

August 2011

# Strategic environmental assessment and climate change: guidance for practitioners

## Introduction

**Climate change** is one of the key challenges facing the UK and the world today. The Intergovernmental Panel on Climate Change (IPCC 2007), and the Stern Report ([Stern, 2006](#)) have highlighted the risks and how urgently we need to respond. The [Climate Change Act 2008](#) made the UK the first country in the world to have a legally binding long-term framework to cut carbon emissions. It also introduced legally-binding carbon budgets, and created a framework for building the UK's ability to adapt to climate change.

The Climate Change Act requires greenhouse gas (GHG) emissions to be reduced by at least 80% by 2050, compared to 1990 levels. There is overwhelming scientific evidence to suggest that GHG emissions are instrumental in causing global warming and climate change. In order to reduce their levels and meet the 80% target, carbon budgets place legally-binding ceilings on the level of emissions allowed in the UK over five year periods<sup>1</sup>. The fourth carbon budget under the Act, agreed by Government in May 2011, commits the UK to an ambitious reduction of 50% from 1990 levels, over the period 2023 - 2027.

**Strategic Environmental Assessment (SEA)**, either alone or as part of Sustainability Appraisal (SA), can help to ensure that plans and programmes take full account of climate change issues and help support government targets. The [SEA Directive](#) (known formally as European Directive 2001/42/EC) is about assessing the effects of certain plans and programmes on the environment. It requires plan-makers to identify and evaluate the impact their plans are likely to have on a number of environmental issues (including climatic factors). Where appropriate, measures must be put in place to minimise and respond to the significant impacts identified.

This guidance is primarily for plan-makers, responsible authorities and consultants preparing SEAs or SAs. However, it could be useful for anyone involved in preparing or reviewing SEAs or SAs.

This guidance suggests how climate change issues can be considered in SEA in England and Wales. It presents information on the causes and impacts of climate change and how they can be described and evaluated in SEA. It also describes how adaptation and mitigation measures can be developed through SEA.

This guidance replaces the original version published in 2004, and the updated version published in 2007. It was originally developed by the Environment Agency in partnership with Natural England, Countryside Council for Wales, UK Climate Impacts Programme, Levett-Therivel Sustainability Consultants, CAG Consultants and InteREAM at the University of East Anglia. This version has been updated by the Environment Agency, with input from the above partner organisations. It reflects updated information on SEA and climate change and complements the [UK Practical Guide to the SEA Directive](#) (Office of the Deputy Prime Minister (ODPM) et al., 2005).

<sup>1</sup> UK Government Committee on Climate Change



## Mitigation and adaptation

There are two necessary responses to climate change. **Mitigation measures** are actions that reduce the impact humans have on the climate system by reducing our emissions of greenhouse gases. For example, moving to more sustainable forms of transport, increasing energy efficiency by improving building insulation, and using energy generated from renewable sources. Mitigation measures reduce global greenhouse gas emissions in order to avoid expected climate change impacts in the future.

**Adaptation measures** are actions that respond to actual or expected climate change. They have the potential to reduce the adverse impacts and enhance the benefits - for example, by harvesting and storing winter rainfall for use in summer. We need adaptation measures because a degree of climate change is unavoidable regardless of what we do to reduce future emissions.

Mitigation and adaptation measures may be interrelated. For instance, increased temperatures will influence the way buildings are designed, but installing air conditioning will add to greenhouse gas emissions. Our response to climate change needs to include both adaptation and mitigation and their interactions. We should aim to manage the unavoidable, while avoiding the unmanageable.

## Climate change in SEA

The SEA Directive requires planning authorities to assess the likely impacts of their plans and programmes on "the environment, including on... climatic factors". These impacts should include secondary and synergistic effects (SEA Directive, Annex 1). Climate change is a synergistic effect. It is caused by the build up of many actions, each of which only has a limited contribution, but which together cause serious effects. It is good practice to also take into account adaptation measures which consider how climate change will impact on plans and programmes.

The SEA Directive is implemented in England through the Environmental Assessment of Plans and Programmes Regulations 2004 ([SI 2004 No. 1633](#)). In Wales, it is implemented through the Environmental Assessment of Plans and Programmes (Wales) Regulations 2004 ([SI 2004 No. 1656](#)). Guidance on SEA in England and Wales is provided by the Practical Guide to the SEA Directive<sup>2,3</sup>.



