissions - could produce radically different policies although it will be important to seek convergence of measures. It is important to recognise the wider context of the need for greater resource efficiency encompassing farm systems, reduction of food waste and diet (human and animals) to meet the challenge of increasing global population, climate change impacts on food production, and competition for land use from biofuels.



Food is a significant component of Wales' ecological footprint and, as a result, we take a broad view of food and its climate change impact. This means understanding, and addressing, the emissions embedded throughout the food chain and not simply concentrating on emissions

from food production here in Wales. It also means that we recognise the need to consider the health and wellbeing implications and economic impact of food consumption and production in making decisions.

The Agriculture and Land Use chapter provides more detail on what we are doing to address direct emissions from agriculture in Wales.

Tools to embed consideration of climate change in what we do

We have adopted the '4 Es model' for behaviour change, which is described in more detail in Chapter 6. There is more detail on this approach in chapter 6 but a critical component is that the Assembly Government is able to 'exemplify' the behaviours it wants others to adopt.

To enable us to do this we need to embed consideration of climate change into all the Assembly Government's policies and processes.

This will include:

- Baseline carbon assessment and reporting:
 - We will establish clear, consistent information about baseline emissions in the public sector and report on progress regularly in a way that minimises the burden on those responsible.
 - We will link to existing reporting such as the Sustainable Development Commission's Environment and Sustainability in Government.
- Climate change assessment tools - carbon and climate impacts:
 - We will identify and disseminate standard tools and guidance to enable assessment of the carbon impact of policies and programmes and an assessment of implications of the impact of climate change.
 - mainstreaming the use of these tools into policy and programme development process.
- Budget and funding:
 - We will embed an assessment of climate change impacts into decision making process for projects and funding through use of assessment tools at key points in decision-making process.
 - We will develop and implement appropriate conditions to promote action on climate change as part of grant or capital funding as part of our wider Sustainable development approach.



Chapter 7

Reducing greenhouse gas emissions



Delivery of a 3 % reduction in greenhouse gases on an annual basis is a major challenge. The Climate Change Strategy for Wales confirms where we will focus our action and how this will be complemented by actions taken by people, communities and organisations across Wales. We will need to keep our actions under review and look for opportunities to stimulate further emission reductions through changes to existing policies or programmes or the development of new ones.

Broad areas where we will act to reduce emissions within Wales:

- encouraging organisations in Wales to make **sustainable development their central organising principle** through signing up to our Sustainable Development Charter
- reducing **energy and resource consumption** and increasing **energy and resource efficiency** in the domestic, public, business and industrial sectors, through behaviour change initiatives, financial incentives, regulation and standards
- supporting a **clear framework to encourage behaviour change** where we will enable locally tailored approaches and work with partners best placed to influence people
- encouraging **smaller scale low carbon energy generation**, for example by increasing awareness of the options; driving demand through public sector investment and supporting businesses in all parts of the supply chain; providing the right skills training and accreditation, and ensuring that there is an enabling planning regime
- providing the right environment to encourage low carbon and resource efficient **business growth** and **innovation**
- working with private and public sector partners to enable the development of **larger scale renewable energy generation**
- supporting **transport investment** which encourages a **shift to low carbon modes** of transport such as walking and cycling, promotes the use of public transport, and provides advice and support that encourages more sustainable choices
- **policies and actions on waste and resource efficiency** that reduce direct and embedded emissions and energy demand
- a **land use planning system** that enables low carbon development and responds to climate change impacts
- seeking to **influence UK** decisions where they are relevant to emission reduction in Wales
- recognising that different parts of Wales have different challenges and contributions to make and using the **Wales Spatial Plan** and the **Low Carbon Regions** work to drive regional responses across Wales
- policies and actions on **land management and agriculture** to maximise carbon sequestration, reduce loss of carbon in soils and cut other emissions from the agriculture sector.



Quantifying the level of emission reduction

The Delivery Plan for Emission Reduction indicates the likely emission reductions from existing and committed policies and programmes, including the expected contribution from UK and EU policies and programmes. In some cases this is difficult to estimate because the precise size of programme is not yet clear or because the activity provides underpinning support to tackling climate change rather than direct emission reduction.

We will need to keep delivery under close review so that we can take action if it appears that some policies are not achieving the emission reductions that we had anticipated.

More information about the methodology we adopted to analyse potential emission reduction from policies and programme is set out in the Delivery Plan. It also sets out, where possible, the projected timing of implementation for the measures.

We will continue to work to refine our analysis and each annual report to the National Assembly for Wales will provide an update of our estimates of the level of emission reduction policies and programmes will deliver.



Chapter 8

Transport sector emission reduction



Summary

Our actions to reduce emissions in the transport sector include:

- Developing Sustainable Travel Centres, and supporting Smarter Choices
- Promoting eco-driving, walking and cycling
- Investing in bus and rail services, and improving traffic management
- Promoting the infrastructure for electric and hydrogen vehicles

Emission trends in the sector

The transport sector is responsible for approximately a fifth of the emissions covered by the 3 % target.

The long-term trend in this sector has been one of increasing emissions, reflecting the underlying increase in the demand for travel.

Reducing emissions in the sector

There is no single solution for reducing emissions in the transport sector. The approach set out in this chapter recognises the importance of a range of measures to reduce the carbon intensity of transport and secure behaviour change. This includes the development of Sustainable Travel Centres, increased use of public transport, enhanced provision for walking and cycling,



personalised travel planning and the promotion of eco-driving and improved traffic management.

In the longer term, the development of low carbon technologies will have a key part to play in the decarbonisation of transport, although we will need to maintain our focus on behaviour change. One of the most important influences on transport demand is the price of fuel, which is determined at a global level but influenced by the UK Government's fiscal policies.

Many of our planned transport measures will also bring other benefits, for example, increased walking and cycling will help to secure both environmental and health benefits.

Emission reduction action in transport has a strong spatial dimension. We will ensure that policies and programmes recognise and are designed to address the differing needs and opportunities in different parts of Wales and in rural and urban areas.

The Committee on Climate Change's key areas for action on transport include:

- Ensuring that we meet EU targets for improving CO₂ efficiency of new cars.

- Ensuring that there is widespread roll-out of electric cars and plug-in hybrid vehicles across the UK by the early 2020s by providing the right financial support and required charging infrastructure.
- Ensuring that the Smarter Choices programme is rolled-out across the country to ensure that more people use public transport and plan their journeys more effectively in order to reduce emissions.
- Developing an integrated planning and transport strategy which can manage the impacts of transport emissions from new developments.



The Assembly Government's main levers to influence emissions from transport relate to infrastructure and service provision, actions to support behaviour change and land use planning. We are working to support technology research, development and deployment, building on academic and commercial strengths in this area. There is also scope to shape wider public sector service delivery in way that helps to reduce emissions.

UK and EU policies and programmes, including on vehicle and fuel standards and fiscal measures, will play a significant role in driving emission reduction in this sector. We will continue to work closely with the UK Government to influence developments in this area.

There is a major role for individuals, organisations and the public sector in making, or encouraging, more sustainable travel choices.

Action in all these areas needs to come together to deliver sustained emission reduction in transport.

Assembly Government approach



The Wales Transport Strategy *One Wales: Connecting the Nation* was published in May 2008. The Strategy recognises the need to develop a balanced approach so that transport plays its full part in tackling climate change while it continues to support economic development and social cohesion. One of the strategic priorities identified in the Strategy is the need to reduce greenhouse gas emissions.

The Wales Transport Strategy provided the framework for the development of the National Transport Plan, which was published in March 2010. The National Transport Plan sets out, for the first time, the full range of measures that we will be undertaking to develop a better integrated and sustainable transport network in Wales.

It brings together our plans for the road and rail networks, adding and integrating public and community transport, walking and cycling. The Plan also seeks to ensure that people are able

to make better and more sustainable transport choices, by supporting the provision of the information that they need to change their behaviour and to plan their journeys. The overall aim is to ensure that the transport network works efficiently and effectively, whilst minimising its impact on the environment.

Our strong focus on encouraging behavioural change in transport also includes support for eco driving (that is driving in a safe and fuel-efficient way) and encouraging smarter purchasing choices so that people buy more fuel-efficient vehicles.



The National Transport Plan sits alongside the Regional Transport Plans which detail the action being taken by the four Regional Transport Consortia and their constituent local authorities to tackle transport issues at the regional and local level.

The enhanced arrangements for transport planning will strengthen the vital links between transport functions and other local government services, such as education, planning, health, leisure and environmental services.

Key areas for action

The specific actions for transport sector emission reduction are set out in our accompanying Delivery Plan.

The focus of Assembly Government action will be:

- Development of the Sustainable Travel Centres.
- Supporting behaviour change and placing greater emphasis on Smarter Choices. This includes better transport planning, the provision of personalised travel information and the development of strategic modal interchanges.
- Promotion of eco-driving.
- Promotion and support for walking and cycling.
- Investment in bus and rail services.
- Improved traffic management on the strategic road network, including average speed cameras and variable speed limits.
- Active promotion of infrastructure for electric and hydrogen vehicles.
- Supporting the freight industry to reduce emissions.
- Ensuring that land use planning decisions are informed by the need to reduce travel.

Where is more work needed?

Our long-term vision is for a fully decarbonised transport network. This will undoubtedly involve significant changes in the way we travel, as well as major developments in vehicle engine and fuel technology. It will be a significant challenge to secure a reduction in the demand for travel

and there are very considerable uncertainties about the rate of development and the cost of low carbon transport technologies.

We will continue to work to develop appropriate policies and programmes to address these long-term issues. We will also continue to work closely with both the UK Government and the European Commission, who control many of the policy levers that will impact on transport-related emissions in the longer term (for example, engine and fuel standards and fiscal policy).

Behaviour change

Encouraging behaviour change is critical to success in reducing emissions from transport and is a major focus of our approach.

Key actions will include:

- **Exemplify:** The Assembly Government has committed to an overall reduction in emissions in its Green Dragon Objectives and Targets including a 10 % reduction from its administrative estate and travel during 2010 as part of the 10:10 campaign.
- **Enable:** Enhanced provision for walking and cycling as well as public transport. Continuing support for eco-driving programmes for individuals.
- **Engage:** Targeted communication and engagement programmes to encourage lower carbon practices as part of the roll-out of Sustainable Travel Centres.
- **Encourage:** The UK Government will use fiscal policy to influence fuel prices.

Vision by 2020

By 2020 we expect to see:

- More people walking and cycling.
- More people car-sharing.
- More people using public transport.
- The number of vehicle kilometres travelled per year has reduced.
- A much greater proportion of electric, hybrid and plug-in hybrid and other alternative fuelled vehicles on the road in Wales.
- A significant improvement in the efficiency of vehicles powered by internal combustion engines.
- Hydrogen vehicles starting to become commercially available.
- Sustainable transport options informing location choices and design of developments.
- When making travel plans, the carbon impact of different modes of transport forms part of people's decision-making process.
- When buying a new vehicle, the vehicle's emissions are a key factor in purchase choice.



Chapter 9

Business sector emission reduction



Summary

Our actions to reduce emissions in the business sector include:

- Enhancing support for businesses, including SMEs
- Supporting R&D, skills and business development to ensure Wales can benefit from the opportunities of a new green economy
- Better sharing of good practice across businesses
- Ensuring that resource use is minimised and that wastes are regarded as a resource for use
- Ensuring that the planning system enables low carbon development

Emission trends in the sector

The business sector (not including direct emissions from heavy industry and energy generation) is responsible for approximately a third of the emissions covered by the 3 % target.

Emissions in the business sector have shown some variability in recent years although less than if the direct emissions from heavy industry and energy generation were also included.

Reducing emissions in the sector

The diverse nature of business and industry emissions means that there is no single solution for reducing emissions. The approach set out in this chapter recognises the importance of a range of measures to reduce the carbon intensity of the business sector through the processes, the products, and the premises in which the business operates.

Many of these actions will also bring other benefits for businesses for example in enabling them to cut costs, manage risks associated with compliance with new legislation and ensuring security of energy supply.

The Committee on Climate Change's key areas for action in the business sector include:

- Increased support for business, particularly SMEs to reduce emissions.
- Improving energy efficiency.
- Using efficient machinery, lights and appliances.
- Changing behaviour.
- Using more energy from renewable sources.
- Decarbonising electricity supply.



