



National Assembly for **Wales**
Cynulliad Cenedlaethol **Cymru**

Climate change mitigation: a comparison of the approaches taken by devolved administrations

Abstract

This paper provides background briefing on the approaches to climate change mitigation developed by the devolved administrations in Wales, Scotland and Northern Ireland, and sets the devolved policies within a wider UK and international perspective.

The paper explores regulatory, voluntary and educational measures introduced by the devolved administrations in order to prepare for and reduce the effects of climate change

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Climate change mitigation: a comparison of the approaches taken by devolved administrations

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Executive Summary

This paper outlines the main policy areas under which action is required to mitigate climate change, and considers the approaches and progress made by the devolved administrations in Wales, Scotland and Northern Ireland. The paper highlights a wide variety of schemes driven, regulated, or funded by the devolved governments, and encompasses regulatory, voluntary and educational measures. It is intended for use as a reference guide with most policies and actions presented as brief summaries and with linked references which provide further sources of information. The paper aims to be comprehensive but the breadth of the topic inevitably means that some aspects of policy may not be covered.

The paper outlines action taken by each devolved administration and assesses the merits of these actions. It is designed as a compendium to facilitate comparison and evaluation of the efforts of the Welsh Assembly Government alongside those of the other devolved administrations, and also to highlight policies in place elsewhere that could be of benefit if implemented in Wales.

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Climate change mitigation: a comparison of approaches taken by devolved administrations

1 Introduction

This paper outlines the main policy areas under which action is required to mitigate climate change and considers the progress and approaches made by the three devolved administrations in Wales, Scotland and Northern Ireland¹. The paper highlights a wide variety of schemes driven, regulated or funded by the devolved governments and encompasses regulatory, voluntary and educational measures. The paper gives a broad overview and evaluation of some of the best practice approaches from each administration and is intended to act as a comprehensive reference guide of ideas and possible policies. Since the paper has such broad scope, most topics are summarised in the text, with sources provided for further information. The three administrations are compared side by side in each section of the paper and with reference to the UK context.

2 Background

Climate change has been described by the UK Prime Minister Tony Blair as “the single most important issue that we face as a global community”². An international response is required to tackle this global problem, and international action in reducing emissions is coordinated under the United Nations Framework Convention on Climate Change (UNFCCC), an international treaty which seeks to reduce the emissions of carbon dioxide (CO₂) and five other greenhouse gases (GHG)³.

An important driver of the UNFCCC is the ‘Kyoto Protocol’ an international agreement which introduced mandatory targets on greenhouse gas emissions for nations which have accepted it. The Kyoto Protocol came into force in February 2005⁴ and efforts are to be made by all nations that have ratified the treaty (though this is based on ability to implement changes). The Kyoto Protocol commits the UK Government to achieving a 12.5 per cent reduction in greenhouse gas emissions from 1990 levels over the commitment period 2008-2012. The UK Government has also set a domestic target to reduce CO₂ emissions, using a baseline of 1990, by 20 per cent by 2010, and the UK Climate Change Programme aims to put the UK on a path to cutting CO₂ emissions by some 60 per cent by 2050, with “real progress” by 2020⁵.

These UK targets are shared by the devolved administrations (Table 1), and they must take action to reduce emissions under UK legislation and using their devolved powers.

¹ Northern Ireland’s Assembly was dissolved in October 2002, but climate change policy and action has continued under the direction of the Secretary of State, assisted by Northern Ireland Office Ministers.

² UK Prime Minister Tony Blair speaking at the launch of The Climate Group, London, 27 April 2004.

³ Greenhouse gases: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulphur hexafluoride (SF₆).

⁴ UNFCCC, *A Summary of the Kyoto Protocol*,
http://unfccc.int/essential_background/feeling_the_heat/items/2879.php

⁵ DEFRA, *Climate Change: The UK Programme 2006*,
<http://www.defra.gov.uk/environment/climatechange/uk/ukccp/pdf/ukccp06-all.pdf>

Table 1 UK emissions reduction targets

UK emission targets	Target end date	Emissions	Per cent cut from 1990
Kyoto Protocol	2008-2012	Greenhouse Gases (GHGs)	12.5
UK domestic target	2010	Carbon Dioxide (CO ₂)	20
UK domestic target	2050	Carbon Dioxide (CO ₂)	60

The approach of each devolved administration varies according to economic and geographical factors, including the size of the industrial sector and the relative importance of farming, and the renewable energy methods most suited to the geography. The administrations also vary according to the extent of the powers available to them. The legislation enacted in Scotland could provide a useful starting point when considering the possible approach of the Welsh Assembly Government (WAG) to climate change when the *Government of Wales Act* comes into force.

3 Current greenhouse gas emissions and targets

3.1 Current emissions

In 2003, net UK greenhouse emissions were 181.6MtC⁶ (Megatonnes of Carbon equivalent⁷), a reduction from 1990 levels of 13.4 per cent⁶. However, this UK average masks significant variation in the emissions from each of the four component UK countries (see Table 2).

Table 2 Summary of greenhouse gas emissions in the base year⁸ and 2003 for UK and constituent countries⁹ (expressed as Global Warming Potential-equivalent mass of carbon¹⁰)

Description	Base year ⁸ emissions (MtC)	2003 emissions (MtC)	Percentage change from base year to 2003
Wales	14.2	13.7	-3.6
Scotland	19.6	17.6	-10.1
Northern Ireland	6.2	5.9	-3.5
England	163.6	137.6	-15.9
Un-allocated¹¹	6.1	6.7	10.4
UK	209.7	181.6	-13.4

⁶ DEFRA, 2006, *2004 UK Climate Change Sustainable Development Indicator and Greenhouse Gas Emissions Final Figures*, <http://www.defra.gov.uk/news/2006/060123b.htm>

⁷ Megatonnes of Carbon equivalent (MtC) provides a standardised unit for assessing greenhouse gas emissions. Gas emissions are calculated as their CO₂ equivalent, for example Methane gas (CH₄) is 21 more times more potent as a greenhouse gas than CO₂.

⁸ Base year is 1990 for CO₂, Methane and Nitrous Oxide, and 1995 for Hydrofluorocarbons, Perfluorocarbons, and Sulphur Hexafluoride.

⁹ Baggot, L., et al., 2005, *Greenhouse Gas Inventories for England, Scotland, Wales and Northern Ireland: 1990-2003* http://www.airquality.co.uk/archive/reports/cat07/0509211321_Reghg_report_2003_Main_Text_Issue_1.doc

¹⁰ GWP: Global warming potential (for more information see Annex B).

¹¹ Un-allocated emissions are from sources which cannot be assigned to any one country, ie shipping, commercial aviation, military aviation, naval, and offshore oil and gas.

Oxera's *Synthesis of Climate Change Policy Evaluations (2006)*¹², carried out on behalf of DEFRA and the devolved administrations, estimates that by 2010, 13.8MtC of savings can be achieved through reserved UK measures, and 20.71MtC from devolved policies¹³.

3.2 National emission reduction targets

Each devolved administration has expressed a commitment to achieving the UK Kyoto Protocol and domestic UK emission reduction obligations, and each has decided upon its own supplementary targets (see Table 3).

Table 3 National emission reduction targets

Devolved emission targets	Baseline	Target end date	Emissions under consideration	Cut from baseline
Wales	2000	2020	GHGs	20%
Scotland	1990	2010	GHGs	2.7MtC ¹⁴ (≈13.8%)
Northern Ireland	1990	2025	GHGs	25%
	1990	2025	CO ₂	30%

Wales

The Welsh Assembly Government has expressed its commitment to “contribute fully to meeting UK-wide targets”¹⁵. It has also set a domestic target to reduce greenhouse gas emissions by 20 per cent between a 2000 baseline and 2020. Other specific Welsh targets are currently under development¹⁵.

Scotland

The Scottish Executive is committed to making an “equitable contribution to UK commitments on climate change”¹⁶ and has made a commitment to achieving a ‘Scottish share’ of these targets. This share is a reduction of 1.7 Megatonnes of Carbon (MtC) by 2010, and the Executive aspires for a further 1MtC of greenhouse gas savings by 2010, to make a Scottish Target of 2.7MtC in savings by 2010. These savings targets are discussed in more detail in Section 3.3.

Northern Ireland

Northern Ireland departments are committed to achieving the UK’s Kyoto Protocol target and domestic target for 2010 and have also set a domestic target of a 25 per cent reduction in greenhouse gas emissions from 1990 levels by 2025¹⁷. This Strategic

¹²DEFRA, 2006, *Synthesis of Climate Change Policy Evaluations*, <http://www.defra.gov.uk/environment/climatechange/uk/ukccp/pdf/synthesiscppolicy-evaluations.pdf>

¹³Scottish Executive, March 2006, *Changing our Ways: Annex E - Supporting Analysis for the Scottish Share*, <http://www.scotland.gov.uk/Publications/2006/03/30091039/24>

¹⁴ 2.7 MtC represents a combination of the ‘Scottish Share’ (1.7 MtC) and the Scottish Target (1 MtC). See Section 3.3 for further information.