Mitigating against, and adapting to, climate change should be considered at various stages of the SEA process "to prevent, reduce and, as fully as possible, offset any significant adverse effects on [climatic factors] of implementing the plan," (SEA Directive, Annex Ig), as shown in Table 1.

<sup>2</sup> Further climate change guidance for Wales can be found in CCW 2007 and WAG 2009, 2011.

<sup>3</sup> SEA and climate change guidance for Scotland can be found in SEPA 2010.

## Table 1. Climate change (mitigation and adaptation) in the SEA process

Please note: SEA is an iterative process and some process stages may need to be reconsidered at several points when the plan is being developed.

SEA process (based on ODPM, 2005)	How climate change could be considered in the process
<p><b>Stage A:</b> Setting the context and objectives, establishing the baseline and deciding on the scope</p> <ul style="list-style-type: none"> <li>• Identifying other relevant plans, programmes and environmental protection objectives</li> <li>• Collecting baseline information</li> <li>• Identifying environmental problems</li> <li>• Developing SEA objectives</li> <li>• Consulting on the scope of the SEA</li> </ul>	<ul style="list-style-type: none"> <li>• Describe the current and likely future climate baseline.</li> <li>• Identify the likely significant problems and constraints caused by climate change. For example, English authorities should refer to their Strategic Flood Risk Assessment required by Planning Policy Statement (<a href="#">PPS</a>) 25<sup>4</sup> and Welsh authorities should refer to their Flood Consequence Assessment required by Technical Advice Note (<a href="#">TAN</a>) 15.</li> <li>• Identify other relevant plans which contain climate change mitigation and adaptation measures that could affect the options being considered. For example, measures within <a href="#">River Basin Management Plans</a>, <a href="#">Catchment Flood Management Plans</a> and <a href="#">Shoreline Management Plans</a>.</li> <li>• Develop climate change objectives and indicators that take account of (the uncertainty of future) climate change: see Table 3.</li> <li>• Consult with SEA Consultation Bodies on climate change issues: Environment Agency – flood risk, water resources and quality; Natural England (NE) and Countryside Council for Wales (CCW) – biodiversity, conservation, landscape; English Heritage (EH) and Cadw - cultural heritage; for other organisations, see Table 2.</li> </ul>
<p><b>Stage B:</b> Developing and refining alternatives and assessing effects</p> <ul style="list-style-type: none"> <li>• Testing the plan or programme objectives against the SEA objectives</li> <li>• Developing strategic alternatives</li> <li>• Predicting the effects of the plan or programme, including (realistic) alternatives</li> <li>• Evaluating the effects of the plan or programme, including pragmatic</li> </ul>	<ul style="list-style-type: none"> <li>• Suggest plan alternatives (related to both mitigation and adaptation) to deal with key climate change related problems.</li> <li>• Assess the effects of plan alternatives on the climate change objectives and indicators.</li> <li>• Refer to, or summarise the findings of, the Strategic Flood Risk Assessment in the Environmental Report.</li> <li>• Consider the alternatives' impacts on greenhouse gas emissions, and their ability to integrate climate change adaptation measures</li> </ul>

<sup>4</sup> Please note; English planning policy is under review by the government (2010/11). The proposed new approach is designed to consolidate policy statements, circulars and guidance documents into a single concise National Planning Policy Framework for England.

SEA process (based on ODPM, 2005)	How climate change could be considered in the process
<p>alternatives</p> <ul style="list-style-type: none"> <li>Avoiding and minimising adverse impacts</li> </ul>	<p>when selecting the preferred alternatives.</p> <ul style="list-style-type: none"> <li>Begin to integrate climate change mitigation and adaptation measures into the plan.</li> </ul>
<p><b>Stage C:</b> Preparing the Environmental Report</p> <ul style="list-style-type: none"> <li>Writing the draft Environmental Report, including the results of the assessment</li> </ul>	<ul style="list-style-type: none"> <li>Explain in the Environmental Report how climate change issues have been identified and managed, including how uncertainty has been managed.</li> </ul>
<p><b>Stage D:</b> Consulting on the draft plan or programme and the Environmental Report</p> <ul style="list-style-type: none"> <li>Consulting the public and Consultation Bodies on the draft plan or programme and the Environmental Report</li> <li>Assessing significant changes</li> <li>Making decisions and providing information</li> </ul>	<ul style="list-style-type: none"> <li>Consult authorities responsible for climate change management and others who can provide advice on good practice (see Stage A).</li> <li>Fully integrate climate change mitigation and adaptation measures into the final plan.</li> </ul>
<p><b>Stage E:</b> Monitoring the significant effects of implementing the plan or programme on the environment</p> <ul style="list-style-type: none"> <li>Developing aims and methods for monitoring</li> </ul>	<ul style="list-style-type: none"> <li>Monitor the effectiveness of mitigation measures in reducing greenhouse gas emissions. The effectiveness of adaptation measures is likely to be difficult to monitor, but whether such measures are put in place/implemented <i>can</i> be monitored.</li> <li>Consider the latest climate change science and predictions and how these could relate to the significant effects of implementing the plan.</li> <li>Be prepared to respond to any adverse impacts identified.</li> </ul>