The Assembly Government's main levers to influence emissions from business relate to direct business support and actions enable the right environment in which businesses can grow and develop, actions to support behaviour change and the role of land use, spatial and marine spatial planning. The Assembly Government and wider public sector can also influence emission reduction in business through the purchasing power of public sector procurement.

There is scope for Wales to seize economic advantage from technology research, development and deployment, building on academic and commercial strengths in this area.

UK and EU policies and programmes, including major regulatory regimes and fiscal measures, will play a significant role in driving emission reduction in this sector. We will work closely with the UK Government to influence developments in this area.

There is also a major role for businesses themselves to take a lead in reducing their emissions - as many are doing already - and a key role for consumers to drive business to consider their climate change impact and provide a market for low carbon goods and services.

Action in all these areas needs to come together to deliver sustained emission reduction from businesses.

Assembly Government approach

'Economic Renewal: a new direction' has established a renewed approach to economic development in Wales and ensures that we are:

- better able to meet the needs of businesses
- encourage a stronger and more sustainable economy
- increase the prosperity and long-term well-being of the people of Wales.



Sustainable development is the key principle underpinning this work and tackling climate change will be one of the key objectives.

The Green Jobs Strategy forms part of a much broader range of measures designed to create a sustainable economy built on the firm foundations of sustainable businesses, sustainable technologies and sustainable employment.

These will make an important contribution to the way in which Wales deals with the current situation and places itself in a robust position to take advantage of future opportunities.

The Green Jobs Strategy will play a key part in shaping and driving the business opportunities associated with a move to a low carbon, low waste economy.

Energy generation, consumption and efficiency are also critical to reducing business sector emissions. *A Low Carbon Revolution: The Welsh Assembly Government Energy Policy Statement* and the *National Energy Efficiency and Saving Plan*, both One Wales commitments set out how the Assembly Government intends to support low carbon energy generation and increased efficiency.

Key areas for action

The specific actions for business sector emission reduction are set out in our accompanying delivery plan.

The focus of Assembly Government action will be:

- Skills for a low carbon economy.
- Low carbon and resilient business.
- Enhanced support for business emission reduction including SMEs.
- More effective use of waste heat and energy efficiency opportunities.
- Supporting energy intensive industries to reduce their emissions.
- Supporting R&D, skills and business development to ensure that Wales takes the opportunities of the new green economy.
- Better sharing of best practice across businesses and sectors.
- Setting the highest standards for new build.
- Ensuring that resource use is minimised and that wastes are regarded a resource for use rather than disposal.
- Ensuring that the land use planning system enables low carbon development and adaptation to the impacts of climate change.
- Ensuring that the land-based and marine spatial planning system promotes sustainable development and enables a move to a low carbon economy.



Where is more work needed?

There are a number of areas where we recognise that we will need to achieve emission reductions in future but where doing so is challenging, either because they are longer term changes which require a complex set of responses to achieve or because more research or development is needed before the right action can be taken because the measures required are particularly difficult, for example they are expensive or lack buy-in.

The Business Task and Finish Group of the Climate change Commission identified a number of areas for further action these include ensuring that there is a supportive financial regime for investment in environmentally beneficial investments.

Behaviour change

Encouraging behaviour change is critical to success in reduced emissions from business and is a major focus of our approach.

Key actions will include:

- **Exemplify:** The Assembly Government has committed to an overall reduction in emissions in its Green Dragon Objectives and Targets including a 10 % reduction from its administrative estate and travel during 2010 as part of the 10:10 campaign.
- **Enable:** rollout of comprehensive environmental and sustainability support for business. Increased emphasis from Carbon Trust and Energy Saving Trust on the needs of SME and sector specific support for example resources for tourism businesses and, through Farming Connect, advice and support for farmers and land managers. Support for ICT development and home working to enable different working patterns.
- **Engage:** We will support the development of a workplace campaign in collaboration with businesses and the trade unions. We will also support sectoral campaigns - working with particular sectoral interests, for example the tourism industry.
- **Encourage:** we will support the Carbon Trust's loan programme for SMEs. Support sector-specific incentives including a proposal for the Sustainable Tourism Transport Challenge Wales.

Vision by 2020

By 2020 we expect to see:

- Businesses have reduced energy costs and emissions.
- Employees actively engaged in reducing emissions from their workplaces.
- Consumers demanding low carbon goods and services and concerned about sustainability performance of businesses.
- Growth of social enterprises and community businesses providing low carbon goods and services locally.
- More businesses operating, and people employed, in businesses that provide low carbon goods and services.



Chapter 10

Residential sector emission reduction



Summary

Our actions to reduce emissions in the residential sector include:

- Encouraging installation of cost-effective energy efficiency measures in all households and adopting a 'whole house' approach
- Developing an area-based approach to domestic energy efficiency
- Targeting investment at those vulnerable to fuel poverty, and supporting community scale energy generation
- Ensuring that land use planning decisions are informed by the need to minimise emissions

Emission trends in the sector

The residential sector is responsible for approximately a fifth of the emissions covered by the 3 % target.

Excluding electricity consumption, the trend in this sector since 1998 is one of decreasing emissions.

Reducing emissions in the sector

The key actions in this sector will be to support activity that will help reduce energy consumption and improve energy efficiency, supported by action to promote low carbon, and local energy generation. Although we are setting high standards for new build, with only 0.6 % of the housing stock in Wales being replaced with new-build every year, it makes a focus on existing stock essential.

Many of these actions will also bring other benefits for example in enabling people to cut their energy bills and even generate income from renewable energy production.



The UK Committee on Climate Change's key areas for action in the residential sector include:

- Improving energy efficiency and adopting a 'whole house' approach.
- Using efficient lights and appliances.
- Changing behaviour (for example turning off lights and appliances).
- Using more energy from renewable sources.
- Decarbonising electricity and heat supply.

The Assembly Government's main levers to influence emissions from the residential sector relate to our investment in energy efficiency and housing, actions to support behaviour change and the role of land use planning.

There is also scope for Wales to seize economic advantage from the manufacture, installation and maintenance of energy efficiency and low carbon energy products and services.

UK and EU policies and programmes, including major regulatory regimes and fiscal measures, will play a significant role in driving emission reduction in this sector. We will work closely with the UK Government to influence developments in this area.

There is also a major role for individuals and communities themselves to take a lead in reducing their emissions - as many are doing already.

Action in all these areas needs to come together to deliver sustained emission reduction in the residential sector.

Assembly Government approach

The National Housing Strategy *Improving Lives and Communities: Homes in Wales* sets out the Welsh Assembly Government's long term vision for housing in Wales. It highlights the need to radically reduce the ecological footprint of housing in Wales and ensure that tackling climate change is built in through:

- Improving the energy performance of existing homes.
- Improving energy performance in the construction of new homes.
- Locating and designing new homes to address climate change impacts.

The *Improving Lives and Communities: Homes in Wales* is closely linked to the National Energy Efficiency and Savings Plan. The National Energy Efficiency and Savings Plan has two key objectives:

- To help reduce Wales' greenhouse gas emissions and contribute to the reduction of its wider ecological footprint.
- To support economic development by helping businesses become more energy efficient and providing new opportunities for business.

The National Energy Efficiency and Saving Plan proposes immediate, practical actions to help all householders across Wales reduce energy use and outlines approaches to help those most in need cut their fuel bills and maximise their income. It also seeks to help communities work together to take action, recognising that community scale action can make energy saving or generation more cost effective.

As outlined in chapter 1, we are absolutely committed to a socially just response to climate change. This means that we must address the impact of rising energy prices, driven, in part by measures required to reduce emissions. Our Fuel Poverty Strategy sets out the practical actions we are taking to eradicate fuel poverty as far as reasonably practicable.

The Communities First Vision Framework provides the thematic basis for the fundable activities of Communities First Partnerships and includes the themes of: Environment; Child Poverty; Community Safety; Health and Wellbeing; Jobs, Business and Income Generation; and Education, Training and Skills. A range of activities that can help contribute to emission reduction, and drive local job creation and other benefits,⁴⁷ are being progressed under these themes.



We will build upon these Plans with further actions to reduce household emissions as this Strategy continues to develop and evolve over the coming months and years.

The UK Government's Green Deal is intended to provide policies and programmes to help reduce emission from heat and energy use across the UK. These policies will be important in helping reduce emissions from homes in Wales.

Key areas for action

The specific actions for residential sector emission reduction are set out in our accompanying delivery plan.

The focus of Assembly Government action will be:

- Encouraging installation of cost effective energy efficiency measures in all households and encouraging water efficiency.
- Adopting a 'whole house' approach to energy efficiency measures.
- Developing an area based approach to domestic energy efficiency.
- Supporting communities and individuals in reducing emissions, through behaviour change programmes that are locally delivered and tailored to their needs.
- Targeting Assembly Government investment at those vulnerable to fuel poverty, leveraging as much funding as possible from other sources and finding other approaches to finance measures in 'able to pay' households.
- Supporting community scale energy generation.
- Setting the highest standards for new build.
- Ensuring that land use planning decisions were informed by the need to minimise emissions.



Where is more work needed?

There are a number of areas where we recognise that we will need to achieve emission reductions in future but where doing so is challenging, either because they are longer term changes which require a complex set of responses to achieve or because more research or development is needed before the right action can be taken because the measures required are particularly difficult, for example they are expensive or lack buy-in.

There are a number of areas like this in relation to the residential sector and where we will continue to work to develop appropriate policies and programmes to address them in the future. These include things like financing the scale of investment in energy efficiency measures required to bring all homes in Wales up to good energy performance rating and persuading people to take up these measures and maintain sustainable energy behaviours over time.

Behaviour change

Encouraging behaviour change is critical to success in reduced emissions from homes and is a major focus of our approach.

Key actions will include:

- **Exemplify:** The Assembly Government has committed to an overall reduction in emissions in its Green Dragon Objectives and Targets including a 10 % reduction from its administrative estate and travel during 2010 as part of the 10:10 campaign.
- **Enable:** Energy Saving Trust advice to encompass transport and water saving, pilots for more intensive, paid-for support service and support for a small team of climate change development advisers able to support community action, enhanced information and resources online and in other formats, better coordination of support available already and practitioners' network set up and supported.
- **Engage:** We will progress communication campaigns on climate change working with partners and ensure Wales gets the most from the new Smart Meter rollout.
- **Encourage:** We will develop a programme to secure maximum benefits from programmes arising from energy supplier and generator obligations and ensure that Assembly Government funding for energy efficiency is targeted on those in fuel poverty and supports low carbon measures. We will develop and secure alternative funding sources to deliver a financing package to support loans for energy efficiency and microgeneration measures in 'able to pay' households.

Vision by 2020

By 2020 we expect to see:

- Households across Wales have reduced energy costs and emissions .
- Fuel poverty has been eradicated as far as reasonably practicable.
- People understand their energy and water use, how they can reduce it and taken all the simple steps to do so.
- The energy performance of homes across Wales has improved.
- Low carbon energy generation at micro and community scale is commonplace and appropriate the needs of the particular home or community.

Chapter 11

Agriculture and land use sector emission reduction



Summary

Our actions to reduce emissions in the agriculture and land use sector include:

- Agriculture and land management schemes targeted at reducing greenhouse gas emissions
- Additional woodland creation

Emission trends in the sector

The agriculture and land use sector is responsible for some 10 % of Wales' total emissions but accounts for approximately a fifth of the emissions covered by the Assembly 3 % target.

Of, this, the vast majority (94 %) come from nitrous oxide and methane from fertiliser and manure use, soil processes and ruminant emissions. At a Welsh level agriculture, forestry and land-use was responsible for 48 % of non-CO₂ emissions in 2008.

The trend in this sector since 1990 is one of decreasing emissions, mainly due to reduced livestock numbers and improvements in farm practices. Comparison of emissions trends for Welsh agriculture shows there has already been a reduction of emissions by 23 % for 2008 compared with 1990.

In addition to the above there is a contribution to emissions from cultivation and conversion between different land uses. This relates to the emissions and sinks from biomass and soils of different types. Currently, the land use, land use change and forestry sector is a net sink.

It is important that Wales' historical carbon sinks are retained because it is estimated that Welsh peat soils contain around 400 Mt of carbon. In addition, the agriculture and land use sector has the potential to reduce emissions in other sectors by providing low-carbon energy sources through forest biomass, biomass crops and biogas. Forest biomass can also yield low energy materials in the form of solid timber for substitution of materials. It is important to look at the overall benefits because biomass production may require land use change, which would have an additional impact on emissions.