¹⁵ Welsh Assembly Government, May 2006, *Environment Strategy for Wales*, http://new.wales.gov.uk/topics/environmentcountryside/epg/Environment_strategy_for_wales/About_the_strategy/?lang=en

¹⁶ Scottish Executive, March 2006, *Changing our Ways: Scotland’s Climate Change Programme*, <http://www.scotland.gov.uk/Resource/Doc/100896/0024396.pdf>

¹⁷ DETI NI, May 2006, *First steps towards Sustainability*,



Objective of reducing emissions also includes an 'important step' to reduce CO₂ emissions by 30 per cent below 1990 levels by 2025. The Department of Environment has a target that the Northern Ireland Government estate will be carbon neutral by 2015¹⁷.

3.3 *The Scottish share and Scottish target*

To date, the Scottish Executive is the only devolved administration to have quantified its commitment to the UK Kyoto target. The concept of the 'Scottish share' was published in the 2006 climate change programme and is defined as "the amount of carbon savings that Scotland has to deliver through its devolved policies to match savings from all devolved policies in the UK Climate Change Programme on a per capita basis" by 2010¹⁸.

Scotland is expected to have 8.3 per cent of the UK population by 2010, so the Scottish share was calculated as being 1.7MtC - 8.3 per cent of the 20.71MtC from devolved savings identified by the Oxera research¹⁹. The Scottish Executive has made a commitment to go further than the Scottish share and has introduced an overall 'Scottish target' of 2.7MtC savings by 2010.

Emissions in some Scottish sectors have increased (eg in the transport and residential sectors), and the Scottish share and target have been criticised for considering only carbon 'savings' and not taking into account any increases²⁰. There is also an argument that the 'share' of each devolved administration might be more equitably based on its percentage contribution to emissions and not its population contribution. For example, Scotland's contribution to UK emissions was 9.4 per cent in 1990 and 9.7 per cent in 2003, compared to the population-based share of only 8.3 per cent.

4 Climate change policy documents

The two main policy documents that deal with climate change at the UK level are the Climate Change Programmes (2000 and 2006) and the Sustainable Development Strategies (1999 and 2005). These are complemented at national level by climate change and sustainability documents produced by the devolved administrations. Other more specific documents outline action necessary in specific areas such as energy, emissions, waste, transport and agriculture and these are discussed in later sections of this paper.

The *UK Climate Change Programme* (2006) is available on the DEFRA website at:
<http://www.defra.gov.uk/environment/climatechange/uk/ukccp/pdf/ukccp06-all.pdf>

Securing the Future- UK Sustainable Development Strategy (2005) is available at:
<http://www.sustainable-development.gov.uk/publications/uk-strategy/index.htm>

4.1 *Devolved climate change programmes*

Wales

<http://www.doeni.gov.uk/epd/susdev.pdf>

¹⁸ Scottish Executive, March 2006, *Changing our ways Scotland's Climate Change Programme*,
<http://www.scotland.gov.uk/Resource/Doc/100896/0024396.pdf>

¹⁹ DEFRA, 2006, *Synthesis of Climate Change Policy Evaluations*,
<http://www.defra.gov.uk/environment/climatechange/uk/ukccp/pdf/synthesiscppolicy-evaluations.pdf>

²⁰ Scottish Green Party, June 2006, *Executive hot air on climate change exposed*,
http://www.scottishgreens.org.uk/site/id/5194/title/Executive_Hot_Air_On_Climate_Change_Exposed.html

The Welsh Assembly Government does not have a specific climate change programme but published its first environment strategy and action plan in May 2006. This sets the strategic direction of environmental action in Wales until 2026 and has climate change as a central theme. The accompanying environment action plan details the specific actions, over and above current policies and actions already in place, which are required to deliver the aims of the environmental strategy. A total of 62 actions are outlined, including a commitment to produce an energy route map by the end of 2006, and a climate change 'adaptation action plan' by March 2007. Several short term (up to 2008) goals are listed for each action and the progress towards these targets will be measured and reviewed annually, with new goals added over time.

Links to the 2006 Welsh Environment Strategy and Action Plan may be found at:
http://new.wales.gov.uk/topics/environmentcountryside/epq/Environment_strategy_for_wales/About_the_strategy/?lang=en

Scotland

Scotland is the only devolved administration to have published a specific climate change programme. The first Scottish climate change programme, *Making it Work Together*, was published in 2000, shortly after the first UK programme, and was recently superseded by a second programme, *Changing our Ways*, published in March 2006. Actions outlined in the programme include encouraging energy efficiency, development of renewable energy, promotion of cleaner vehicle technology, promotion of waste recycling and increasing forest cover.

The 2006 Scottish climate change programme may be found at:
<http://www.scotland.gov.uk/Publications/2006/03/30091039/0>

Northern Ireland

The Northern Ireland departments have yet to produce a comprehensive climate change or environment strategy. In 2005 the Environment and Heritage Service (EHS) published a guidance document for public bodies on how climate change is likely to influence their work and how best to adapt to these changes. This guidance considers impacts such as increased coastal and river flooding, changes in rainfall and the growing season, disruption of travel, and changes in biodiversity. Possible means of mitigation are offered.

The 2005 EHS climate change guidance document may be found at:
<http://www.ehsni.gov.uk/pubs/publications/guidanceweb.pdf>

4.2 Devolved sustainable development strategies

Sustainable development is a cross-cutting concept which aims to create wealth while at the same time balancing social, economic and environmental concerns. The achievement of sustainable development has many similar requirements and actions to those needed to reduce climate change. A common commitment to sustainable development was set out in the UK strategic framework, *One Future - Different Paths*. This document sets out common challenges and goals to be met by separate strategies under each administration.

One Future - Different Paths can be found at:
<http://www.sustainable-development.gov.uk/publications/pdf/SD%20Framework.pdf>

Wales



The National Assembly for Wales has a unique constitutional duty, under Section 121 of the *Government of Wales Act 1998*, to consider sustainable development when exercising all its functions²¹. To help achieve this, the Assembly adopted a sustainable development scheme, *Learning to Live Differently*, in November 2000 which sets out key principles to guide the work of the Assembly and to help ensure that sustainable development is at the heart of all policy decisions. The sustainable development scheme must be reviewed in the year following an election and the 2000 scheme was revised in 2004 and renamed *Starting to Live Differently*. The scheme is structured according to preferred approaches to achieving sustainable development and not aimed at specific sectors. These approaches include: decision making; strategic policies; policy actions; working with others; leading by example and setting and using indicators and targets.

Wales has also published two Sustainable Development Action Plans, one in 2002 and one in 2004, which detail the actions required to achieve the vision set out in the sustainable development scheme. The 2004 action plan runs from 2004 – 2007 and contains 94 individual commitments, including a stipulation that 100 per cent of the electricity used in all Assembly buildings will be supplied from renewable sources or good quality embedded generation by 2010 and a commitment to investigate alternative fuels. Progress towards achieving these commitments is reviewed annually in a written report; the most recent report (June 2006) stated that 83 out of the 94 current action plan commitments had already been met or were on course for completion.

The revised sustainable development scheme, *Starting to Live Differently*, is available at: <http://www.wales.gov.uk/themessustainabledev/content/review/revised-scheme-e.htm>

The 2004-2007 Action Plan can be found at: <http://www.wales.gov.uk/themessustainabledev/content/review/action-plan-scheme-e.pdf>

The new *Government of Wales Act 2006* received Royal Assent on 25 July 2006.²² Following the 2007 Assembly Elections, new provisions relating to sustainable development will come into force. The statutory duty for the Welsh Assembly Government to produce a sustainable development scheme and report annually on its progress is provided for by Section 79.

Scotland

The first Scottish sustainable development strategy, *Choosing our Future*, was published in 2005. Important themes in the strategy include travel, food, environmental justice, thriving communities, waste, the built environment, natural heritage, and natural resources. Climate change is viewed as an integral part of each theme. The first annual progress report and a sustainable development implementation plan were published in July 2006. The implementation plan sets out 47 'workstreams' by which sustainable development may be achieved, including the publication of the new climate change programme, and work on energy efficiency and renewable energy. The progress report states that 38 out of the 47 workstreams have been achieved or are 'on track' to be completed by their target date. Nine of the workstreams have experienced 'some slippage' against their target timescales, while none are considered 'off track' and in need of corrective action.

Choosing our Future is available at: <http://www.scotland.gov.uk/Publications/2005/12/1493902/39032>

²¹ OPSI, *The Government of Wales Act 1998*, <http://www.opsi.gov.uk/acts/acts1998/19980038.htm>

²² OPSI, *The Government of Wales Act 2006*, <http://www.opsi.gov.uk/acts/acts2006/20060032.htm>

The first annual progress report on the sustainable development strategy and the strategy implementation plan are available at:

<http://www.scotland.gov.uk/Resource/Doc/921/0033436.pdf>

Northern Ireland

Northern Ireland published its first sustainable development strategy *First Steps Towards Sustainability* in May 2006. The strategy contains a specific chapter on climate change and energy and this specifies three key objectives that seek to:

- Reduce greenhouse gas emissions, principally by promoting energy efficiency and the use of renewables
- Establish Northern Ireland as a world class exemplar in the development and use of renewable energy technology
- Plan and prepare for climate change impacts in Northern Ireland

More generally, the strategy imposes a statutory duty upon relevant public bodies, based on the Welsh model, to “take account of sustainable development in the exercise of their functions”. The strategy also announced that the responsibility for achieving sustainable development will move from the Department of Environment (DoE) to the office of the First Minister and Deputy First Minister in recognition of the cross-cutting importance of sustainable development. An action plan to accompany the sustainable development strategy is expected to be published by the end of 2007 and progress reports will be produced annually.