## Climate change baseline and indicators

Table 2 lists sources of baseline information and indicators for climate change causes and impacts. The Regional Climate Change Partnerships in England, and the Climate Change Commission in Wales, can provide information on more locally specific problems and approaches.

**Table 2. Possible climate change indicators and information sources**

Aspects of climate change	Possible indicators	Data/information sources see also Regional Climate Change Partnerships (England) and the Climate Change Commission for Wales
<b>Causes</b>	<ul style="list-style-type: none"> <li>Greenhouse gas emissions: per region, per capita</li> </ul>	<p><a href="#">International Energy Agency</a> - CO2 Emissions from Fuel Combustion 2010.</p> <p><a href="#">UK Climate Projections 2009 (UKCP09) User Interface</a> - web-based portal that provides users with access to the UKCP09 datasets, and image and numerical products, as well as the UKCP09 <a href="#">Weather Generator</a> and associated <a href="#">Threshold Detector</a> - sea level, precipitation, temperature, extreme weather events.</p>
<b>Climate / weather changes</b>	<p>N.B. these will typically act as context indicators</p> <ul style="list-style-type: none"> <li>sea level</li> <li>precipitation</li> <li>temperature</li> <li>flood levels in rivers</li> <li>extreme events such as heat waves</li> </ul>	<p><a href="#">Climate Research Unit, UEA</a> - global temperature record, sea level rise, rainfall intensity.</p> <p><a href="#">CLG</a> - land use changes.</p> <p><a href="#">Environment Agency Flood maps</a>. See also <a href="#">Stern</a> (2006), <a href="#">CLG</a> (2007) and 'Mitigation measures' below.</p>
<b>Local impacts of climate / weather changes</b>	<ul style="list-style-type: none"> <li>average annual flood incidence / damage drought orders</li> <li>ranges of habitats</li> <li>number of heat and/or cold related deaths</li> <li>number of cases of subsidence / insurance claims for subsidence</li> <li>river flows and water quality</li> </ul>	<p><a href="#">Environment Agency</a></p> <p><a href="#">Flood maps</a></p> <p><a href="#">River and sea levels</a></p> <p><a href="#">Water quality</a></p> <p><a href="#">Drought</a></p> <p><a href="#">Natural England</a> - nature conservation, habitats etc.</p> <p><a href="#">Countryside Council for Wales (CCW)</a> - nature conservation, habitats etc.</p>
<b>Mitigation measures</b>	<ul style="list-style-type: none"> <li>household energy use</li> <li>total electricity and gas use</li> <li>vehicle-km travelled per person per year</li> <li>electricity generated from renewable energy sources</li> </ul>	<p><a href="#">Audit Commission Area Profiles</a> - household/individual energy use, by local authority</p> <p><a href="#">Department of Energy and Climate Change</a> - energy trends</p> <p><a href="#">Environmental Change Institute</a> - emissions from buildings, appliances</p>