The calculated emissions included within the 3 % target for the agriculture and land-use sector are presented below, alongside an indication of the emissions trajectory required to meet the 3 % target:

If emission from the food chain from field to plate are considered, this would increase the impact further to about 20 % of total emissions. However since most Welsh produced food is exported and most food eaten in Wales is imported and distributed through the supermarket system, there is little integration and association between the two at present.



Reducing emissions in the sector

Compared to most other sectors we know less about effective interventions to reduce emissions in agriculture and land use. This is partly because the bulk of emissions are from greenhouse gases other than carbon dioxide and emissions occur as a result of processes in natural systems which are very complex and less predictable.

The UK Committee on Climate Change will be looking at agriculture and land use emissions in a separate report in 2010 in order to provide advice to the UK Government and devolved administrations on emission reduction in the land use sector.



The Minister for Rural Affairs established the Land Use and Climate Change Group to provide specific advice on emission reduction in agriculture. The report outlines five possible future scenarios based on possible Welsh and international initiatives, which are not necessarily mutually incompatible; with the Land Use and Climate Change group identifying one, in particular, as offering a set of viable options leading to significant cuts in emissions.

The Assembly Government has significant levers in this sector, although many of these operate within an EU framework, for example payments to farmers under the Common Agricultural Policy (CAP) and the wider Rural Development Plan and regulatory requirements.

The Assembly Government is also active on skills and knowledge development, communication and behaviour change and research and development in this sector. In addition the Assembly Government owns a significant public forest estate around 11 % of the land mass of Wales which acts a net sink as well as providing fossil fuel substitution benefits through woodfuel and solid timber as a material.



There is also a major role for agriculture businesses themselves to take a lead in reducing their emissions - as many are doing already - and a key role for consumers to drive business to consider their climate change impact and provide a market for low carbon food choices.

Action in all these areas needs to come together to deliver sustained emission reduction in the agriculture and land use sector.

Assembly Government approach: Agriculture and land management strategy

Early in 2010, the Land Use and Climate Change Group produced its report which assessed the science relating to emissions from the agriculture, land use and food sectors in Wales. The report also outlined a way forward for these sectors to achieve significant reductions in greenhouse gas emissions by 2040.

The report contains forty-nine recommendations, but its central theme is to recognise the importance of grassland-based farming systems to the range of ecosystem services (including food and fibre production) in Wales. The report also emphasise the need for Wales to contribute fully to the production of food to meet global challenges of food security, and importantly not to displace the GHG emissions associated with food production to other countries.

The report outlines five possible scenarios, with the Land Use and Climate Change Group identifying one in particular as being a viable option. This option involves:

- Increased technical efficiency of livestock farming (including increases in feed conversion rates, longevity of breeding livestock, and lambing percentages; and more effective use of manure and fertiliser coupled with anaerobic digestion to produce biogas which can be used for energy production and on-farm).
- Methane capture from housed dairy and associated beef herds with systems based on zero-grazing.
- Expansion of woodland in Wales by increasing the average planting rate from about 500 ha to 5,000 ha per annum maintained over 20 years. This will expand the carbon sink and so off-set emissions. Secondary benefits will be obtained if carbon is locked in wood products (e.g. increased use of wood for buildings substituting for more energy intensive materials such as steel and concrete).
- Expansion of renewable energy production on farms - including small scale wind, hydro, solar, biomass and biogas - to contribute to low-carbon energy production for on-farm and off-farm use.
- Increased efficiency of the food-chain to reduce waste associated with processing, distribution, and storage. This includes lifestyle changes to use energy, food and fibre more efficiently and to reduce food wastage by consumers.
- Greater emphasis management of existing woodlands and forests on maximise net carbon capture.

The Assembly Government has welcomed the Group's report and, in relation to those recommendations that have been accepted, many are already being progressed through Assembly Government strategies and policies such as the forthcoming Glastir scheme, Wales' new sustainable land management scheme and the knowledge transfer work of the Farming Connect Climate Change Development Centre. Others are areas of research or mechanisms to gather data on emissions (for the GHG inventory) where the Assembly Government is already proactive in liaising with research funders and research bodies.



The Assembly Government's Internal Working Group will be producing its Implementation Plan at the end of 2010 for taking forward the accepted recommendations.

Farming, Food & Countryside - Building a Secure Future sets out a clear vision of Welsh farming at the heart of a sustainable countryside and profitable rural economy. The objective of the Strategy is to achieve a sustainable and profitable future for farming families and businesses

through the production and processing of farm and forestry products. The objective also includes safeguarding the environment, animal health and welfare, tackling the causes of climate change and adapting to its impacts.

The Rural Development Plan 2007-2013 (RDP) is the mechanism by which the Welsh Assembly Government will deliver the activities under the EU Rural Development Regulation. It is a strategic policy document and so does not contain operational detail on the individual schemes that will be implemented.

The activities permitted under the RDP are as follows:

- Axis 1 Improving the competitiveness of the agriculture and forestry sectors.
- Axis 2 Improving the environment and the countryside.
- Axis 3 Enhancing the quality of life in rural areas and the diversification of the rural economy.
- Axis 4 Adopting the Leader approach for community regeneration.



The overall projected spend for the RDP is estimated at some £795 million over the period 2007-2013 of which some £195 million comes from the EU.

Woodlands for Wales, the Welsh Assembly Government's strategy for woodlands and trees, focuses on striking a balance between sequestration and retaining carbon in woodlands, and substitution of more carbon-intensive substances with wood (for example in buildings or as fuel).

The strategy recognises the importance of creating new woodlands, conformation to the UK Forestry Standard, and maximisation of woodland carbon storage capacity.

Key areas for action

The specific actions for agriculture and land use are set out in our accompanying Delivery Plan.

The focus of Assembly Government action will be:

- Agriculture and land management schemes targeted on actions that will reduce greenhouse gas emissions.
- Additional woodland creation.
- Advice and support for farmers.
- Red meat and dairy roadmaps.

Where is more work needed?

There are a number of areas where we recognise that we will need to achieve emission reductions in future but where doing so is challenging, either because they are longer term changes which require a complex set of responses to achieve or because more research or development is needed

before the right action can be taken or because the measures required are particularly difficult, for example they are expensive or lack buy-in.

There are a number of areas like this in relation to agriculture and land use where we will continue to work to develop appropriate policies and programmes to address them in the future. These include research to improve our understanding of the basic process underpinning methane and nitrous oxide emission production and its measurement and exploring the public acceptability of some of the more radical options for livestock production.

Behaviour change

Encouraging behaviour change is important in reducing emissions from agriculture and land management and is a major focus of our approach.

Key actions will include:

- **Exemplify:** The Assembly Government has committed to an overall reduction in emissions in its Green Dragon Objectives and Targets including a 10 % reduction from its administrative estate and travel during 2010 as part of the 10:10 campaign.
- **Enable:** Provide expert advice and training through Farming Connect on how farmers can reduce emissions.
- **Engage:** Targeted communication and engagement programmes to encourage lower carbon practices.
- **Encourage:** Provide support for on-farm renewable development.



Vision by 2020

By 2020 we expect to see:

- Food production in Wales maintained but emissions reduced.
- Increased level of woodland creation in appropriate locations in Wales.
- Increased anaerobic digestion of waste and more efficient use and reuse of wastes and resources.
- Increase in the number and capacity of on-farm renewable generation.
- Greater consumer awareness of embedded energy in food and more informed consumer choices.
- More local production and sourcing.
- Better management of existing forest holdings (especially of FC) to capture carbon and prevent Welsh forests reverting to becoming a carbon dioxide source.

Chapter 12

Resource efficiency and waste sector
emission reduction



Summary

Our actions to reduce emissions in the waste sector include:

- Reducing GHG emissions from landfill sites
- Reducing indirect emissions associated with resource consumption by increasing reuse, recycling and composting
- Implementing our Waste Strategy and Sector Plans

Emission trends in the sector

The waste sector is responsible for a very small proportion of the emissions which are covered by the 3 % target (less than 5 %).

Waste can contribute to greenhouse gases directly and indirectly through a number of different ways. In terms of direct emissions from this sector the key source is the disposal of biodegradable waste straight to landfill which produces methane through the decomposition of waste matter. Methane is 21 times more potent than carbon dioxide as a greenhouse gas.

Since 1998 the trend in this sector has been towards slightly decreased direct emissions.

Although waste makes a relatively small contribution to direct greenhouse gas emissions, in terms of indirect emissions, action on resource efficiency is very significant in terms of Wales' ecological footprint. In producing goods, transporting them, using them and then disposing of them we create emissions. These 'embedded' emissions give a broader view of the footprint of our lifestyles and we need to address the issue of resource consumption alongside action to address the emissions from landfill noted above.

There is a strong read across between this chapter and the business and residential chapters.

Reducing emissions in the sector



We will seek to develop a range of measures to prevent waste, divert waste from landfill by increasing recycling, composting and anaerobic digestion, and reduce emissions from existing landfill sites further.

The Assembly Government has significant levers in this sector, although many of these operate within an EU framework, for example regulatory requirements. The Assembly Government provides significant funding in this sector and is active on skills and knowledge development, communication and behaviour change and research and development in this sector.

UK and EU policies and programmes, including product standards, major regulatory regimes and fiscal measures, will play a significant role in driving emission reduction in this sector. We will work closely with the UK Government to influence developments in this area.

There is also a major role for individuals, organisations and the public sector in making, or encouraging, resource use choices.

Action in all these areas needs to come together to deliver sustained emission reduction in the waste sector.

Waste Strategy

Wales' revised waste strategy: *Towards Zero Waste* was launched on 21 June 2010. The strategy is an overarching framework document which sets out long term policy aims and targets for outcomes from 2010 to 2050. Reducing direct and indirect greenhouse gas emissions from waste management is a key driver of the Waste Strategy. Actions for delivery will be implemented through sector plans which will be developed with stakeholders at a later date and on a rolling basis.

The key outcomes of *Towards Zero Waste* are:

- **A Sustainable Environment**, where the impact of waste in Wales is reduced to within our environmental limits by 2050. This means we will take action on reducing the ecological footprint of waste in Wales to 'one Wales: one planet' levels through waste prevention and recycling, so that we contribute to using only our fair share of the earth's resources.
- **A Prosperous Society**, with a sustainable, resource efficient economy. More 'green jobs' across a range of skill levels will be provided within the waste and resource management industry in Wales, and increased profit for businesses will be achieved through resource efficient practices, which are 'future proofed' against increasing competition for resources.
- **A Fair and Just Society**, in which all citizens can achieve their full human potential and contribute to the wellbeing of Wales through actions on waste prevention, reuse and recycling.

To implement our outcomes, we are working towards two key milestones. These are:

2025: Towards zero waste

2025 is an intermediate step on the way towards 'zero waste', (which we define as an aspirational end point where all waste that is produced is reused or recycled as a resource, without the need for any landfill or energy recovery). By 2025, we will have:

- significantly reduced waste through actions on sustainable consumption and production.
- maximised recycling and minimised the amount of residual waste produced, and eliminated landfill as far as possible. A 70 % recycling / composting target is set for all sectors i.e. business, householders and the public sector by 2025 together with a cap on energy from waste of 30 % of municipal waste by the same date.



2050: Achieving zero waste

As a minimum, we will reduce the impact of waste in Wales to within our environmental limits, aiming to phase out residual waste through actions on waste prevention and sustainable consumption and production so that the only waste that is produced is reused or recycled as a resource.

Sector plans



Sector plans are the implementation plans for the strategy. We will develop a rolling programme of sector plans on a priority basis and the following sector plans will be developed first:

- Municipal waste collected by local authorities.
- Collection, infrastructure and markets.
- Construction and demolition.
- Retail including wholesale, food manufacturers and hospitality (with a focus on food waste and addressing packaging in detail).
- Subsequent specific sector plans will include the public sector and agriculture and there will also be a sector plan covering the remaining commercial and industrial waste sectors.

Each sector plan will focus on the following main issues:

- Waste prevention & minimization.
- Re-use.
- Recycling.
- Service provision/infrastructure.
- Awareness/education.
- Support/funding.
- Levers/instruments.
- Indicators/measurement.
- Targets.

Key areas for action

The specific actions for waste management and resource efficiency are set out in our accompanying Delivery Plan.