First Steps Towards Sustainability is available on the DoE website at:

<http://www.doeni.gov.uk/epd/sustainable%20development.asp>

5 Energy and emissions

The energy sector contributes more emissions than any other sector in each of the devolved countries. The emissions from energy increased in Scotland and Wales between 1990 and 2003, but fell in Northern Ireland²³. Overall energy policy is reserved to the UK Government, but devolved administrations have control over the planning and development of renewable energies and have been given scope to influence energy efficiency.

5.1 Energy efficiency

Energy efficiency is aimed at reducing energy consumption and may be achieved in two main ways:

- By reducing the demand for energy through consumer behaviour and technological advances
- By improving power generating technology and obtaining a higher energy output from the same resource input.

5.1.1 Efficiency in energy use

Wales

²³ DEFRA, 2006, *Climate Change: The UK Programme 2006*,
<http://www.defra.gov.uk/ENVIRONMENT/climatechange/uk/ukccp/pdf/ukccp06-all.pdf>



Under the *Sustainable Energy Act 2003*, the Welsh Assembly Government was required to set targets for energy efficiency savings²⁴, and these were published in the energy efficiency action plan *Energy Saving Wales*²⁵, in October 2004. This plan aims to support the promotion of energy efficient practices by:

- Highlighting the help available and improving access to practical guidance
- Helping business become more competitive through increased energy efficiency
- Reducing fuel poverty through simple, cost effective energy efficiency measures
- Encouraging adoption of energy efficiency best practice by public bodies
- Promoting and developing the environmental goods and services sector in Wales

Energy Saving Wales is available at:

<http://www.businessenvironment.wales.gov.uk/documents/esw-e.pdf>

To promote the use of energy saving measures set out in the 2004 action plan, WAG has set up an Energy Saving Wales 'portal website'. This provides web-links to publicly funded bodies that offer information, advice and support on all aspects of energy efficiency to householders, public sector organisations and business.

The Energy Saving Wales portal is available at:

<http://www.energysavingwales.org.uk/index.cfm>

Green Dragon is an independent environmental management certification scheme for Wales administered by the ARENA network and Groundwork Wales. It aims to reduce resource and energy use and promote more efficient operations through the implementation of an environmental management system. The Welsh Assembly Government offices at Cardiff and Powys have completed all stages of the certification process and have been certified Green Dragon Level 5²⁶.

The Green Dragon website is available at:

<http://www.greendragonems.com/english/index.asp>

Scotland

Scotland has experienced a recent rise in energy consumption in the residential sector and improving energy efficiency in this sector is likely to be important in reducing emissions. An energy efficiency strategy is in development and is expected to be made available by the end of 2006. The likely objectives²⁷ of the energy efficiency strategy are to:

- Define the Executive's policy objectives for energy efficiency
- Ensure Scotland makes a significant contribution to UK carbon emissions targets
- Set agreed methods for measuring progress
- Identify priority sectors and methods for Executive intervention
- Increase co-operation across the Executive and with other bodies (including UK government)
- Improve the impact of the Executive's investment in energy efficiency

²⁴ OPSI, *The Sustainable Energy Act 2003*,

<http://www.opsi.gov.uk/ACTS/acts2003/20030030.htm#3>

²⁵ Welsh Assembly Government, October 2004, *Energy Saving Wales*,

<http://www.businessenvironment.wales.gov.uk/documents/esw-e.pdf>

²⁶ Green Dragon, *Certified Companies*,

<http://www.greendragonems.com/certifiedcompanies/levels.asp?level=5>

²⁷ Scottish Executive, May 2005, *Energy Efficiency Strategy*,

<http://www.scotland.gov.uk/Resource/Doc/921/0011732.ppt>

- Communicate clear explanation of the Executive's energy efficiency policy

More information on the expected content of the energy efficiency strategy is available at:
<http://www.scotland.gov.uk/Resource/Doc/921/0011732.ppt>

In 2004, the Scottish Executive launched the Central Energy Efficiency Fund (CEEF), a Public Sector initiative to reduce carbon emissions across the public sector in Scotland. £20 million in funding was provided over 2004/05 and 2005/06 to implement energy efficiency measures in local authorities (£15m), NHS Trusts (£4m) and Scottish Water (£1m). The finance was used to set up a revolving loan fund administered at local level: as savings accrue from funded schemes, repayments are made to the fund that enable further loans to be disbursed.

More information on the Scottish CEEF is available at:
http://ceef.energy-efficiency.org/view_item.aspx?item_id=1833

Northern Ireland

The Northern Ireland Department of Enterprise, Trade and Investment (DETINI) produced a strategic energy framework for Northern Ireland in 2004. The strategy has four main policy goals: to reduce energy costs, to build competitive energy markets, to enhance the sustainability of energy use and production, and to ensure reliable energy supplies.

The 2004 DETINI strategy is available at:
<http://www.detini.gov.uk/cgi-bin/downutildoc?id=547>

The Northern Ireland Central Energy Efficiency Fund was established in 1993 and provides support for energy and carbon saving measures which cannot be financed from within Departmental budgets. The fund is open to all Northern Ireland Departments, Health Trusts, Education and Library Boards, District Councils and non-departmental public bodies. The CEEF has an estimated annual budget of £2.7 million²⁸.

More information on the Northern Ireland CEEF is available at:
<http://www.dfpni.gov.uk/index/public-sector-energy-campaign/psec-ceef.htm>

Case study projects funded by the scheme may be viewed at:
http://www.dfpni.gov.uk/selected_studies.pdf

5.1.2 Efficiency in energy production: Combined Heat and Power (CHP)

Combined Heat and Power (CHP) is a specific technological means of increasing energy efficiency which focuses on the co-production and utilisation of electricity and heat. Electricity production in traditional power stations is only 30-50 per cent efficient²⁹; the remainder of consumed energy is converted into heat energy, which has traditionally been lost through power station cooling towers. If captured, this 'waste' heat could be used to

²⁸ DEFRA, April 2004, *Energy Efficiency The Government's Plan for Action*,
<http://www.archive2.official-documents.co.uk/document/cm61/6168/6168.pdf>

²⁹ Carbon Trust, 2004, *GPG359 Good Practice Guide: Utilising Third Party CHP Schemes to Benefit your Buildings*,
<http://www.carbontrust.co.uk/publications/publicationdetail.htm?productid=GPG359&metaNoCache=1> (registration necessary to access document)



supply heat to homes and businesses. In this way, the efficiency of energy consumption can be increased to 65-80 per cent, and the use of what would be wasted heat 'displaces' fossil fuel consumption. CHP plants generally involve small-scale, decentralised energy systems, where networks of buildings, or large individual buildings, produce their own electricity and heat.

The UK Government has set a target to have 10,000 MW of 'good quality CHP' electrical capacity installed by 2010 and the devolved administrations must contribute to this. However, CHP opportunities vary from region to region because of the availability of suitable sites³⁰ and access to the main gas network³¹. The latest figures (2005) for CHP capacity in each of the UK countries, and the UK total, are given in Table 4.

Table 4 Combined Heat and Power capacity in the UK in 2005³²

Country	Number of Schemes	Electrical capacity (MWe ³³)	Heat Capacity (MWth ³⁴)
Wales	86	208	370
Scotland	88	777	3,139
Northern Ireland	32	32	93
England	1,328	4,782	8,796
UK	1,534	5,792	12,398

Wales

CHP installations may be approved in Wales if the electrical capacity is less than 50MW; installations of greater capacity than that require approval from the DTI. In 2005, Wales had an installed electrical CHP capacity of 208 MWe, 3.6 per cent of the UK total, and a heat capacity of 370 MWth (3.0 per cent of the UK total).

Scotland

Policy on CHP is reserved to the UK Government³⁵. In 2005, installed electrical capacity was 777 MWe, 13.4 per cent of the UK total, while installed heat capacity was 3,176 MWth, 25.3 per cent of the UK total.

Northern Ireland

³⁰ In practice, CHP technology is most viable at sites that have a high demand for heat, for example, large industrial sites, community heating networks (aggregation of several diverse buildings onto a single CHP served network), and in large individual buildings such as hospitals.

³¹ The CHP fuel trend is away from oil and coal, and towards natural gas.