customer service line  
08708 506 506

incident hotline  
0800 80 70 60

floodline  
0845 988 1188

[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

Aspects of climate change	Possible indicators	Data/information sources see also Regional Climate Change Partnerships (England) and the Climate Change Commission for Wales
	<p>and Combined Heat &amp; Power (CHP) located in the area</p> <ul style="list-style-type: none"> <li>• embodied energy in new buildings</li> <li>• average energy efficiency of new buildings</li> <li>• % of new homes conforming to recognised codes for sustainable buildings</li> </ul>	<p><a href="#">Defra, Environmental Statistics</a> - air pollutant emissions, air quality indicators. Also see <a href="#">HM Government</a> (2006)</p> <p><a href="#">Renewable Energy Statistics Database</a> - renewable energy</p> <p><a href="#">Office of Gas &amp; Electricity Markets (OFGEM)</a> - CHP, energy providers</p>
<b>Adaptation measures</b>	<ul style="list-style-type: none"> <li>• % developments with Sustainable Drainage Systems (SUDS)</li> <li>• number or % homes in floodplain / coastal flooding</li> <li>• number or % roads/railway lines in floodplain</li> <li>• number of planning permissions granted against Environment Agency advice on grounds of flood risk</li> <li>• household water use</li> <li>• % of developments subjected to checklist for development (<a href="#">South East Climate Change Partnership</a> (SECCP) et al, 2005)</li> </ul>	<p><a href="#">Environment Agency</a></p> <p><a href="#">Natural England</a></p> <p><a href="#">Countryside Council for Wales (CCW)</a> - nature conservation, habitats etc.</p> <p>Also see <a href="#">CLG</a> (2010), <a href="#">Land Use Consultants (LUC)</a> et al. (2005), <a href="#">SECCP</a> et al (2005)</p>

## Issues and constraints caused by climate change

Over the next 50 years we will experience higher temperatures, changing rainfall patterns, rising sea levels and more frequent extreme weather events, ranging from droughts to floods and freezing winters<sup>5</sup>. Our changing climate is likely to have a range of impacts, such as those listed below. During Stage A of the SEA process, the plan-maker will identify environmental problems, and consider how the plan could be affected by the expected climate change impacts, During Stage B, when developing and refining alternatives and assessing effects, the plan-maker will need to consider how the plan will mitigate and adapt to these impacts.

<sup>5</sup> Defra 2011

**Water resources.** There may be little change in average annual rainfall, but there may be more rain in winter and less in summer - particularly in the south of England. Coupled with increased temperatures, this may lead to much lower average summer river flows, but there may also be a significantly increased risk of flooding as more rain comes down in heavier bursts. River and lake water temperatures are likely to continue to increase broadly in line with air temperatures. Droughts may also become more common. Climate change will therefore affect the demand for water as well as its availability and quality.<sup>6</sup>

**Coastal flooding and erosion.** Rising sea levels will increase coastal flooding and erosion. Current projections of sea level rise show that the coastal floodplains of the south-east and east coast of England would be more likely to flood. Coastal environments and morphology are hugely diverse, which will lead to local variations in coastal change. Climate change is very likely to increase erosion rates and the most severe erosion will occur in the east of England.<sup>7</sup>

**Biodiversity.** Animal and plant species are moving and changing in response to increasing temperatures. These changes are clearest in marine and coastal environments. In terrestrial and freshwater habitats the inability of species to move far, coupled with the influence of land and water management, tends to obscure trends. There is some evidence that animals living in both terrestrial and freshwater environments have extended their range northwards and upwards. By the late 21st century, the potential range of many European plant species may shift several hundred kilometres north. Natural events – like leafing and spawning – appear to be happening earlier in the season.<sup>8</sup>

**Health.** Warmer winters may reduce winter human mortality. It is predicted that cold-related deaths are likely to decline substantially, by perhaps 20,000 cases per annum. However, warmer summers can lead to more health problems. Heat-related deaths are predicted to increase by about 2000 cases per annum. Increased exposure to UV rays could lead to high rates of skin cancer, increasing to perhaps 5000 cases per year, and cataracts by 2000 cases per year. Cases of food poisoning linked to warm weather in the UK have been increasing. Flooding and other extreme events such as gales are likely to increase the risk of major disasters. This could make access to health services more difficult, as well as having a direct impact on public health.<sup>9</sup>

**Buildings and infrastructure.** Climate change could have significant implications for infrastructure. Infrastructure assets have long operational lifetimes, so they are sensitive not only to the existing climate at the time of their construction, but also to climate variations over decades of use<sup>10</sup>. Higher winter rainfall and more extreme events such as flooding are likely to increase damage to buildings and infrastructure through flood damage and subsidence. Services such as transport and access to medical facilities may be disrupted.

**Land quality.** Climate change may increase pesticide and fertiliser run-off in agricultural catchments, affecting the quality of water bodies. Higher temperatures and lower rainfall in the summer may affect soil structure and moisture content. This will increase the potential risk of sediment run-off into rivers and other water bodies.<sup>11</sup>



---

6 Environment Agency 2010

7 Environment Agency 2010

8 Environment Agency 2010

9 DoH 2008

10 Defra 2011

11 Environment Agency 2010

customer service line

08708 506 506

incident hotline

0800 80 70 60

floodline

0845 988 1188

[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

## Climate change objectives

It is recommended that SEA objectives and indicators cover climate change. Whilst Table 2 lists possible climate change indicators, Table 3 lists possible SEA objectives. These may need to be selected and adapted to reflect the plan contents.