The focus of Assembly Government action will be:

- Reducing greenhouse gas emissions from landfill sites, by taking action to:
 - reduce emissions even further from existing sites;
 - substantially reduce the amount of biodegradable waste entering landfills in the future, by diverting waste to recycling, composting and anaerobic digestion.

- Reducing indirect emissions associated with resource consumption by preventing waste, increasing reuse, recycling and composting.
- Implementing the Waste Strategy and Sector Plans.
- Encouraging behaviour change to support more efficient waste and resource use.

Where is more work needed?

There are a number of areas where we recognise that we will need to achieve emission reductions in future but where doing so is challenging, either because they are longer term changes which require a complex set of responses to achieve or because more research or development is needed before the right action can be taken because the measures required are particularly difficult, for example they are expensive or lack buy-in.

There are a number of areas like this in relation to resource efficiency and waste and we will continue to work to develop appropriate policies and programmes to address them in the future. These include things like changing consumer habits and encouraging resource efficient purchasing.

Behaviour change

Encouraging behaviour change is critical to success in reduced emissions from waste and in minimising wider consumption emissions and is a major focus of our approach.

Key actions will include:

- **Exemplify:** The Assembly Government has committed to an overall reduction in emissions in its Green Dragon Objectives and Targets including 10 % from its administrative estate and travel during 2010 as part of the 10:10 campaign.
- **Enable:** Provide expert advice through Waste Awareness Wales and via local authorities to support people in reducing waste; also support business resources efficiency programmes.
- **Engage:** Targeted communication and engagement programmes to encourage waste prevention and recycling.
- **Encourage:** Landfill tax.



Vision by 2020

By 2020 we expect to see:

- Greatly increased level of landfill diversion.
- Product design much more efficient in resource use.
- An anaerobic digestion network is in place across Wales.
- Greatly increased levels of recycling in all waste streams and greatly increased levels of composting and co-digestion of wastes.

Chapter 13

Public sector emission reduction



Summary

Our actions to reduce emissions in the public sector include:

- Embedding climate change in Community Strategies through guidance and by sharing good practice
- Reducing the carbon footprint of the Assembly Government estate
- Reducing the carbon footprint of education and health services
- Delivering public sector buildings to higher standards of energy performance

Emission trends in the sector

The public sector is responsible for a relatively small share of the emissions covered by the 3 % target, but has a critical role to play in visibly demonstrating leadership on climate change action.

The public sector within Wales is not totally devolved, many public sector offices in Wales are offices of UK government agencies and are therefore outside of the direct control of the Assembly Government (although they will be subject to Welsh regulations common to any workplace or commercial premises in Wales). Estimates of the public sector emissions directly attributable to the operations of the devolved Government of Wales have been made on the basis of employment statistics.

Reducing emissions in the sector

The Committee on Climate Change highlighted that the public sector needed to provide leadership on emissions reduction actions.

Beyond direct emissions from their buildings, the public sector has the ability to influence emissions much more widely through the delivery of their services, through procurement and their community leadership role and we expect the public sector to maximise this wider contribution.

There are also opportunities to save made and integrate service provision better by reducing energy costs, bringing together public sector transport demand and driving sustainable procurement.

The public sector includes emissions from the Welsh Assembly Government and our sponsored bodies, local authorities, schools, further and higher education institutions and the health service. Emissions from Welsh police forces will also be included in this sector, and although policing is not devolved we will be working with the Police forces to support the action they are already taking to reduce their emissions.

The Assembly Government has an accredited Environmental Management System with targets for emission reduction from our administrative estate. We have invested in new buildings



in Merthyr, Aberystwyth and Llandudno that meet the highest standards of environmental performance. We are also working across the estate to invest in measures that will reduce emissions and engaging staff in playing an active role. The rollout of new, more energy efficient ICT hardware has led to an overall reduction in the carbon footprint of our ICT network.

Education has a key role to play in any long-term climate change strategy, for raising awareness of climate change and providing the skills needed by a green workforce.

The National Health Service has one of the largest estates in the public sector, and so also has an important role to play and has demonstrated consistent leadership in this area.

Local authorities form a critical link between the Assembly Government and communities across Wales. Many local authorities have adopted ambitious emission reduction targets. There are also opportunities for town and community councils to play a role in supporting local emission reduction.

Assembly Government approach

One Wales: One Planet the new Sustainable Development Scheme makes sustainable development the central organising principle for the Assembly Government and confirms that we will encourage and enable other organisations in Wales to make sustainable development their central organising principle - through our Sustainable Development Charter. Climate change is the most significant consequence of unsustainable living, and addressing its causes and impacts is a key component of our commitment to making Wales more sustainable.


Key areas for action

The specific actions for agriculture and land use are set out in our accompanying Delivery Plan.

The focus of Assembly Government action will be:

- Supporting behaviour change across the public sector.
- Embedding climate change in Community Strategies through guidance and sharing of good practice.



- 
- Reducing the carbon footprint of the Assembly Government estate.
 - Reducing the carbon footprint of education and health services.
 - Delivering public sector buildings to higher standards of energy performance.

Where is more work needed?

There are a number of areas where we recognise that we will need to achieve emission reductions in future but where doing so is challenging, either because they are longer term changes which require a complex set of responses to achieve or because more research or development is needed before the right action can be taken because the measures required are particularly difficult, for example they are expensive or lack buy-in.

There are a number of areas like this in relation to the public sector and we will continue to work to develop appropriate policies and programmes to address them in the future. These include things like bringing together the constraints in the public finances with emission reduction action.

Behaviour change

Encouraging behaviour change is critical to success in reduced emissions from waste and in minimising wider consumption emissions and is a major focus of our approach.

Key actions will include:

- **Exemplify:** The Assembly Government has committed to an overall reduction in emissions in its Green Dragon Objectives and Targets including a 10 % reduction from its administrative estate and travel during 2010 as part of the 10:10 campaign.
- **Enable:** enhanced support from the Carbon Trust, common tools and standards developed and communicated and enhanced local authorities and housing association advice programme from Energy Saving Trust.
- **Engage:** We will support the development of a workplace campaign in collaboration with businesses and the trade unions. We will encourage and support local campaigns, working with local authorities, third sector organisations and communities.
- **Encourage:** we will support invest to save schemes for energy efficiency and low carbon energy measures.

Vision by 2020

By 2020 we expect to see:

- The public sector leading the way on emission reduction.
- Greatly reduced energy use and emissions from the public sector.

Chapter 14

How will climate change affect Wales?



Summary

- Using climate scenarios from UKCP09, Wales is likely to experience temperature increases of between 2.0 and 2.5°C by 2050
- Annual average rainfall is predicted to remain roughly the same as present, but there is likely to be a large difference in the patterns of summer and winter rainfall in the future
- Future sea level rise is likely to result in more severe coastal erosion, and inundation events more likely in low-lying coastal areas

Climate change is a complex process which makes predicting exactly what will happen, where and when, very challenging. But our understanding of future climate change is improving and we are using new information and tools to help understand how the consequences of climate change may affect our economy, environment and society.

As explained in Chapter 1, whilst climate change is leading to a global increase in average temperature, individual areas of the globe are changing at different rates and therefore the consequences of climate change are likely to be different from one locality to another and influenced by local environmental conditions. The latest climate projections, the UK Climate Projections 09 (UKCP09), provide us with information to help us prepare for the consequences of climate change.

As a result of current emissions and those that have already occurred, we cannot avoid the impacts of climate change entirely. As a result, we need to consider how we are going to adapt to changes that will affect many aspects of our lives in the future.

The earlier Wales starts to prepare, by understanding the vulnerability to climate change impacts, increasing resilience and building the capacity to adapt, the better equipped we will be to cope with our future climate.

Impacts of climate change in Wales

The UK Climate Projections show a probabilistic view of what will happen based on high, medium and low greenhouse gas emissions scenarios for the future. These align to those scenarios first developed by the Intergovernmental Panel on Climate Change in their fourth report.

In presenting information on likely changes in the climate in this Strategy we have used the UKCP09 information and results under the central estimate of the medium emissions scenario based on the 1961-1990 baseline.⁴

⁴ the central estimate is the 50 % probability level - it represents an outcome that in qualitative terms, is as likely to happen as not.

Impacts of climate change in Wales

The global response to climate change assumes that we are tracking towards the UKCP09 model's medium emissions scenario. The predicted impacts for this scenario are substantial and are likely to lead to real challenges in terms of the way all of us live our lives. The high emissions scenario illustrates a bleaker picture with global temperatures rising by around 6°C by 2100 and even greater predicted impacts. Low emissions scenarios, with emissions peaking around 2040, would most likely avoid the worst of these predicted impacts, but we are not tracking this sort of pathway globally.

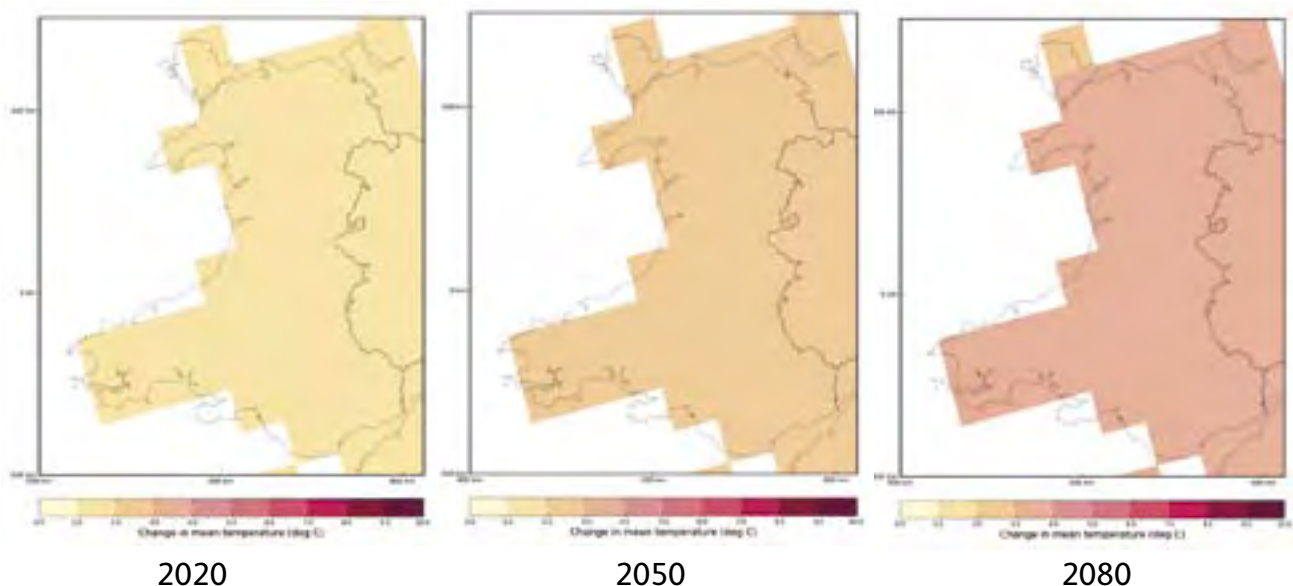
Whilst the Climate Projections provide useful information about how the Welsh climate is likely to change over time, we also need to understand how these changes could affect people and the natural environment.

Using the information under the central estimate of the medium emission scenarios (the central estimate is the 50 % probability level - it represents an outcome that, in qualitative terms, is as likely to happen as not), the following sections outline the impacts that Wales is likely to experience.

Temperature

Figure 6 below illustrates the likely temperature changes in Wales based on the 1961-1990 baseline for the medium emissions scenario.

Fig 6 Temperature increases in °C



© UK Climate Projections 2009
Funded by DEFRA and the devolved Administrations

It is important to note that the above illustration demonstrates the likely temperature increases based on the 1961 to 1990 baseline, and are not forecasts of weather but projections of Climate. However, there is likely to be natural variability e.g. an unusually cold winter with heavy snowy fall. Despite this natural variability, average temperatures will continue to increase.

The scenarios tell us that due to emissions that have already occurred and likely future emissions, Wales is likely to experience temperature increases of between 2.0 - 2.5°C by 2050. After 2050 this relationship becomes more dependent on the greenhouse gases that we in the future are more uncertain.