³² DTI, September 2006, *Energy Trends*, <http://www.dti.gov.uk/files/file34201.pdf>

³³ MWe = MegaWatts electric = Million Watts of electrical capacity

³⁴ MWth = MegaWatt thermal = Million Watts of thermal capacity

³⁵ DEFRA, 2006, *Tomorrow's Climate, Today's Challenge The UK Climate Change Programme 2006*, <http://www.defra.gov.uk/ENVIRONMENT/climatechange/uk/ukccp/pdf/ukccp06-all.pdf>



Policy for CHP is devolved to the Northern Ireland Administration³⁴. Northern Ireland has a CHP capacity of approximately 2 per cent of the installed electricity generating capacity compared with the UK figure of 7.6 per cent. There are two main factors contributing to this gap. Firstly, Northern Ireland has a relatively low industrial/manufacturing base and secondly, the natural gas is of limited availability in Northern Ireland. Despite these drawbacks, Northern Ireland has performed well in other ways with twice as many CHP plants in the non-industrial sector, on a per capita basis, as the rest of the UK. The Northern Ireland administration aims to introduce biomass fuelled CHP to the Government buildings to achieve a carbon neutral estate by 2015.

5.2 Renewable energy

Renewable energy refers to energy resources that, if properly managed, are replenished by natural processes at a rate that is equal to or faster than the rate at which the resource is being consumed³⁶. Increasing energy production from renewable sources is essential in reducing greenhouse gas emissions as their use may be regarded as either 'carbon free' or 'carbon neutral'. Carbon free energy includes wind, solar, tidal, wave, and hydro-electric power. Carbon neutral includes biomass, bio-diesel, bio-ethanol and animal derived waste: 'biofuels' which are derived from living organic matter. The UK Government has set a target that 10 per cent of electricity generation is to be from renewable sources by 2010³⁷ (20 per cent by 2020), and the devolved administrations are committed to achieving their contributions towards this total.

All devolved administrations have set targets for renewable electricity generation equal to or greater than the UK-wide 10 per cent by 2010. Wales has a domestic target for 4TWh³⁸ (10.7 per cent of Wales' anticipated electricity production³⁹) of electricity to be generated from renewable sources by 2010⁴⁰, and has also set a long-term target of 7TWh by 2020. Scotland has a target to produce 18 per cent of its electricity from renewable sources by 2010, and 40 per cent by 2020⁴¹. Northern Ireland aims to achieve at least 12 per cent of electricity generation from renewable sources by 2012⁴². The UK and national renewable energy targets are summarised in Table 5.

Table 5 UK and national targets for renewable electricity production

	Proportion of electricity production	Target date
UK	10%	2010
	20%	2020
Wales	4 TWh (≈10%)	2010
	7 TWh	2020
Scotland	18%	2010

³⁶ Fossil fuel is theoretically renewable and carbon neutral over a very long time scale, but is not being used in a sustainable manner: the rate of coal, oil and gas use far outpaces their renewal through long-term geological processes.

³⁷ DTI, 2003, *Energy White Paper: Our Energy Future – Creating a Low Carbon Economy*, <http://www.dti.gov.uk/files/file10719.pdf>

³⁸ The base unit of electricity is 1 kilowatt (kW) hour, 1,000 kW equals 1 megawatt, 1,000 megawatts equals 1 gigawatt (GW) and 1, 000 gigawatts equals 1 terrawatt (TW).

³⁹ Welsh Assembly Government, 2002, *Review of Energy Policy in Wales – Part 1: Renewable Energy*, <http://www.wales.gov.uk/assemblydata/3CC82C8F0000819C0000503700000000.pdf>

⁴⁰ Welsh Assembly Government, 2005, *Technical Advice Note 8: Planning for Renewable Energy*, http://new.wales.gov.uk/docrepos/40382/4038231121/403821/403821/40382/TAN_8/tan8-pages1-21-e.pdf?lang=en

⁴¹ Scottish Executive, 2003, *Securing a Renewable Future: Scotland's Renewable Energy*, <http://www.scotland.gov.uk/Resource/Doc/47034/0014765.pdf>

⁴² Department of Enterprise, Trade and Investment, 2004, *Energy: A Strategic Framework for Northern Ireland*, <http://www.detini.gov.uk/cgi-bin/downutildoc?id=547>



	40%	2020
Northern Ireland	12%	2012

5.2.1 Wind power

There is a huge potential wind resource in each of the UK countries, and wind power is currently the most economically and technologically viable of the large scale renewable energy developments. Wind power is being actively promoted by each of the devolved administrations. The current and planned wind power (both onshore and offshore) developments in Wales, Scotland and Northern Ireland, with reference to England and the UK as a whole, are listed in Tables 6 and 7.

Table 6 Current operational wind farms (onshore and offshore) in the UK⁴³

Country	Number of sites	Number of Turbines	Capacity (MW)	Annual homes equivalent ⁴⁴
Wales	26	515	361.2	201,965
Scotland	38	638	934.1	522,301
N. Ireland	12	127	106.6	59,605
England	59	569	538.7	301,214
UK total	135	1618	1940.6	1,085,044

Table 7 Comparison of number of completed and potential wind farms in the UK⁴²

Country	Operational	Under construction	Consented	In planning
Wales	26	1	7	14
Scotland	38	11	38	74
N. Ireland	12	0	6	26
England	59	7	39	68
UK total	135	19	90	182

Wales

The Welsh Assembly Governments' approach to renewable energy was outlined in Technical Advice Note (TAN) 8 *Planning for Renewable Energy*, published in July 2005. This promotes onshore wind energy as providing "the greatest potential for an increase in generation of electricity from renewable energy in the short to medium term" and predicts that an additional 800 MW capacity from wind power is required to meet the Welsh target for renewable electricity generation of 4 TWh for 2010. The advice note sets out seven 'Strategic Search Areas' (SSAs) in which, for environmental and efficiency reasons, large scale (>25MW) onshore wind developments should be concentrated. These SSAs were chosen to maximise efficiency and to avoid designated conservation areas such as National Parks, and Areas of Outstanding Natural Beauty.

⁴³ Data from the British Wind Energy Association, *Statistics*, <http://www.bwea.com/statistics/>

⁴⁴ Calculated as the rated capacity of wind development (kW) x 0.3 (capacity factor) x 8760 (hours per year) / 4700 (average household electricity consumption in kWh). For further information, see <http://www.bwea.com/edu/calcs.html>

TAN 8 guidance *Planning for Renewable Energy* is available at:

http://new.wales.gov.uk/docrepos/40382/4038231121/403821/403821/40382/TAN_8/tan8-pages1-21-e.pdf?lang=en

Scotland

The equivalent planning advice in Scotland is contained in Planning Advice Note (PAN) 45, *Renewable Energy Technologies*, a revised version of which was published in 2002. This provides information and planning advice on a range of renewable energy technologies. PAN 45 is to be revised in 2006 to include new guidance on the spatial development of renewable energy installations.

PAN 45 *Renewable Energy Technologies* is available at:

<http://www.scotland.gov.uk/library/pan/pan45.pdf>

Northern Ireland

The Northern Ireland Planning Service has produced a short Regional Planning Policy note on Renewable Energy: Public Services and Utilities (PSU) 12. The policy note sets out the need to assess proposals for renewable energy sources against the need to protect and conserve the environment.

Renewable Energy PSU12 is available at:

http://www.planningni.gov.uk/AreaPlans_Policy/Strategies/PlanStratforRuralNI/Part3_Policies/PSU/PSU12.htm

In 2004, the Northern Ireland DETI (in conjunction with a private energy company) published a *Study into the Renewable Energy of the six counties of Northern Ireland* which provides detailed analysis of the most viable renewable energy sources on a regional basis across Northern Ireland. The study focused strongly on onshore and offshore wind.

The full study report is available at: <http://www.detini.gov.uk/cgi-bin/downutildoc?id=586>

5.2.2 Tidal and wave power

There is a large potential resource for commercial tidal and wave-based power generation in each of the UK countries but at present the technology is less advanced than for wind power. These renewables also have more uncertain and potentially more complicated impacts on wildlife and the environment. Current action by the devolved administrations is generally centred on technological research and small-scale demonstration projects, with the notable exception of a large-scale commercial installation under consideration by the Welsh Assembly Government.

Wales

The Welsh Assembly Government is considering proposals to build a large-scale tidal barrage across the Severn Estuary and submitted the barrage plans for consideration in the UK energy review. The energy review recommended further research to explore possible environmental issues and public acceptability. The Severn estuary has the second largest tidal range in the world⁴⁵ with a huge potential for power generation: if constructed the barrage could supply 5 per cent of UK energy needs. However, the

⁴⁵ JNCC, 2001, *SPA description Severn Estuary*,
<http://www.jncc.gov.uk/default.aspx?page=2066>



timescale for completion of a barrage would be from 6⁴⁶-15⁴⁷ years, so it would not contribute to the 2010 target, and critics argue that the environmental impacts on the estuary would be severe. Environmentalists have for some time⁴⁸ advocated alternative schemes using 'tidal lagoons' to harness the tidal power in the estuary.

The position of the Welsh Assembly Government on the Severn Barrage development is set out in a press release from April 2006:

<http://new.wales.gov.uk/news/pressreleasearchive/businesseconomy/April2006bus11/260406energy.jsessionid=A72EAFBAACBBEF5646027D1908A8146C.www1?lang=en>

A report by Friends of the Earth, which considers the relative merits of the barrage and tidal lagoon schemes can be viewed at:

http://www.foe.co.uk/resource/briefings/severn_barrage_lagoons.pdf

Scotland

A consultation on the Renewables Obligation (Scotland) was initiated by the Scottish Executive in September 2006⁴⁹. In the consultation document, the Scottish Executive clearly states its preference for enhanced support of wave and tidal energy. FREDS (Forum for Renewable Energy Development) is a partnership set up by the Scottish Executive to help them reach their renewable target in 2020. It has produced reports recommending how development in emerging renewables can be accelerated.