**Table 3. Possible SEA climate change objectives**

	Possible SEA objectives
<b>Mitigation</b>	<p>Minimise future climate change, for example by:</p> <ul style="list-style-type: none"> <li>• reducing the need for energy, for example reducing the need to travel</li> <li>• improving energy efficiency</li> <li>• switching to lower carbon fuels</li> <li>• increasing % renewable energy</li> <li>• improving waste and land use practices</li> <li>• maintaining carbon sequestration potential of woodlands, peats and other organic soils</li> </ul>
<b>Adaptation</b>	<p>Reduce vulnerability to the impacts of climate change, for example by:</p> <ul style="list-style-type: none"> <li>• providing wildlife corridors</li> <li>• providing adequate health services and infrastructure</li> <li>• ensuring that drainage systems can cope with changing rainfall patterns/intensity</li> <li>• taking a precautionary and risk-based approach to developing in the floodplain</li> <li>• ensuring adequate sea defences (soft, hard, managed realignment)</li> <li>• ensuring adequate future water supply and demand management</li> <li>• designing buildings and urban areas to cope with new climate extremes</li> <li>• providing robust transportation infrastructure</li> <li>• increasing urban green space</li> <li>• avoiding actions that foreclose or limit future adaptation, or that contribute to climate change (mal-adaptation)</li> </ul>

## Effects of plan alternatives

A plan's impact on climate change cannot be assessed directly. This is because there are many other factors involved, such as natural variability, and the global scale of consequences. However, a plan's impact on energy use and greenhouse gas emissions can generally be determined. Most of this impact will not be direct, but will arise through a chain of actions. For example, a transport programme advocating airport expansion may result in more flights, and thus increase greenhouse gas emissions. A conceptual model may be helpful to identify and document these links.

The SEA objectives in Table 3 can be used to assess a plan's impact in terms of:

- (i) reducing greenhouse gas emissions
- (ii) reducing vulnerability to climate change (in terms of the probability and extent of adverse impacts, as well as any opportunities which may arise)
- (iii) making best use of the benefits of climate change. For example, in England, Strategic Flood Risk Assessments can inform the assessment of vulnerability, as can flood consequence assessments in Wales.

The timeline for predicting a plan's impact on climate change, and vice versa, is longer than for other types of impacts. It may well be beyond the plan's lifetime. As such, we recommend that the SEA particularly considers the possible long-term climate change impacts on a plan. The European Spatial Planning Adapting to Climate Events ([ESPACE](#)) support guidance provides information on incorporating adaptation into spatial planning.

The plan-maker must consider mitigation and adaptation measures if a plan is likely to have a significant impact on climate change, or to increase vulnerability to climate change (taking into account likely future climate change trends). Whilst a plan may do its best to avoid climate change impacts, it may not succeed in reducing greenhouse gas emissions or vulnerability to climate change. This is because other factors, such as lifestyle choices affecting car choices and car usage, can counteract even the most well-intentioned plan policy.



## Climate change mitigation and adaptation measures

Climate change is a synergistic impact that can only be dealt with through multiple actions. Principles for identifying appropriate mitigation and adaptation measures are:

- Keep options open and flexible, so that further measures or strategies can be put in place to meet needs identified in the future.
- Avoid decisions that will make it more difficult to manage climate risks in the future. One example is inappropriate development in a flood risk area.
- Implement 'no regret' options that deliver net benefits whatever the extent of climate change, where these exist. If weather-related problems are already being experienced, cost-effective actions to deal with them should be 'no regret' options.
- Find win-win options that contribute to climate change mitigation, adaptation and to wider plan objectives. For example, business opportunities from energy efficiency measures.

For more detailed guidance on identifying and developing adaptation and mitigation measures, please refer to the UK Climate Impacts Programme's range of tools and guidance. In particular, their [AdOpt Report](#), and [Adaptation Wizard](#) may be helpful.