Rainfall

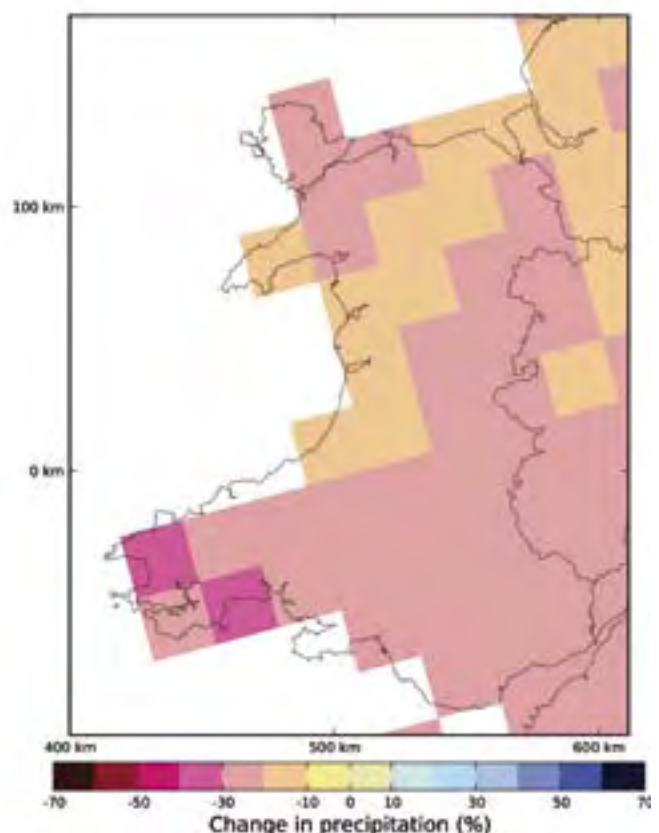
Across Wales the annual average rainfall is predicted to remain roughly the same as present, with changes of between -10 and +10 % by 2080, with a broad pattern of increases in the west and decreases in the east of Wales likely. However there is likely to be large differences in the pattern of summer and winter rainfall, with decreases in summer rainfall and increases in winter rainfall.

Summer Rainfall

Across Wales the summer average rainfall is predicted to decrease between 10 % and 40 % by the 2080s, with the greatest decreases likely to be in South-West Wales.

The % change in summer average rainfall from the 1961-1990 baseline for the 2080s (for 25km grid squares for the central estimate of the medium emissions scenario).

Fig 7 Changes to summer precipitation



Winter Rainfall

Across Wales the winter average rainfall is predicted to increase between 0 and 30 % by the 2080s, with the greatest increases in South-West Wales.

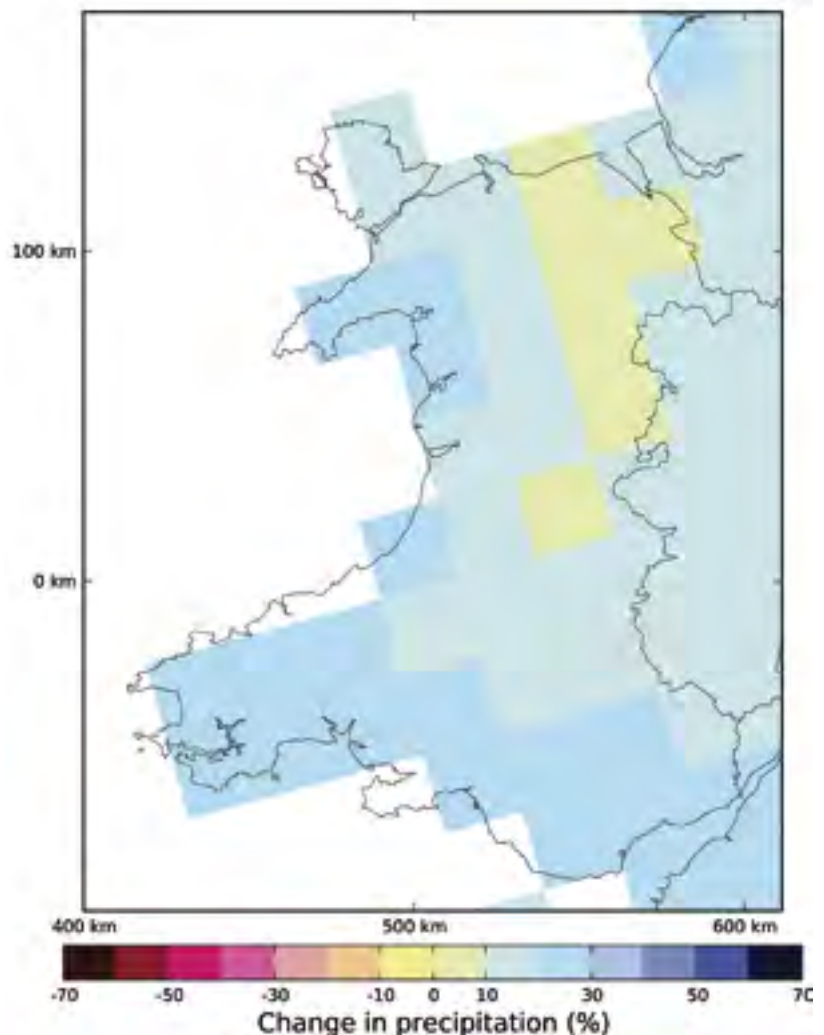
The % change in winter average rainfall from the 1961-1990 baseline for the 2080s (for 25km grid squares for the central estimate of the medium emissions scenario).

It is expected that intense, but short-lived, rainfall events will become more frequent in both summer and winter.

These changes in average temperatures and rainfall are likely to result in a number of consequences:

- Hotter drier summers:
 - Increased maximum summer temperatures are likely to result in increased thermal discomfort in buildings. (The projected summer average daily maximum temperatures for Wales are up to: 22°C by the 2020's, 23°C by the 2040's and 25°C by the 2080's up from an average of 20°C for the period 1961-1990);
 - Increased health problems are likely in summer, including heat related deaths and those linked to high air pollution. Elevated summer temperatures cause health problems both directly and indirectly, via elevated levels of air pollutants. (As a result the burden on NHS services is likely to increase);
 - Summer water shortages are likely to become more commonplace as summer rainfall decreases (across different parts of Wales the summer average rainfall is projected to decrease between 10 % and 40 % by the 2080s);
 - Increased health problems are likely in hot weather, including heat related deaths and those linked to high air pollution. Elevated summer temperatures cause health problems both directly and indirectly via elevated levels of air pollutants increasing the burden on NHS Services. Hotter summers might result in new infectious disease threats and the possibility of increased foodborne illness;

Fig 8 Changes to winter precipitation



- Hotter drier summers may also lead to an increase in summer tourism;
- Changes in temperature and rainfall profiles are likely to impact on ecosystems and are likely to be associated with the loss or migration of climate-sensitive species;
- Non-native species are likely to become more widespread as the Welsh climate becomes more favourable for them.
- Milder Winters:
 - The reduction in the number and severity of annual frosts and snowfall, caused by the likely increased temperatures during the winter months, could result in a longer growing season for suitable crops and grasslands. (Across Wales the daily minimum temperature averaged over the winter (November, December, January) are projected to rise between 3°C and 4°C by the 2080's);
 - Less cold weather transport disruption, decreased requirement for the gritting of roads;
 - Reduced demand for winter heating;
 - Less cold weather related illnesses.
- Increased rainfall and flood risk:
 - Increased river and urban flooding, due to the increased incidence and severity of extreme rainfall events (the projected increases in the winter average rainfalls in Wales are 7 % by the 2020s, 11 % by the 2040s and 19 % by the 2080s for Wales);
 - Increased pressure on sewer systems with associated water quality impacts.

Sea level

The relative sea level rise around Wales (taking into account land level changes) is predicted to be 36cm by the 2080s.

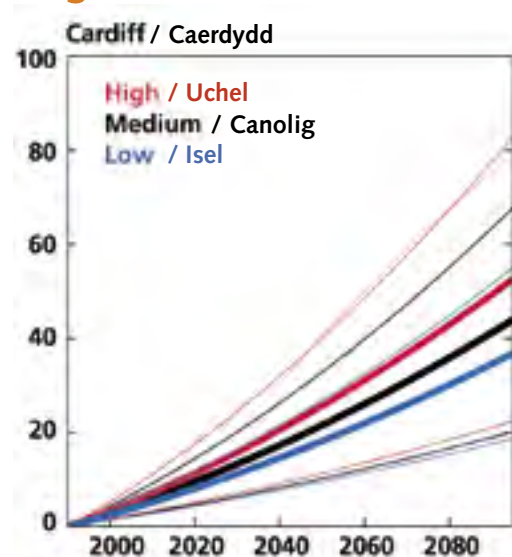
This graph shows estimates of relative sea level (RSL) rise for Cardiff, combining absolute sea level rise estimates, from global models, and land movement estimates

These projections show the central estimate (in bold) along with the 5th to 95th percentile range (thin lines) for the 3 emission scenarios.

Whilst the forecast of relative sea-level rise is for Cardiff, the geographic variations in sea level around Wales are small. By 2040 the estimated rise for all emissions scenarios is approximately 15 to 20cm, however by 2080 the scenarios have diverged with potential increases in mean sea level of between 31cm for the low emissions scenarios and 43cm for the high emissions scenarios.

This is likely to result in more severe coastal erosion taking place and inundation events will be more likely in low-lying coastal areas as sea level rises.

Fig 9 Sea level rise in cm





Global climate change impacts on Wales

The UKCP09 projections provide us with useful information on the specific climate changes we are likely to experience in Wales during the 21st Century. Other parts of the world are likely to experience more severe changes, however. These may lead to wider geo-political and economic consequences that could significantly affect Wales and the UK. Some examples of these global consequences are described in the first chapter of this Strategy.

Our approach to adaptation

The messages from the 2009 UK Climate Projections are stark and underline the pressing need to adapt to the inevitable climate change we already face and plan for the future of our environment, economy and communities in Wales. Our approach to adaptation is explained in Chapter 15.

Chapter 15

Adapting to climate change impacts



Summary

- We will deliver a national, co-ordinated approach via our Adaptation Framework to ensure that Wales is well-placed to adapt to a changing climate
- Our framework approach will address vulnerability to climate change impacts by:
 - Building the evidence base
 - Mainstreaming adaptation
 - Communicating on climate change impacts and adaptation
- Our Adaptation Framework is supported by the provisions of the Climate Change Act (2008), which provides Ministers with specific powers to support climate change adaptation

As a result of past and current emissions, we cannot avoid the consequences of climate change. So we need to consider how we are going to adapt to the changes that will affect many aspects of our lives in the future.



The earlier Wales starts to prepare, by understanding the vulnerability to climate change impacts, increasing resilience and building the capacity to adapt, the better equipped we will be able to cope with the consequences of future climate change.

This chapter sets out the Assembly Government's strategic approach to adaptation in Wales and explains the principles for managing our response in the years ahead as our understanding of the risks and vulnerabilities improves. The strategic approach is complemented by the Adaptation Delivery Plan which sets out the specific activities, objectives and outcomes for meeting these broader aims.

Assembly Government's strategic approach to adaptation

As outlined in Chapter 14, the messages from the UKCP09 projections are stark and underline the pressing need to adapt to the inevitable climate change we already face and plan for the future of our environment, economy and communities in Wales. Early and co-ordinated adaptation to the unavoidable consequences of climate change will help Wales minimise the impacts of costly disruptions and safeguard the long-term wellbeing of our environment, economy and communities.

The Assembly Government's Adaptation Framework presents a national, co-ordinated approach to ensure that Wales understands the risks and opportunities these changes present and is well-placed to adapt in a sustainable way. It sets out the overarching model for adapting to climate change in Wales and will provide a mechanism for focused, sectoral responses.

The Adaptation Framework is intended to build adaptation to climate change into decision making, deliver meaningful action that enhances Wales' ability to respond to the challenges and opportunities presented by climate change and to meet our statutory obligations under the Climate Change Act (2008.)

The Adaptation Framework

The purpose of the Adaptation Framework is to increase Wales' preparedness to the impacts and consequences of climate change. The actions in the Framework Delivery Plan will seek to increase the resilience of people in Wales, and the natural and economic systems on which they depend, against the unavoidable impacts of a changing climate.