These FREDS reports are available at:

<http://www.scotland.gov.uk/Topics/Business-Industry/infrastructure/19185/17613>

The Scottish Executive has also provided £3 million in funding to the European Marine Energy Centre (EMEC) at Orkney, a test facility that has enabled the sale of wave-generated electricity to the national grid since 2004⁵⁰, and that plans to develop facilities to harness tidal energy.

The EMEC website can be found at: <http://www.emec.org.uk/>

Northern Ireland

The Northern Ireland Environment and Heritage Service has granted permission for a small-scale test site to be developed to explore the potential of tidal power in Strangford Lough, which has one of the strongest tidal currents in the UK. The project is part funded by the DTI and will supply electricity to the national grid sufficient to supply 800 homes.

More information on the Strangford Lough scheme can be found at:

http://www.marineturbines.com/mct_text_files/051604%20News%20Letter%20V2.pdf

5.2.3 Biofuels

⁴⁶ BBC, 21 April 2006, *Backing for Severn Barrage Power*, http://news.bbc.co.uk/1/hi/wales/south_east/4927744.stm

⁴⁷ Friends of the Earth, 11 April 2006, *Severn Barrage is not the answer*, http://www.foe.co.uk/resource/press_releases/severn_barrage_is_not_the_11042006.html

⁴⁸ For example, the Environment Trust (since November 2003): http://news.bbc.co.uk/1/hi/wales/south_west/3234548.stm;

Friends of the Earth (since October 2004): http://www.foe.co.uk/cymru/english/press_releases/2004/tidal_lagoon_power.html

⁴⁹ The Scottish Executive, September 2006, *Renewables Obligation (Scotland) – Statutory Consultation*, <http://www.scotland.gov.uk/Resource/Doc/1086/0039679.pdf>

⁵⁰ EMEC and OPD Press Release, August 2004, *First Electricity from Offshore Wave Power Generated and Supplied to the UK Grid*, <http://www.oceanpd.com/PDFS/OPD%20EMEC%20PR%2023-AUG-2004.pdf>

A biofuel is any fuel that is derived from biomass, specifically, from recently living organisms. The most important biofuels from the UK perspective are ethanol, biodiesel, and wood (biomass).

The uptake of biofuels for transport is promoted by UK and EU targets. The Renewable Transport Fuel Obligation is the principal mechanism for achieving increased use of biofuels⁵¹. The Obligations stipulate proportions of biofuel (by volume) in the overall transport fuel mix; these proportions are shown in Table 8.

Table 8 Proportion of biofuel required in the overall transport fuel mix

Financial year	Level of obligation (by volume)
2008/09	2.5%
2009/10	3.75%
2010/11	5.0%

Biofuels contributed about 0.24 per cent (by volume) of total road fuel sales in 2005⁵¹.

About 1.85 per cent of electricity supply in the UK in 2004 was derived from biomass⁵¹.

Wales

The Welsh Assembly Government aimed to produce a biomass energy strategy document by mid 2006⁵². Key tasks identified in the *Energy Wales Route Map* consultation document were to research an appropriate biomass energy strategy for Wales, and to assist in the process of setting achievable targets for biomass-generated electricity and heat.

WAG has provided funding, through European structural funds, for the development of a £33 million Wood Energy power plant at Margam. The plant will have a 13.8MW capacity (enough to heat and power 31,000 homes), and will supply electricity to the national grid through the use of surplus product from the timber industry. Construction began in July 2006, and is expected to take two years to complete. £4.95 million of the funding was provided by the DTI through the Bioenergy Capital Grants Scheme.

Further information on the Margam project is available at:
<http://www.wefo.wales.gov.uk/default.asp?action=newsdetail&ID=1737>

The Wood Energy Business Scheme (WEBS) is a Forestry Commission Wales initiative, funded by the Welsh Assembly Government, which aims to establish a network of wood-fuelled installations across Wales. Public or private buildings such as schools, hospitals, hotels, factories or offices may be eligible for grants towards the capital costs of installing wood fuel heating systems, installing Wood Fuel Processing equipment and installing wood-fuelled CHP systems below 5MWe. WEBS is able to offer up to 48.2 per cent

⁵¹ Department for Transport, 2006, *Promotion and Use of Biofuels in the United Kingdom*, http://www.dft.gov.uk/stellent/groups/dft_roads/documents/pdf/dft_roads_pdf_611908.pdf

⁵² Welsh Assembly Government, April 2005, *Energy Wales: Route Map to a Clean Low-Carbon and More Competitive Energy Future for Wales*, <http://new.wales.gov.uk/docrepos/40382/4038231141/40382112412/energyroutemape.pdf?lang=en>

funding for any of the eligible costs. The Forestry Commission in Wales has also committed part of the Assembly's woodland resource to help launch the industry.

More information on WEBS is available at:

<http://www.woodenergybusiness.co.uk/en/default.aspx>

Scotland

Scotland's Biomass Energy Group has estimated that the industry in Scotland could supply as much as 450MW of electricity from the wood fuel resource⁵³.

In June 2006, the Scottish Executive announced a green fuels initiative aimed at encouraging farmers in the Lothian region of Scotland to grow energy crops fertilised using treated solid waste. There will be financial help available to farmers in the scheme which is expected to produce five million litres of biofuel each year. However, it is anticipated that the energy crops will be exported for processing to continental Europe and a necessary next step would be to provide processing facilities in Scotland.

Details of the green fuels initiative are provided in a press release from June 2006 available at: <http://www.scotland.gov.uk/News/Releases/2006/06/22095539>

The first Scottish large-scale biodiesel plant (to convert used cooking oil and animal fats into usable fuel) became operational in 2005⁵⁴.

Northern Ireland

The largest biofuel wood pellet plant in the UK opened in Northern Ireland in 2005 and is operated in conjunction with a timber processing plant run by Balcas (a wood product supply company). The development was part-funded by a £2million grant from the Department of Trade and Industry. The Balcas saw mill uses sawdust and wood chips from timber processing to produce wood pellets. The plant will produce 50,000 tonnes of fuel pellets annually, enough to provide the energy requirements of 10,000 homes in Northern Ireland and to generate enough clean electricity to supply all of the Balcas site's electricity and heating requirements⁵⁵. Electricity is generated on site at a 2.5MW CHP plant and surplus electricity is supplied to the National Grid⁵⁶. Balcas also estimate that the processing of the wood pellet co-products on-site results in 10,000 fewer truck journeys per year; a travel saving of 1.5 million miles, with attendant emission reductions.

Further information on the Balcas project is available at:

http://news.bbc.co.uk/2/hi/uk_news/northern_ireland/4568868.stm

5.2.4 Microgeneration

Microgeneration refers to renewable electricity or heat generation by consumers at a small community or domestic scale. The dominant technologies at this scale are solar water heating systems, heat pumps (ground, water or air), biomass stoves and boilers, solar photo-voltaic (PV) electricity systems, micro-wind turbines, micro-hydro systems and

⁵³ Scottish Executive, 2005, *Promoting and Accelerating the Market Penetration of Biomass Technology in Scotland*, <http://www.scotland.gov.uk/Resource/Doc/35596/0027973.pdf>

⁵⁴ BBC, 2005, *Green Biodiesel Production Starts*, <http://news.bbc.co.uk/1/hi/scotland/4409369.stm>

⁵⁵ DETI NI, 2004, *Timms Announces Major Renewable Energy Production Facility for Northern Ireland*, <http://www.detini.gov.uk/cgi-bin/morenews?util=528>

⁵⁶ Balcas, *Biomass Fuel*, <http://www.balcas.com/articles/chp.html>

micro-CHP⁵⁷. All of the devolved administrations actively promote microgeneration, but there are no targets for penetration of any microgeneration technology at any UK level. The UK-wide approach set out in the microgeneration strategy published in March 2006 argues that it is too early in the development of a market to set a meaningful target.

The UK strategy on microgeneration, *Power From the People*, is available at:
<http://www.dti.gov.uk/files/file27575.pdf>

Wales

The Welsh Assembly Government aims to produce a microgeneration action plan for Wales and published a consultation document on this in April 2006. This looks at how best to facilitate the uptake of microgeneration, and explores actions in raising public awareness and knowledge, promoting Welsh manufacturing and installation of micro-generation technology, developing best practice flagship projects, and encouraging research and development.

The Microgeneration Action Plan consultation is available at:
http://new.wales.gov.uk/docrepos/40382/4038231141/40382112413/MICROGENERATION_ACTION_PLAN1.pdf?lang=en

A pilot internet portal, *Energy Saving Wales*, has also been set up which provides information on legislation and sources of funding related to microgeneration projects, as well as courses in renewable energy and general advice on the various microgeneration technologies. At present Wales is the only administration that does not have a specific funding stream for microgeneration.

The Energy Saving Wales web portal is available at:
<http://www.energysavingwales.org.uk/index.cfm>

Scotland

The Scottish Executive supports microgeneration through the Scottish Community and Household Renewables Initiative (SCHRI) which offers grants, advice, and project support to assist community and household renewables schemes. As well as providing help and advice, specific grants of up to 30 per cent of installation costs, up to a maximum of £4,000, are available to home owners installing household microgeneration facilities.

More information on SCHRI is available on the Energy Saving Trust website at:
<http://www.est.org.uk/schri/>

In May 2006, the Scottish Executive published an Annex⁵⁸ to the Renewable Energy Technologies Planning Advice Note 45⁵⁹ which provides planning advice on micro-renewables.

The 2006 *Planning for Micro-renewables* Annex to Pan 45 is available at:
<http://www.scotland.gov.uk/Resource/Doc/112453/0027329.pdf>

Northern Ireland

⁵⁷ Department of Trade and Industry, 2006, *Our Energy Challenge: Power From the People*,
<http://www.dti.gov.uk/files/file27575.pdf>

⁵⁸ Scottish Executive, 2006, *Planning for Micro-Renewables*,
<http://www.scottishexecutive.gov.uk/Resource/Doc/112453/0027329.pdf>

⁵⁹ Scottish Executive, 2002, *Planning Advice Note 45: Renewable Energy Technologies*,
<http://www.scotland.gov.uk/library/pan/pan45-00.asp>

A microgeneration funding scheme for Northern Ireland, 'The Environment and Renewable Energy Fund', was launched in February 2006. This will provide £59 million of funding for research and demonstration, accelerated deployment, building market capacity and underpinning knowledge. A £300 million contribution from the private sector is also expected, with £150 million collected so far.

A press release explaining the principles behind the new scheme is available at:
<http://www.nio.gov.uk/media-detail.htm?newsID=12785>

A breakdown of the actions to be funded by the £59 million scheme is provided at:
<http://www.detini.gov.uk/cgi-bin/downdoc?id=1985>

The Northern Ireland Department of Enterprise Trade and Industry (DETI NI) is involved in 'Action Renewables', a telephone- and internet-based advice scheme which aims to stimulate awareness of issues associated with conventional energy use and the range of solutions available through renewable energy technologies.

Information on the help available through Action Renewables is available at:
<http://www.actionrenewables.org/helpavailable.htm>

6 Waste: reduction, reuse and recycling

The management of waste is an important facet of climate change action and the approach of all administrations must necessarily focus on the first three levels of the accepted hierarchy of waste management: 'Reduce, Reuse, Recycle'. The reduction of waste may be achieved by reducing the demand for products, by changing consumer behaviour (including the use of incentives), through changes in the type of products produced, and by minimising product packaging. Reuse involves finding a new use for a product in its current form while recycling involves the extraction of useful materials from waste for reuse in a new form. The reduction, reuse and recycling of materials saves energy that would have been used in the extraction and processing of the raw natural resource and thus helps to reduce greenhouse gas emissions.

Wales

In 2002 WAG published a waste strategy for Wales, *Wise about Waste*, which provides a programme of change over a ten year time horizon. The strategy specifies several waste management targets, including:

- Public bodies and businesses to reduce the amount of waste they produce by at least 10 per cent of the 1998 figure by 2010, building on an anticipated 5 per cent reduction in 2005.
- Each local authority to achieve at least 25 per cent recycling/composting of municipal waste by 2006/07 and at least 40 per cent by 2009/10, building on an anticipated 15 per cent recycling rate in 2003/04 (the actual recycling rate in 2003/04 was 16 per cent).
- The stabilisation and reduction of household waste, such that by 2009/10 the waste produced per household should be no greater than that (for Wales) in 1997/98 and that by 2020 waste produced should be less than 300kg per person per annum.

- To reduce the amount of industrial and commercial waste going to landfill by 20 per cent from 1998 levels by 2010, building on an anticipated 15 per cent reduction in 2005.
- To reduce the amount of biodegradable waste going to landfill by 20 per cent from 1998 levels by 2010, building on an anticipated 15 per cent reduction in 2005.
- To reuse and recycle at least 85 per cent of construction and demolition waste by 2010, building on an anticipated rate of 75 per cent in 2005.

The 2002 Waste Strategy for Wales is available at:

<http://www.wales.gov.uk/subienvironment/content/wstetext-e.pdf>

In April 2006, WAG announced a £6.8 million⁶⁰ 'Materials Action Programme' (MAP) which aims to improve resource efficiency for key sector businesses in Wales (the food and drink, pharmaceutical, chemical, and electronics industries). Businesses will be encouraged to divert waste from landfill and increase the recycled content of their products and packaging. One important component of the MAP will be an Industrial Symbiosis initiative (MAP-IS) which facilitates links between organisations from different sectors to create commercial opportunities whereby previously unwanted or low value output resources from one business become useful, competitively-priced inputs for another business.

More information on the Materials Action Programme is available at:

http://www.wrap.org.uk/about_wrap/tenders_and_grants/an_exciting.html

Information on the MAP Industrial Symbiosis initiative is available at:

http://www.nisp.org.uk/page.asp?slevel=0z1z6&parent_id=6

The Welsh Assembly Government also funds 'Cylch' - Wales Community Recycling Network - an umbrella organisation formed to promote sustainable resource management through education and practical action. The service provides information, resources, training, support, and marketing advice to the community recycling sector in Wales.

The Cylch website is available at: <http://www.cylch.org/index2.html>

Previous issues of Cylch's educational magazine, Cylchgrawn, can be viewed at:

<http://www.cylch.org/cylchgrawn-magazine.html>

WAG also funds 'Waste Awareness Wales' an awareness project administered jointly by the Welsh Local Government Association and Keep Wales Tidy, which aims to encourage a change in public attitudes and behaviour and promotes waste reduction, reuse and recycling.

The Waste Awareness Wales website is available at:

<http://www.wasteawarenesswales.org.uk/>

Scotland

The Scottish Executive has published two policy documents relating to waste management: *National Waste Strategy: Scotland* (1999) a framework within which Scotland can reduce the amount of waste it produces and in which all waste produced is dealt with in a more sustainable way; and *The National Waste Plan 2003* which outlines

⁶⁰ Welsh Assembly Government, April 2005, *Businesses in Wales get £9.5M to Tackle Waste*, http://www.countryside.wales.gov.uk/fe_news/news_details_printable.asp?newsid=355

the means by which waste production may be reduced and levels of recycling can be increased. 11 regional 'area waste plans' are also in development.

National Waste Strategy: Scotland is available at:

<http://www.sepa.org.uk/pdf/publications/nws/nationalwastestrategy.pdf>

The National Waste Plan 2003 is available at:

http://www.sepa.org.uk/pdf/nws/guidance/national_plan_2003.pdf

Draft versions of the 11 area waste plans are available at:

<http://www.sepa.org.uk/NWS/guidance/dawp.htm>

The National Waste Plan commits the Scottish Executive to several waste management targets:

- Increase recycling/composting rates to 25 per cent by 2006
- Increase recycling/composting rates to 55 per cent by 2020 (35 per cent recycling and 20 per cent composting)
- Achieve zero growth in the amount of municipal waste by 2010
- Reduce amount of Biodegradable Municipal Waste sent to landfill to 1.5 million tonnes by 2006
- Provide segregated kerbside waste collections to over 90 per cent of Scottish households by 2020

There is also an interim target arising from the (2005-2008) spending review⁶¹:

- 30 per cent recycling/composting by 2008.

To help deliver these targets, the Scottish Executive has set up 'Waste Aware': a national campaign that aims to change public attitudes and behaviour towards waste. The overall programme includes smaller, more focused, initiatives including 'the BIG Recycle for Scotland': an initiative to encourage people to recycle more household waste. Information and advice from Waste Aware is disseminated through a dedicated website and a quarterly magazine. The Executive also plan to invest £230 million over the next three years through the 'Strategic Waste Fund'⁶², to enable local authorities to recover waste resources and to put the Area Waste Plans into effect⁶³.

The Waste Aware website is available at: <http://www.wascot.org.uk/html/index.asp>

Northern Ireland

In March 2006 the Environment and Heritage Service published *Towards Resource Management: The Northern Ireland Waste Management Strategy 2006-2020*. The strategy focuses on six core areas of policy and action: waste prevention, recycling and recovery, waste planning, data and research, legislation and enforcement, and learning and communication. Targets have been developed for each action area, including the following 'recycling and recovery' targets:

- 60 per cent of commercial and industrial waste to be recycled by 2010

⁶¹ Scottish Executive, 2004, *Building a Better Scotland Spending Proposals 2005 – 2008: Enterprise, Opportunity, Fairness*, <http://www.scotland.gov.uk/Resource/Doc/25725/0027982.pdf>

⁶² Scottish Environmental Protection Agency, June 2004, *Funding News: The Strategic Waste Fund*, <http://www.sepa.org.uk/nws/thenetwork/2004/jun/funding.htm>

⁶³ SEPA, 2003, *National Waste Plan*, <http://www.sepa.org.uk/nws/guidance/nwp.htm>

- 75 per cent of construction, demolition and excavation waste to be recycled or reused by 2020
- 35 per cent of household waste to be recycled and composted by 2010; 40 per cent by 2015; and 45 per cent by 2020.