Our framework approach will address vulnerability by:

- **Building our evidence base** so that we can understand our exposure to climate change impacts and their consequences.
- **Mainstreaming adaptation** to build capacity within organisations and communities. Embedding adaptation will also help us to understand and tackle competing pressures on our social, natural and economic systems.
- **Communicating** on adaptation will ensure that decision makers at all levels are aware of the impacts of climate change and equipped with the information and tools they need to apply that knowledge in planning and decision making processes.

Who is the Adaptation Framework for?

Sustainable adaptation to the impacts of climate change will require a mixture of actions at local, national and international levels. Through the Adaptation Framework, we will work with strategic partners to address Wales' vulnerability to changes in our climate. These include businesses, organisations that deliver public services, that manage Wales' natural environment and that develop social and economic policy.

The impacts of climate change will have consequences for individuals and individual businesses and the Adaptation Framework will also establish support mechanisms to work with local businesses and communities. Local authorities, Local Service Boards, Spatial Plan Area Groups and the Climate Change Commission for Wales will be central in helping their local stakeholders adapt to climate change.



Building the evidence base

To adapt to the impacts and consequences of climate change and increase resilience we will need to determine our vulnerability and assess associated risks. This will be achieved through research and evaluation of the effectiveness of action on the ground so that the results can inform future decisions on our adaptive response.

The evidence base will help us improve our understanding of the potential consequences of climate change and the challenges and opportunities that it presents.

Part of the process will be to determine the potential risk of climate change and the thresholds which we can tolerate. Risk thresholds will vary for different sectors, organisations and individuals. It is important therefore that decision-makers consider what level of risk they are prepared to accept and, where relevant, they engage the communities and stakeholders in making that determination.

The key actions to build our evidence base will be to:

- Supporting the development of climate change impact and vulnerability assessments including, where appropriate, refinement of UK climate projections.
- Developing a detailed assessment of the risk and opportunities posed by a changing climate which will include findings from the UK Climate Change Risk Assessment.
- Developing a better understanding of the costs of the risks and opportunities presented by climate change by contributing to the development of the UK Adaptation Economic Assessment.
- Continuing to support environmental monitoring programmes; implementation of River Basin Management Plans; and the Marine Climate Change Impacts Partnership, all of which will provide valuable evidence on impacts.

Case study: The National Trust Coastal Risk Assessment

The National Trust cares for 230km of Wales's coastline - one sixth of the total. To better understand how coastal change will affect its properties the National Trust commissioned a study exploring how erosion and flooding might affect its coastal sites over the next 100 years.

UK data such as FutureCoast and the UK Climate Projections was supplemented with detailed local analysis, helping the Trust to understand exactly which habitats, historic features, buildings and recreational sites are vulnerable. The assessment identified 55 sites that could lose land by erosion, 66 sites that are currently at risk from tidal flooding and 2 low-lying sites that are at risk of combined tidal and river flooding within the next 100 years.

The assessment has helped improve understanding of the importance of adapting to climate change at the coast. It also gives managers the information they require to plan for the future by initiating thinking on how to mitigate risks and avoid developing new assets in a known risk zone. The next step is to devise action plans and strategies to deal with the issues identified. Actions will be incorporated into future management plans and business planning processes.

Mainstreaming adaptation

To ensure Wales is resilient to climate change impacts and consequences, adaptation needs to be integrated into all sectors, at all levels.

By mainstreaming adaptation we can ensure that the decisions we make now take into account adaptation to climate change. For example, in planning new infrastructure or buildings we will need to consider the consequences of climate change over the life time of that asset.

The key actions to mainstream adaptation will be to:

- Ensure consistency of adaptation planning throughout the public sector in Wales through the publication of Climate Change Act (2008) Statutory Guidance on the assessment of risk from climate change and supporting the production of adaptation plans.
- Integrate the assessment of risk and the development of adaptation plans into the delivery of public services in Wales through a dedicated knowledge transfer programme.
- Embed consideration of the consequences of climate change in all appropriate Assembly Government policies and processes, by identifying and supporting the use of the right tools and guidance. This will be supported by training on using the climate scenario data and associated tools.
- Develop Sector Adaptation Plans (SAPs) so that adaptation risks can be assessed and considered in future policy decisions. This will be led by Assembly Government departments in partnership with relevant stakeholders and experts.
- Ensure that adaptation is addressed at a spatial level in Wales in a way that promotes sustainable development. The consequences of climate change impacts will be felt at the local level and, in many circumstances, experienced by those communities who are least able to deal with the consequences. We will focus on assessing climate change risks at the right level in order to identify the most appropriate solutions.


Case study: Changing Climate, Changing Places

Changing Climate: Changing Places supports four local authorities in Wales to pilot strategic and practical approaches to climate change adaptation and, to a lesser extent, mitigation. The authorities are Gwynedd, Rhondda Cynon Taf, Flintshire and Cardiff.

It brings together expertise from Environment Agency Wales, Countryside Council for Wales, Welsh Local Government Association, UK Climate Impacts Programme and others. These organisations, together with the local authorities, hold a wealth of scientific, technical and policy expertise which can be used to provide an evidence base to address this agenda.

The project addresses three basic questions:

- What does climate change mean for our community?
- What risks and opportunities does climate change represent to services and particular localities?
- How can we adapt now and in the future?



The first action of the project was to produce a Local Climate Impacts Profile (LCLIP) for each of the four pilot areas. The purpose of the LCLIPs was to examine extreme weather events in the pilot areas over the last five years and to begin to understand the resilience of the community and how our services responded.

Responses to extreme weather events were often found to be ad hoc and poorly understood. Different communities suffered in different ways to similar events, again reinforcing our understanding that resilience differs according to the socio-economic context. This is especially true in the recovery phase after an incident and in how communities organized themselves to respond to future events.

The reports were helpful in engaging local politicians and local communities in a dialogue about what the future might hold if climate change did bring more of these events. Critically this work informed a debate about what appropriate adaptation might look like and at what cost.

Each pilot area then reviewed all key local authority services using the UK Climate Impacts Programme Business Areas Climate Impacts Assessment Tool to assess likely impact upon services and what business continuity issues arose.

This work produced some real insight into the key risks faced by the local authority services that people depend upon. The current phase of the project is looking at these risks and how they are prioritised.

Communicating

To ensure Wales builds up resilience to climate change we need to ensure greater awareness of the need for adaptation by helping to develop the skills and provide the tools necessary to build capacity and inform decision-making. We will need to ensure that decision makers at all levels are aware of the consequences of climate change and equipped with the information and tools they need to apply so that risk can be assessed and informed decisions made. There has already been research conducted on adaptation and therefore we need to ensure that this information is communicated to others.

The focus will be on supporting organisations and communities in Wales to respond to the impacts of climate change rather than simply raising their awareness of climate change impacts.

The key actions for the communication of adaptation will be to:

- Raise awareness of current and projected impacts of climate change in Wales and provide decision makers with tools and training. The UKCP09 projections will form the foundation of what we want to communicate about the impacts of climate change.
- Identify and disseminate the essential tools for integrating consideration of climate impacts into policy and programme development.
- Encourage and support adaptation networks in Wales to support knowledge transfer.
- Establish and support Welsh case study examples of the use of the climate scenario data and tools, so that lessons can be learned and passed onto others.
- Disseminate current research and development that is already ongoing through partners.

Case study: Community Action Eco-Guidance Pack, Merthyr Tydfil

The Eco-Guidance Pack provides residents with information about caring for local wildlife and developing green spaces. These activities will enhance connectivity, thereby helping biodiversity adapt to climate change.

The pack also includes instructions for how to be prepared for flooding, increasing society's resilience to the impacts of climate change.

The pack was launched in 2009 and is being promoted in Merthyr Tydfil and beyond by the Countryside Council for Wales and Communities First.

The pack will be rolled out across Wales as part of work under the Communities First National Support Contract that is managed by the Wales Council for Voluntary Action.

Climate Change Act 2008

The Adaptation Framework is supported by provisions in the Climate Change Act (2008) which addresses impact of and adaptation to climate change. These provisions are set out below.



Climate Change Risk Assessment (CCRA)

The Climate Change Act 2008 requires the UK Government to assess the risks to the UK from the current and predicted impacts of climate change. This is known as the Climate Change Risk Assessment (CCRA).

The Climate Change Act establishes a 5-yearly cycle for review and updating of the CCRA with the first assessment being delivered in 2012.

We are working with the UK Government and devolved administrations of Scotland and Northern Ireland and other partners to ensure that the interests and needs of Wales are fully considered in development and delivery of the CCRA. This will provide key evidence to inform future UK Government and Devolved Administration decisions on climate change adaptation needs and priorities.

Adaptation Reports

The Climate Change Act 2008 provides Welsh Ministers with powers to:

- produce guidance for public bodies on adapting to the impacts of climate change;
- require public bodies to produce reports on their assessment of the current and predicted impacts of climate change.

These powers will enable the Assembly Government to provide focused support to public authorities on climate change adaptation. Formal guidance for public bodies on assessing and preparing for climate change impacts is an important component of our approach to adaptation.

We are consulting on proposals for the most effective use of these provisions, and on the draft guidance that will help key public service organisations in Wales assess climate change risks and to develop appropriate plans.

Our proposals focus on three main areas:

- **how we intend to define the relevant public service organisations**, referred to as “Reporting Authorities” in the Climate Change Act (2008) and identifying these organisations in Wales;
- **how and when we intend to apply the Power of Direction** to require Reporting Authorities to provide reports to us; and
- **the statutory guidance to Reporting Authorities** on climate change risk assessment and the adaptation planning process.

Reporting Authorities

Prior to the completion of the first CCRA in 2012, which will help inform strategic decisions on vulnerabilities in Wales to climate change, we propose to use the following criteria to identify Reporting Authorities (our approach is broadly consistent with the methodology used by the UK Government to identify Reporting Authorities in England and those organisations with non-devolved functions):

- organisations responsible for national infrastructure, and therefore making a key contribution to the day-to-day functioning of Wales;
- organisations that are vulnerable to the projected impacts of climate change, particularly in relation to provision of key public services;

- organisations that have limited or no current regulatory framework that requires them to look long-term at and report on the need for climate change adaptation in relation to their functions, assets and business.

On the basis of the above criteria, Reporting Authorities in Wales fall into the following categories:

- Local Government and Planning Authorities.
- Environment (for example, Environment Agency and the Countryside Council for Wales).
- Health (for example, Local Health Boards and NHS Trusts).
- Water (for example, Dwr Cymru Welsh Water).
- Transport (for example, network rail).

There are other organisations delivering non-devolved functions in Wales, such as energy generators and suppliers, and strategic airport operators, who have been defined as Reporting Authorities by the UK Government and directed to prepare adaptation reports by the Secretary of State⁵.

How will the powers to direct Reporting Authorities be applied in Wales?

We intend to use the reporting provisions in the Climate Change Act to help embed the assessment of and response to climate change risks into the delivery of critical public services where these are vulnerable to the impacts of climate change.

Before publication of the UK Climate Change Risk Assessment in 2012, we do not intend to require Reporting Authorities in Wales to prepare and submit adaptation reports. We will, however, publish the statutory guidance which Reporting Authorities must have regard to in their adaptation work, and will provide additional support and information to Reporting Authorities.

Looking ahead, we will be considering the findings of the UK Climate Change Risk Assessment in 2012, the standard of Reporting Authority risk assessment, planning and capacity-building, and the Sectoral Adaptation Plans for Wales before making a decision on whether to require Reporting Authorities to report formally in the future. The CCRA may indicate, for example, that there are specific strategic issues that need to be addressed in Wales that require monitoring via formal reports from Reporting Authorities.

There are circumstances where we might require a reporting authority to prepare a report in the period before the CCRA is published but this would either be on the basis that the Reporting Authority was clearly not taking adequate steps to consider climate change impact risks and relevant adaptation planning or where the organisation works in Wales and England, the UK Government intended to require them to report and a joint direction would make preparing that report easier. The latter approach has already been taken in relation to the Environment Agency.

⁵ Details of the Secretary Of State's directions can be found on the Defra website.
<http://www.defra.gov.uk/environment/climate/legislation/reporting.htm#who>

The main features of the statutory guidance

Our guidance does not prescribe a particular methodology for assessing risk or of developing a programme of adaptation measures. Rather, it seeks to inform to Reporting Authorities about adapting to the changing climate and to support related planning processes. The guidance should help Reporting Authorities develop a structured approach to adaptation. Looking ahead, it should lead to the changing climate becoming a key consideration in Reporting Authorities' planning processes and decisions.