Towards Resource Management is available at:
<http://www.ehsni.gov.uk/pubs/publications/wms.17.pdf>

The Northern Ireland Civil Service departments have each produced an action plan to demonstrate the Northern Ireland Government's commitment to changing their resource utilisation and waste management practices. Each department was expected to include minimum headline commitments, including a reduction in paper use of 10 per cent per annum based on their departmental baseline.

The 11 departmental action plans are available in one document, also entitled *Towards Resource Management*, published in April 2006:
<http://www.ehsni.gov.uk/pubs/publications/NICSDepartmentalAction.pdf>

To help implement changes in waste and resource management, the Northern Ireland Government has set up 'Wake up to Waste': a long-term educational programme in partnership with local councils, the voluntary sector, business, schools, and colleges. Wake up to Waste includes an off-shoot programme: 'Northern Ireland Waste Works' which is aimed at encouraging more sustainable waste management by commercial businesses.

The Wake up to Waste website is available at: <http://www.wakeuptowaste.org/> and the Northern Ireland Waste Works website is available at:
<http://www.investni.com/index/develop/onlineinfocentre/niwasteworks.htm>

7 Transport

Transport accounts for 26 per cent of UK greenhouse gas emissions and is the fastest growing source of emissions. A switch from private vehicles to public transport, by road or by rail, reduces the emissions produced per person, whilst cycling and walking do not release emissions at all.

7.1 Private and public transport

Wales

In 2004 WAG announced an £8 billion, 15-year programme to deliver an integrated transport system in Wales. The Programme aims to reduce congestion, increase consumer choice, and improve both national and international transport links, and includes improvement schemes for road, rail, bus, and air transport. Additional powers to help implement this programme was gained under the *Railways Act 2005* and the *Transport Wales Act 2006*, which gives NAW more powers to plan and improve transport. The *Transport Wales Act* places a duty on the Assembly to promote safe, integrated, sustainable, efficient and economic transport and also requires WAG to produce a transport strategy. WAG published a draft Wales Transport Strategy, *Connecting Wales*, in July 2006 which has a horizon of 30 years. The strategy has three key objectives:

- to achieve a more effective and efficient transport system
- to achieve greater use of the more sustainable and healthy forms of travel
- to minimise the need for travel.

The draft Wales Transport Strategy, *Connecting Wales*, is available at:
[http://new.wales.gov.uk/docrepos/40382/4038231141/4038211251/4038211252/WTS_\(English\).pdf?lang=en](http://new.wales.gov.uk/docrepos/40382/4038231141/4038211251/4038211252/WTS_(English).pdf?lang=en)

The revision of Technical Advice Note 18: Transport (TAN 18) was identified in the first action plan of the *Environment Strategy for Wales* as a means of contributing to the environmental outcomes sought through the strategy. A consultation on the proposed revisions closed in October 2006.

WAG also produced a *Walking and Cycling Strategy for Wales* in 2003, which emphasises the health and environmental benefits of cycling and walking for short journeys, and encourages reduced car use.

The *Walking and Cycling Strategy for Wales* is available at:
<http://www.wales.gov.uk/subitransport/content/walking-cycling-e.pdf>

Scotland

The Scottish Executive plans to develop a National Transport Strategy (NTS) by the end of 2006 to provide a “long-term strategic backdrop for investment decisions and regional transport strategies” in Scotland. A consultation document on the strategy was published in April 2006 and this includes three environment-specific chapters on: possible measures to promote new technologies and cleaner fuels, measures to manage demand, and measures to reduce the need to travel. The consultation document also outlines proposals for developing indicators on these three themes to help monitor progress.

The consultation on Scotland's National Transport Plan is available at:
<http://www.scotland.gov.uk/Resource/Doc/112254/0027311.pdf>

A Strategic Environmental Assessment was carried out for the NTS to ensure that the environmental impacts of the strategy were considered. This is available at:
<http://www.scotland.gov.uk/Resource/Doc/116655/0028769.pdf>

In 2005, the Scottish Executive produced Scottish Planning Policy (SPP) 17, *Transport and Planning Maximum Parking Standards*, a guidance document which advocates constraining car parking for new developments “to help focus attention on the overall travel context of the development” and also suggests that development should be encouraged to locate where it is most accessible by public transport.

SPP 17 *Transport and Planning Maximum Parking Standards* is available at:
<http://www.scotland.gov.uk/Resource/Doc/47034/0026422.pdf>

The *Railways Act 2005* also gave Scottish Ministers full control of future investment in railway infrastructure (unlike the situation in Wales).

Northern Ireland

A Regional Transport Strategy (RTS) for Northern Ireland was published in 2002. This identifies transportation investment priorities and considers potential funding opportunities and the affordability of planned initiatives over the ten year period up to 2012. The RTS is progressed by three transport plans: the Belfast Metropolitan Transport Plan, the regional Strategic Transport Network Transport Plan; and the Sub-regional transport plan.

The Northern Ireland RTS 2002-2012 is available at:

http://www.drdni.gov.uk/DRDwww_Strategies/file.asp?id=121

Northern Ireland also has two separate Planning Policy Statements (PPS 13, *Transportation and Land Use Equality Impact Assessment* and PPS 3, *Access, Movement and Parking*) which aim to integrate transport and land use and thus reduce car travel.

PPS 13 *Transportation and Land Use Equality Impact Assessment* is available at:
http://www.drdni.gov.uk/DRDwww_FOISearch/details.asp?docid=1777

PPS 3 *Access, Movement and Parking* is available at:
http://www.planningni.gov.uk/AreaPlans_Policy/PPS/pp3/PPS3.pdf

In 2005, the Northern Ireland roads service launched Travelwise; an initiative to encourage sustainable transport use. The Travelwise website provides advice for commuters, employers and schools on alternatives to private car use while a separate web-based database encourages 'car sharing partnerships' by matching commuters who travel similar routes. The car share partnership scheme was first trialled for the Northern Ireland Civil Service in summer 2005 but has been expanded to cover other public sector workers, the private sector and the general public since early 2006.

The Travelwise Northern Ireland website is available at: <http://www.travelwiseni.com/> and the car share partnership website is at: <http://www.travelwisenicarshare.com/>

7.2 Aviation

Air travel emissions are calculated at a UK level, and are not allocated at a sub-UK level.

Wales

WAG has carried out an air travel review to evaluate recommendations for improving air travel in Wales. Plans emerging from the review include improving surface access to Cardiff airport, expanding the runway and terminal at Cardiff airport and developing new routes both inside (North-South link) and outside Wales. New air routes will be supported by a Route Development Fund (RDF) which uses Government funding to subsidise airport landing charges. The first route to be established through the RDF was Cardiff to Brussels, in March 2006.

More information on the Welsh air travel review is available at:
<http://www.wales.gov.uk/subitransport/content/review/airservices-e.htm>

Scotland

The Scottish Executive has pledged its support for the aviation sector to be included in the European Union Emissions Trading Scheme (EU ETS)⁶⁴. The Scottish Executive has attracted criticism from environmentalists⁶⁵ for choosing to subsidise selected air routes through its Route Development Fund. This £12.4 million fund⁶⁵ has been running since November 2002 and is used to negotiate discounted landing charges at airports with the aim of enhancing direct air services to Scotland by securing new routes and enhancing existing services.

⁶⁴ Scottish Executive, March 2006, *Changing our ways Scotland's Climate Change Programme*, <http://www.scotland.gov.uk/Resource/Doc/100896/0024396.pdf>

⁶⁵ Friends of the Earth Scotland, The World Wildlife Fund Scotland and TRANSform Scotland, 17 January 2006, *Joint Parliamentary Briefing on the Air Route Development Fund*, http://www.foe-scotland.org.uk/nation/PB_RDF_briefing.pdf



SNIFFER (Scotland and Northern Ireland Forum for Environmental Research) which has produced a climate change adaptation action plan for 2006 and is expected to update this on an annual basis. The adaptation plan provides for the implementation of five main objectives:

- to develop a Scottish local authority climate change programme
- to complete an update of the climate change scenarios produced by UKCIP in 2002: the updated version is to be published in 2008
- to encourage the dissemination of climate change research outputs
- to consider climate change impacts on the transport network in Scotland
- to make a written contribution to the formal consultation on a UK Adaptation Policy Framework.

Further information on SCCIP can be found in the Scottish Climate Change programme for 2006: <http://www.scotland.gov.uk/Resource/Doc/100896/0024396.pdf>

The 2006 Scottish Climate Change Programme also includes: a description of key areas of Scottish Executive adaptation activity; a list of positive examples of current activity which builds adaptive capacity; and a climate change adaptation route map for 2006-2010.

The Scottish Executive has commissioned several SNIFFER research reports aimed at preparing for climate change, including *The Business Risks of Climate Change to Public Sector Organisations in Scotland* (2004), *A Survey of Scottish Local Authority Activity on Climate Change* (2005), and *A Handbook of Climate Change Trends Across Scotland* (2006).

These research reports are available at:

[http://www.sniffer.org.uk/results.asp?bool=OR&proposed=1&active=1&complete=1&theme=\[Climate%20Change\]&location=research_areas&refer=res_area_other_1.asp](http://www.sniffer.org.uk/results.asp?bool=OR&proposed=1&active=1&complete=1&theme=[Climate%20Change]&location=research_areas&refer=res_area_other_1.asp)

Northern Ireland

In 2005, the Department of Environment (DOE) for Northern Ireland commissioned a report from SNIFFER entitled *Preparing for a Changing Climate in Northern Ireland*, which is to be completed by November 2006. The purpose of the study is to supply policy makers with up to date information on climate impacts at the Northern Ireland level, and to provide policy recommendations on adapting to climate change. The report will include a risk analysis of predicted climate change impacts and will set out an adaptation strategy for each impact, including identifying which public sector bodies are responsible for policy delivery under each impact. The report will look at possible preparatory measures relating to economic infrastructure, the built environment, the natural environment, and social wellbeing.

In 2002 SNIFFER produced a research document entitled *Implications of Climate Change for Northern Ireland: Informing Strategy Development*. This investigated the likely impacts of climate change on the environment, economy, and natural resources of Northern Ireland and considered the possibilities for adapting to climate change.

Further information on the 2002 and 2006 SNIFFER research documents is available at:

[http://www.sniffer.org.uk/results.asp?start=5&keywords=&code=&year=&output=&bool=OR&proposed=1&active=1&complete=1&theme=\[Climate%20Change\]&location=research_areas&refer=res_area_other_1.asp&title=Climate%20Change&research_area=](http://www.sniffer.org.uk/results.asp?start=5&keywords=&code=&year=&output=&bool=OR&proposed=1&active=1&complete=1&theme=[Climate%20Change]&location=research_areas&refer=res_area_other_1.asp&title=Climate%20Change&research_area=)

8.1 Scotland's Green Jobs strategy

Scotland has taken its approach to climate change mitigation and adaptation a step further by focusing not only on minimisation of climate problems, but also on developing an approach to utilising the opportunities expected to arise from climate change. The *Green Jobs Strategy*, published in June 2005, is designed to take advantage of business opportunities arising from the need for sustainable development and mediation of, and adaptation to, climate change. The strategy focuses on two broad areas:

- resource efficiency to improve the competitiveness of Scottish businesses
- new business opportunities arising from renewable energy, waste management, recycling and the use of recycled materials

The Scottish *Green Jobs Strategy* is available at:

<http://www.scotland.gov.uk/Resource/Doc/54357/0013160.pdf>

9 Monitoring and reporting

Monitoring and reporting are essential to the efforts in mediating climate change. Monitoring of greenhouse gas emissions is important to help evaluate the success of actions and policies taken towards reducing emissions and to ensure that targets are met. The monitoring of climate and measures of climate change are important to inform estimates and models of future climate change and to monitor the long-term success of any global reductions in greenhouse gases.

Wales

The Welsh Assembly Government commissioned a *Review of Options for Monitoring Changes in the Welsh Climate*, which was published in 2001. A final list of indicators has not been made public and no current or historical data for the indicators have been published.

The 2001 review of potential indicators is available at:

<http://www.wales.gov.uk/subienvironment/content/climatechange/climatechangeindicators-e.pdf>

WAG produces an annual publication of *Key Environmental Statistics for Wales* which contains four indicators that may be used to monitor progress in emissions reductions and changes in climate: rainfall, temperature, emissions of greenhouse gases, and emissions of CO₂.

The latest Key environment statistics for Wales (2006) are available at:

<http://www.wales.gov.uk/keypubstatisticsforwales/content/publication/environment/2006/sb5-2006/sb5-2006.htm>

WAG also produces annual statistics for 21 sustainable development indicators, but only one of these, greenhouse gas emissions, can be directly related to climate change.

The Welsh sustainable development indicators statistics for 2006 are available at:

<http://new.wales.gov.uk/docrepos/40382/40382313/403824/sustainable/sustain-2006/sb21-2006.pdf?lang=en>

Scotland

The Scottish Executive publishes annual environment statistics, including five indicators with relevance to climate change: annual temperature, annual rainfall, electricity generated by source, greenhouse gas emissions, and CO₂ emissions by source.

The key Scottish environment statistics for 2005 are available at:
<http://www.scotland.gov.uk/Resource/Doc/57346/0016767.pdf>

The Scottish Executive has published statistics on sustainable development indicators since 2003. One of these indicators, greenhouse gas emissions, is directly related to climate change. The Executive has recently published a revised set of sustainable development indicators which are to be reported on annually. Four of these new indicators are related to climate change: greenhouse gas emissions, carbon emissions, total and net electricity generated from renewable sources, and total vehicle kilometres travelled.

Statistics for sustainable development indicators in Scotland for 2003-2005 are available at: <http://www.scotland.gov.uk/Topics/SustainableDevelopment/7369>

The revised list of Scottish sustainable development indicators is available at:
<http://www.scotland.gov.uk/Resource/Doc/921/0033440.pdf>

Northern Ireland

In 2004 the Environment and Heritage Service produced a report containing information on 13 indicators of climate change in Northern Ireland. The chosen indicators include: annual temperature, annual rainfall, rainfall seasonality, sea levels, river levels, the length of the growing season, sightings of indicator species, and crop yields. Data are provided for each indicator from the historical starting point (as early as 1844 for temperature and rainfall) up until 2003. Future reviews and updates of the report are expected and will provide an ongoing picture of climate change in Northern Ireland.

The 2004 report on Northern Ireland climate change indicators is available at:
<http://www.ehsni.gov.uk/pubs/publications/ccl.pdf>

The Northern Ireland Government does not publish annual sustainable development indicators, but it plans to have reporting measures in place by the end of 2006⁶⁷. There are no annual government environment statistics.

⁶⁷ Department of Environment, May 2006, *First Steps Towards Sustainability: A Sustainable Development Strategy for Northern Ireland*,
<http://www.doeni.gov.uk/epd/susdev.pdf>

A Annex A: List of acronyms and abbreviations

Acronym	Denotes
CEEF	Central Energy Efficiency Fund Scottish Executive
CO ₂	Carbon dioxide
CHP	Combined Heat and Power
DETI NI	Department of Enterprise Trade and Investment (Northern Ireland)
EHS	Environment and Heritage Service (Northern Ireland)
EMEC	European Marine Energy Centre
EPC	Environment Planning and Countryside (Wales)
EU ETS	European Union Emissions Trading Scheme
FREDS	Forum for Renewable Energy Development in Scotland
GHG	Greenhouse Gas: carbon dioxide (CO ₂), methane (CH ₄), nitrous oxide (N ₂ O) hydrofluorocarbons (HFC), perfluorocarbons (PFC) and sulphur hexafluoride (SF ₆)
GWP	Global Warming Potential (see Annex B)
MAP	Materials Action Programme (Wales)
MAP-IS	Materials Action Programme Industrial Symbiosis
MtC	Metric tonnes of Carbon
MW	Mega Watt
NAW	National Assembly for Wales
PAN 45	Planning Advice Note 45 Renewable Energy Technologies (Scotland)
PSU 12	Public Service and Utilities 12 Regional Planning Policy (Northern Ireland)
PPS 13	Planning Policy Statement 13 <i>Transportation and Land Use Equality Impact Assessment</i> is available (Northern Ireland)
PPS 3	Planning Policy Statement 3 <i>Access, Movement and Parking</i> (Northern Ireland)
RDF	Route Development Fund
RO	Renewables Obligation
RO(S)	Renewables Obligation (Scotland)
RSA	Regional Selective Assistance grant (Scotland)
SCCIP	Scottish Climate Change Impacts Partnership
SEPA	Scottish Environmental Protection Agency
SNIFFER	Scotland and Northern Ireland Forum For Environmental Research
SPP 17	Scottish Planning Policy 17 <i>Transport and Planning Maximum Parking Standards</i>
SSAs	Strategic Search Areas (Wales)
TAN 8	Technical Advice Note 8 Renewable Energy (Wales)
UKCCP	United Kingdom Climate Change Programme
UKCIP	United Kingdom Climate Impacts Programme
UNFCCC	United Nations Framework Convention on Climate Change
WAG	Welsh Assembly Government
WEBS	Wood Energy Business Scheme (Wales)



B Annex B Global Warming Potential of greenhouse gases on a 100-year time horizon (tonne CO₂ equivalent/ tonne gas)⁶⁸

Greenhouse Gas	Global Warming Potential (tonne CO₂ equivalent / tonne gas)
Carbon Dioxide (CO ₂)	1
Methane (CH ₄)	21
Nitrous Oxide (NO ₂)	310
Hydrofluorocarbons (HFCs)	140 -11700
Perfluorocarbons (PFCs)	6500 - 9200
Sulphur hexafluoride (SF ₆)	23900

⁶⁸ Baggot, L., et al., 2005, *Greenhouse gas inventories for England, Scotland, Wales and Northern Ireland: 1990 - 2003*, http://www.airquality.co.uk/archive/reports/cat07/0509211321_Reghg_report_2003_Main_Text_Issue_1.doc