The main features of the guidance are:

- Outline of climate change impacts for Wales.
- The need and benefits of adapting to climate change.
- Identifying and assessing climate change risks.
 - Evidence gathering;
 - Dealing with uncertainties.
- Addressing climate change risks by considering:
 - Sustainability and the need for flexibility;
 - How to best managing impacts by sharing and consulting on risks, reducing consequences, and exploiting opportunities.
- Monitoring, Evaluating and Reviewing risks and plans via:
 - Business planning;
 - Risk management; and
 - Investment decisions.
- Advice on preparation of Adaptation Reports.

Adaptation Sub Committee of the UK Committee on Climate Change (CCC)

The Climate Change Act 2008 introduced an independent Climate Change Committee to:

- provide expert advice and scrutiny on the Government's climate change work.
- It also introduced a new Adaptation Sub-Committee of the CCC.

The role of the Adaptation Sub-Committee is to provide advice, analysis, information and other assistance through the Committee on Climate Change.

The Adaptation Sub-Committee will scrutinise the National Climate Change Risk Assessment which covers the whole of the UK. It will also look at the implementation of the statutory National Adaptation Programme for England and reserved matters (for example issues like defence). It will also consider the implementation of the statutory National Adaptation Programme for England and reserved matters. We will continue to liaise with the Adaptation Sub-Committee make use of the Sub-Committee's advice and support where appropriate.



Roles and Responsibilities

Climate change is an issue that no government can address in isolation. Success will depend on organisations, businesses and communities across Wales accepting responsibility and preparing for a changing climate now. In taking the adaptation agenda forward, the Assembly Government will work collaboratively with a range of local, national and international partners.

The Assembly Government

The Assembly Government will provide clear leadership in promoting a sustainable approach to climate change adaptation. We are leading by example by integrating adaptation into our policies and corporate structure and in providing the right framework for others to take action.

We will provide clear advice and guidance to help sectors across society to better understand their role in addressing climate change and ensure easy access to necessary information and tools. We will also provide specific guidance to public sector partners on assessing and reporting on the impacts of climate change.

Sectoral Adaptation Plans

Another key challenge for the Assembly Government will be to establish practices to promote the integration of adaptation into sectoral policies.


A major feature of this our Adaptation Framework will be the preparation of key Sectoral Adaptation Plans for Wales. The plans will help focus our response to adaptation needs and priorities, and inform our engagement and knowledge transfer approaches in cross-cutting areas. The Sectoral Adaptation Plan approach will also enhance the risk assessment and adaptation planning work under the Climate Change Act (2008) described above.

We have identified the following sectors for which Sector Adaptation Plans will be developed:

- Health (already in place).
- Natural Environment (including land use, forestry, agriculture and the marine environment).
- Infrastructure (including planning, transport, buildings, water, emergency services, energy (supply) and food).
- Communities (including social justice, equality issues and local government).
- Business and tourism.

The Assembly Government's Department for Health and Social Services has already made significant progress to produce a co-ordinated public health response to the impacts of climate change by establishing a Climate Change and Health Working Group in 2007. This group has developed a Public Health Adaptation Plan⁶ which is now helping to inform long-term policy and infrastructure planning decisions. The Assembly Government will be following a similar approach to develop Sectoral Adaptation Plans for the remaining sectors identified above.

⁶ <http://wales.gov.uk/topics/health/protection/environmental/publications/climate>



As we make clear in chapter 2, our action on climate change must promote social justice. We will target additional support for adaptation on those people and communities that are likely to be most vulnerable to the impacts of climate change and least able to afford protection.

We will work closely with local authorities, emergency services, the third sector and community groups to ensure that Wales is prepared for more frequent extreme weather events and the, often, long lasting effects they can have.

We cannot address adaptation in isolation here in Wales and we will actively engage with the UK Government, Scottish Government and the devolved administration in Northern Ireland to share knowledge and address cross border issues. We will also participate in Climate UK which brings together representatives of Regional Climate Change Partnerships in England, Scotland and Northern Ireland.

We will also work with international partners to learn and share good practice on adaptation. This will include supporting the Mbale region of Uganda through our Wales for Africa Programme in its adaptive response work which is supported by the UN Development Programme and the Network of Regional Governments for Sustainable Development (nrg4SD). We will also work with other regional Governments and organisations through the Climate Group partnership to identify opportunities in tackling the causes and consequences of climate change.


Local Government

Local government has a vital role to play in ensuring Wales adapts to the impacts of climate change. Local authorities deliver a range of key services and, in planning for the future of their local area and the services they deliver, they can build adaptation into decision making. The Welsh Local Government Association's Sustainable Development Framework provides practical guidance at both a corporate and service level to local authorities on delivering sustainable development.

Recognising that adaptation is fundamentally a spatial issue, the weather and climate tend to act locally, with local consequences, local authorities are in an ideal position to raise awareness and act as leaders through their powers and responsibilities in key service areas such as housing, planning, local transport, health promotion and through procurement.

The Local Government Act 2000 provides a duty of wellbeing for Local Authorities in Wales to ensure the social, economic and environmental well being of their communities. Climate change presents a challenge to community wellbeing and this has been recognised by all 22 unitary authorities, plus the fire and rescue and National Park Authorities, who have all signed the Welsh Commitment to Address Climate Change which was launched in April 2006 entitled *Changing Climate: Changing Places*. The aim of the document is for the local authorities to take action to address the impacts of climate change through adaptation and mitigation.

Four pilot local authorities - Cardiff, Rhondda Cynon Taff, Flintshire and Gwynedd - have participated in the *Changing Climate: Changing Places* project, supported by the Environment Agency Wales, Countryside Council for Wales, Welsh Local Government Association and the UK Climate Impacts Programme. The aim of the study is to pilot strategic and practical approaches to enable effective consideration of climate change impacts and their implications for a local authority.



We will be encouraging all local authorities to learn from the project and to use a range of practical tools to assist them in assessing and planning for adaptation, including the UK Climate Impact Programme's Local Climate Impact Profile and the Business Areas Climate Impacts Assessment Tool (BACLIAT).

Private Sector

Businesses will need to take into account climate change, as it will impact on their organisation and their customers. Businesses will need to assess how the risks associated with climate change might affect them. This will include everything from their operating premises and processes, to their markets, logistics and staff.

There are also potential opportunities to develop for products and services to help communities and organisations adapt to a changing climate. This could also result in the development opportunities for training and skills in Wales, which could act as a showcase to other countries.

Businesses, particularly smaller business, may not always have long term planning integrated into their risk planning, but there is still value in planning for things like extreme weather events. Businesses should see managing the risks posed by climate change as part of their business continuity activity and seek to quantify the financial consequences of impacts and adaptation options.

We will be ensuring that our business support activity assists businesses in making themselves more resilient to the impacts of climate change and in taking the economic opportunities to develop new products and services.

Third Sector and Communities

The third sector and communities have a critical role to play in dealing with the impacts of climate change both for society and the natural environment. When extreme events happen, such as flooding, the third sector and communities will play an important role in the response and in providing help in the aftermath of such events.


The third sector has a key communication role to play in engaging communities and individuals, especially harder to reach groups, to support them in considering how climate change impacts on them and how they can build resilience to it by adapting their homes and communities.

Communities First Partnerships, which operate in our most deprived areas, have a key role to play in engaging communities in this agenda and linking with service deliverers.

We are encouraging the development of grass roots groups to address adaptation, building on the growing action already being seen in relation to emission reduction.

Individuals

Individuals can help themselves to adapt to the consequences of climate change impacts, for example they could find out the level of risk their homes face from increasing flood risk and other climate change consequences and make any necessary changes to build their resilience to those consequences, over time.



For example, if you live in an area that is at risk of flood you can take simple steps to help yourself be more prepared for a flood event. You can register for Floodline, the flood warning service from the Environment Agency so that you will get a warning if a flood event is likely to happen. You can also make your home more resilient to flooding, for example by changing the flooring or moving plug sockets higher up the wall.

We will be working with partners to enable people to take steps to build their resilience to climate change impacts.

Implementation, monitoring, reporting and progress

As we note in chapter 2, the implementation of adaptation actions must take into consideration the need to reduce greenhouse gas emissions to avoid the worst impacts of climate change. In the same way that emission reduction actions must be designed to reflect the likely future climate. When assessing adaptation actions we need to ensure that it is done sustainably taking into account social, economic and environmental costs.

Adaptation is not like emission reduction in having a unit of measurement such as carbon to determine how much an organisation, community or environment has adapted.

Measuring and assessing adaptation will mean different things for different organisations and as a result we will not be setting overarching targets for adaptation, but relevant, sector specific measures will be developed as part of the work on the sector adaptation plans.

In addition we will also be looking for evidence as to whether a process for assessing the risks posed by climate change has been established or built into existing processes in organisations and, where it has, how it will be reviewed over time to reflect emerging evidence.


We will continue to develop indicators of progress on adaptation, working with Defra, and report on these.

Timeframe for adapting to climate change

Climate change impacts will change over time and, if we do not reduce emissions effectively, those impacts are likely to become more severe during the course of the 21st Century.

We therefore need to consider the most appropriate the timeframe for developing and delivering our adaptation objectives, taking into account the current availability of robust information on climate change for the decades ahead, balanced against shorter-term considerations of resource and policy planning, infrastructure planning and investment decisions that will be taken in the years ahead.

The risk and opportunities for different sectors and organisations will change over time. The Assembly Government will ensure that appropriate action is targeted at the right time. To do this we have identified three distinct time periods for policy planning and decision making from 2011 onwards: short, medium, and long-term:

- 
- **Short-term:** 2011 to 2015.
 - **Mid-term:** from 2015 to 2045.
 - **Longer-term:** from 2045 to the end of this century.

Short-term: the next 5 years 2011 to the end of 2015.

Our best evidence for the weather and climate over this period is what we have experienced in the recent past. In the short term, we will be focusing on building the evidence base through the Climate Change Risk Assessment, Local Climate Impacts Profile (LCLIP) and other projects and on awareness raising of adaptation into different sectors.

Building the evidence base will help us understand what our risks are and what options are most sustainable in terms of social, economic and environmental costs and we will take immediate action to deal with urgent issues.

Mid-term: from 2015 to 2045.

This is what we understand as ‘unavoidable climate change’, because the global temperature over this period is already largely committed as a result of emissions during the 20th Century.

In the mid term period we will continue to develop and review the evidence base and develop and implement adaptation plans and actions and monitor the effectiveness of adaptation strategies.

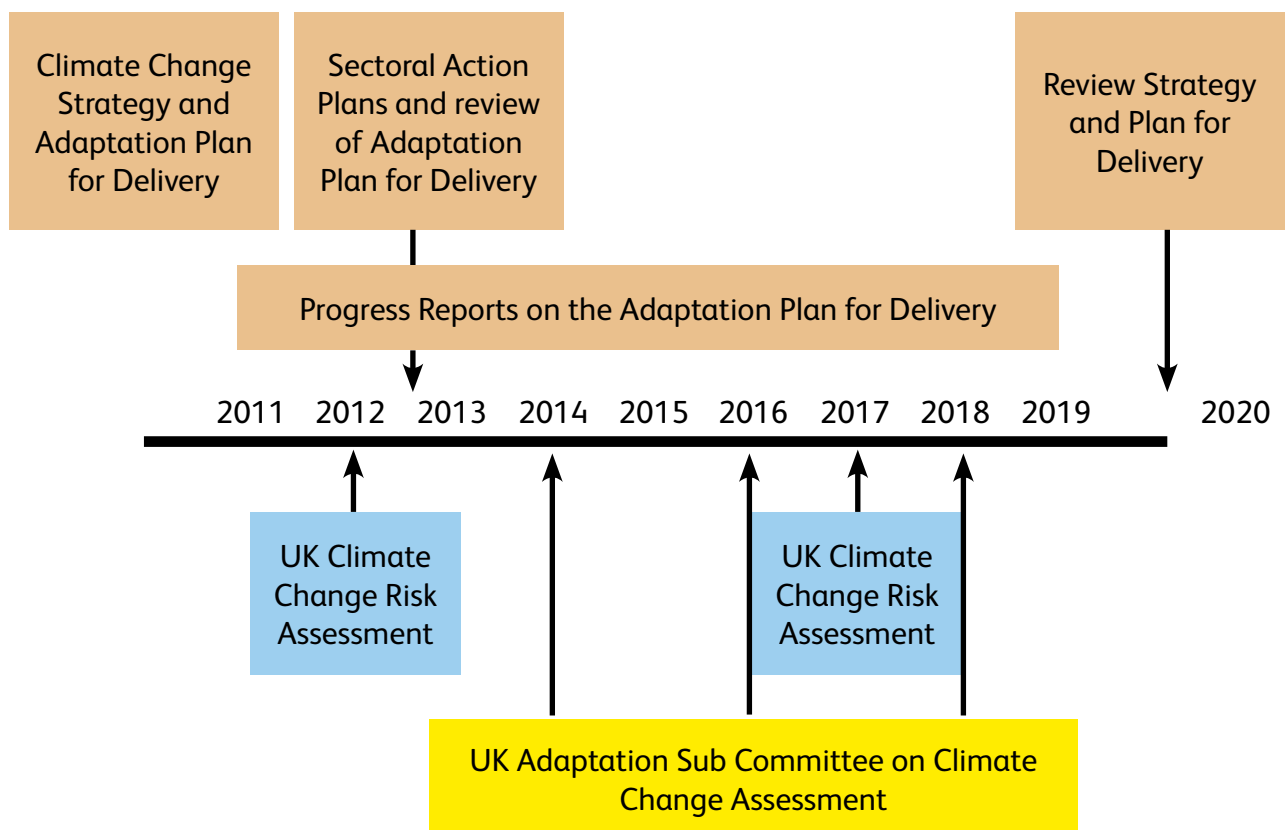
Longer-term: from 2045 to the end of this century.




After 2045, the picture is more complicated because it requires a judgment to be made on the level of future global emissions. There is a considerable range in the projected numbers according to how successful we are in reducing global emissions quickly. Decision-makers will need to explore this range as part of their risk-based approach.

Timeline for measures

Timelines of implementation measures will vary for different sectors and organisation depending on their vulnerability, but Figure [x] below provides an indication of the intended timings for delivering the main features of the Adaptation Framework in the decade ahead.

Managing for uncertainty rather than a specific scenario will in many cases be important as well as identifying any win, win opportunities. Moreover, avoiding implementing measures that reduce future options will be critical.



-  Welsh Assembly Government Measures
-  UK Adaptation Sub Committee
-  UK Climate Change Risk Assessment

Annexes



Summary of methodology underpinning the emission figures in the Strategy

3% Target

One Wales contains a broad commitment to ‘3 % annual reductions in carbon reduction-equivalent emissions reductions in areas of devolved competence’. With the support of the Climate Change Commission for Wales, we have developed the definition of the 3 % target in greater detail as set out below.

The 3 % target relates to emissions of the basket of six main greenhouse gases. The target will include all ‘direct’ greenhouse gas emissions in Wales except those from heavy industry and power generation, which are being broadly defined as those installations covered by the EU Emissions Trading Scheme (EU ETS).

Emissions from most large power plants are covered by the EU ETS. However, because we recognise the importance of reducing electricity consumption in order to reduce emissions, we will also be including these emissions in the 3 % target by assigning them to the end-use of the electricity.

We will calculate the emissions associated with that end-use of electricity on the basis of the level of electricity consumption reported in the disaggregated greenhouse inventory multiplied by the carbon intensity coefficient for UK electricity generation.

This means that the direct emissions from transport, the residential sector, the public sector, waste, agriculture and land use change will be included, along with all business and industrial emissions that are not subject to the EU ETS. Additionally, we will be including the emissions resulting from electricity consumption in each sector.

Consequently, the One Wales commitment covers approximately 69 % of emissions from Wales.

In practice, there is mixed competence for emissions from buildings, transport and industry in Wales - with EU, UK and Assembly Government policy, regulation and legislation all having an impact. On the basis of our analysis, we anticipate that approximately 40 % the One Wales target to be met by EU or UK Government measures, a 30 % by specific Assembly Government policies, with the remainder from the anticipated contribution of wider actions taken by business, the public sector and communities across Wales.

We will use the disaggregated greenhouse gas inventory, which reports Wales-specific emissions, as the main data source to set the baseline and measure progress, but will supplement this with other data sources as required.

To measure progress against the target, we will compare the relevant emissions in each year from 2011 onwards to a baseline. This baseline will be an average of the relevant emissions between

2006 and 2010. However, data for 2010 will not be available until September 2012, until that is available we will use an average of the data from the most recent years available.

The baseline has been selected to ensure that it is as up to date as possible, and representative of our emissions levels at the start of the target period. Once emissions data for 2010 becomes available, it will be possible to project the absolute targets for emissions in subsequent years.

Beginning with 3 % in 2011, the target is to reduce greenhouse gas emissions by 3 % of the baseline in each subsequent year.

Progress against the target will be assessed by a simple comparison between the level of emissions and the baseline. We do not intend using any complex accounting systems.

Progress will be reported annually. The greenhouse gas inventories are released around 21 months after the end of the year on which they are reporting.

Table 1 highlights the 3 % target projections. It shows how many MtCO₂e need to be saved on a yearly basis to meet the 3 % target. It also highlights the projected emissions trajectory based on the current baseline of 34.03 MtCO₂e (an average of 2006-2008).

Table 1: 3% target and Mt CO₂e equivalents

	% saving	Emissions saving (MtCO ₂ e)	Emissions trajectory based on current baseline of 34.03 Mt CO ₂ e
2011-2012	3	1.02	33.01
2012-2013	6	2.04	31.99
2013-2014	9	3.06	30.97
2014-2015	12	4.08	29.95
2015-2016	15	5.10	28.93
2016-2017	18	6.13	27.91
2017-2018	21	7.15	26.88
2018-2019	24	8.17	25.86
2019-2020	27	9.19	24.84

The 3 % target equates to savings of 27 % by 2020 (up until, but not including 2020). This requires savings of 9.19 MtCO₂e by 2020, reducing emissions covered by the 3 % target to 24.84 MtCO₂e from 33.01 MtCO₂e.

There will be no ‘banking’ or ‘borrowing’ of emission cuts from one year to the next. Each year’s emissions savings will be judged solely against the 2006-2010 baseline, and not on the previous years achievements.

For example, as highlighted in Table 1, the 3 % target implies Wales needs to achieve savings of 1.02 MtCO₂e by 2012. It does not matter whether we achieve, for instance, 0.50 MtCO₂e or 1.50 MtCO₂e by 2012, we still need to achieve savings of 2.04 MtCO₂e by 2013, 3.06 MtCO₂e by 2014 and so on. The savings achieved in each individual year will not affect the target emission reductions needed to achieve 3 % a year reductions versus our 2006-2010 baseline.

What the disaggregated greenhouse gas inventory covers

The disaggregated greenhouse gas inventory is published annually and reports direct emissions of the six main greenhouse gases: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride emissions.

These are then converted into Carbon Dioxide Equivalent (CO₂e) values, using the current Global Warming Potential (GWP) factors supplied by the International Panel on Climate Change (IPCC).

The inventory methodology is constantly being improved so each publication also updates all previous years, as well as providing data for an additional year.

It takes two years from the publication of data for any given year's emissions, for example 2007 data was first reported in the 2009 publication.

The inventory report presents information in a number of ways including emissions by sector and also into traded / non-traded emissions.

It also covers electricity consumption in Wales. A UK-wide carbon intensiveness factor is used to convert this electricity use into tonnes CO₂e, which is added to the non-traded total.

A UK-wide carbon intensiveness factor has been used in recognition that the National Grid is entirely integrated across Wales and England and it will also minimise the volatility of the figures resulting from changes in generation (a Welsh specific carbon intensiveness factor would be vulnerable to large fluctuations from changes in the operation of individual power stations).

40 % target by 2020

We have also adopted a target that all greenhouse gas emissions in Wales should be reduced by at least 40% in 2020 on a 1990 baseline.

The 3 % and 40 % targets are based on different baselines and hence are not directly comparable.

The 40 % target relates to all greenhouse gas emissions in Wales, not just those in areas of devolved competence - i.e. it includes the traded sector and the baseline year is 1990 not an average of 2006 - 2010.

Since these targets are based on two different baselines it is not possible to extrapolate and expand the 3 % target trajectory to encompass all emissions and back to 1990. It is more meaningful to consider the two targets as two separate commitments that we intend to achieve.



Quantification

The Emission Reduction Delivery Plan indicates the level of emission reductions we anticipate that Assembly Government, UK and EU policies and programmes will achieve. It also highlights the level of emission reduction we anticipate will arise as a result of wider action by people, communities, organisations and businesses in Wales.

The quantification has used Welsh-specific studies estimating likely levels of emission reduction wherever possible.

Where Welsh data has not been available, we have reviewed and used UK Government figures, apportioned to Wales using population statistics or vehicle kilometres (in the case of Transport). In some instances, we have used data from UK Climate Change Committee reports, these usually relate to policy or programmes that have not been directly assessed by either the Assembly Government or the UK Government.

There is mixed competence across all the emission sectors the Strategy covers. This makes quantification challenging and there is a significant risk of double counting. To minimise this risk and to draw on the most detailed quantification work that has been undertaken to underpin our estimates, we started with four main UK packages:

- Domestic Energy Efficiency Package (The Home Energy Management Scheme),
- Non-Energy Intensive Business Package (Carbon Reduction Commitment Energy Efficiency Scheme),
- Energy Intensive Business Package (Climate Change Agreements) and
- UK Transport package.

Assembly Government policies and programmes were assessed and quantified where they could be shown to be additional to the estimates for Wales assumed in the UK packages.


This means that the emission reduction estimates set out in the Delivery Plan are biased toward UK Government programmes delivering a greater share of the emission reduction.

Those Welsh policies and programmes that were identified as being additional were assessed and emissions reduction levels estimated using appropriate methodologies which are set out in 'Valuation of Energy Use and Greenhouse Gases Emissions for Appraisal and Evaluation' provides guidance on the quantification of GHG emissions.

That guidance, provided by DECC, is a supplement to HM Treasury's Green Book.

It ensures that our analysis is consistent by supplying the latest assumptions for quantification inputs like emission factors and energy prices.

We have also had to make assumptions about the phasing of emission reduction policies and options - that is how soon and how completely greenhouse gas savings are realised on the ground.



For this assessment, policies and options have been quantified on the basis of emissions savings and costs in Wales by 2020 (up to, but not including 2020) and it has been assumed that the emissions savings are spread equally (on a linear basis) from their implementation to 2020. Hence, savings calculated from 2011 to 2020 were divided by nine years to estimate their yearly contributions to the 3 % target.

At this stage we do not have the evidence available to inform us of the exact shape of the phasing schedules, however this is a key area of ongoing and future work.

Sector Targets

One Wales makes a commitment to providing specific targets for residential, public and transport sectors. However, in response to the 'Climate Change Strategy - High Level Policy Statement Consultation' at the start of 2009, we have revised our approach to include targets for all sectors.

To provide challenging targets, while at the same time retaining flexibility for each sector to identify and adopt new measures, we have decided to set target ranges for emission reduction for each sector. The minima for the sector target range is the total of emissions savings included in the current package for that sector. The maxima of the range is equivalent to a 3 % cut in emissions in that sector.

However, for the public sector, we have not set a range, but simply a maxima to reflect the Assembly Government's commitment for the public sector to lead by example in efforts to curb emissions.

UK targets and carbon budgets

Kyoto Protocol

Through the Kyoto Protocol, the UK is committed to reducing its greenhouse emissions by 12.5 % over the period 2008 - 2012 against a 1990 baseline.

Climate Change Act 2008

The UK Government has statutory targets to:

- To reduce greenhouse gas emissions by 34 % by 2020 against a 1990 baseline
- To reduce greenhouse gas emissions by 80 % by 2050 against a 1990 baseline

The level of the first three carbon budgets, as provided for in the Carbon Budgets Order 2009, are set out in the table below⁷:

	Budget 1: 2008 - 2012	Budget 2: 2013 - 2017	Budget 3: 2018 - 2022
Carbon Budget (MtCO₂e)	3018	3782	2544
% reduction below 1990 levels	22 %	28 %	34 %
Traded sector (MtCO₂e)	1233	1078	985
Non-traded sector (MtCO₂e)	1785	1704	1559

⁷ These reflect the Committee on Climate Change's recommendations on 'interim budgets' in advance of an international agreement. The Committee on Climate Change also recommended more challenging 'intended budgets' for adoption in the light of an international deal.