[ODPM](#) et al (2004), [CLG](#) (2007), the [SECCP](#) et al (2005) and UK [Climate Impacts Programme](#) (UKCIP 2009) give many useful suggestions for climate change mitigation and adaptation measures. These reports can be the starting point for sustainability appraisals/SEA for spatial plans. Table 4 gives additional examples of mitigation measures. Such measures take account of projected changes to the future climate and aim to set a complementary context for adaptation measures. Table 5 lists categories of adaptation and provides some examples.

customer service line  
08708 506 506

incident hotline  
0800 80 70 60

floodline  
0845 988 1188

[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

**Table 4. Categories of mitigation and some examples** <sup>12</sup>

Mitigation measure	Examples for spatial plans	Examples for other plans
<b>Buildings</b>	<ul style="list-style-type: none"> <li>Support the delivery of sustainable buildings. In England, new homes are intended to be 'zero carbon' by 2016 (HM Treasury, 2011); The Welsh Government is also committed to moving towards zero carbon buildings<sup>13</sup>.</li> <li>Ensure that a significant proportion of the energy supply of substantial new development is gained on-site and from a renewable source and/or from a decentralised, renewable or low-carbon, source</li> </ul>	<ul style="list-style-type: none"> <li>Promote the use of recycled building materials and materials that have low embodied carbon</li> <li>Retrofit existing buildings to make them more energy and water efficient</li> </ul>
<b>Transport</b>	<ul style="list-style-type: none"> <li>Support the construction of pedestrian and cycle paths</li> <li>Support car-free developments</li> <li>Locate jobs, shops, services etc. so as to minimise the need to travel</li> </ul>	<ul style="list-style-type: none"> <li>Support public transport</li> <li>Support congestion charging and other ways of encouraging efficient and minimal use of vehicles</li> <li>Improve fuel efficiency of vehicles</li> <li>Promote the purchase and use of small, efficient cars.</li> <li>Encourage local holidays, to reduce need for air travel</li> <li>Promote the purchase of locally-produced goods (food, construction materials etc.)</li> <li>Support farmers' markets</li> </ul>
<b>Energy production</b>	<ul style="list-style-type: none"> <li>Ensure that a significant proportion of the energy supply of substantial new development is gained on-site and from a renewable supply, and/or from a decentralised, renewable or low-carbon energy supply</li> <li>Support the use of renewables where appropriate, Combined Heat and Power (CHP), hydropower etc.</li> </ul>	<ul style="list-style-type: none"> <li>Generate (green) electricity locally</li> <li>Use price incentives (for example energy prices that rise with increased usage, congestion charging) to discourage wasteful energy use</li> <li>Support the use of renewables where appropriate, CHP, hydropower etc.</li> </ul>
<b>Minerals / waste</b>	<ul style="list-style-type: none"> <li>Locate developments (for example waste, minerals) to minimise need to travel</li> </ul>	<ul style="list-style-type: none"> <li>Encourage the capture and use from landfill gas</li> </ul>

<sup>12</sup> See also CLG, 2007; ODPM et al., 2004; WAG, 2006.

<sup>13</sup> WAG 2010

**Table 5. Categories of adaptation and some examples** <sup>14</sup>

Sector	Examples for spatial plans	Examples for other plans
<b>Buildings</b>	<ul style="list-style-type: none"> <li>• Site and design buildings to cope with climate change impacts (e.g. green roofs, improved water efficiency, good ventilation) and to minimise energy consumption (e.g. reducing solar gain in summer)</li> <li>• Carry out flood and coastal erosion risk assessments; avoid inappropriate development in areas prone to flooding or coastal erosion; require flood-resilient and resistant buildings</li> <li>• Consider whether existing buildings remain fit for purpose under changing climatic conditions</li> </ul>	<ul style="list-style-type: none"> <li>• Consider how to maintain required comfort conditions in for example hospitals and schools</li> </ul>
<b>Water management</b>	<ul style="list-style-type: none"> <li>• Increase resilience to flooding through Sustainable Drainage Systems (SUDS)</li> <li>• Consider use of rain and grey water</li> <li>• Ensure adequate water supply and drainage for future development</li> </ul>	<ul style="list-style-type: none"> <li>• Reduce water leakage and water use</li> <li>• Improve drainage, for example by use of permeable surfacing</li> </ul>
<b>Infrastructure including water services and flood defence</b>	<ul style="list-style-type: none"> <li>• Ensure that infrastructure and service developments - particularly emergency services - are resilient to changing climatic conditions</li> </ul>	<ul style="list-style-type: none"> <li>• Upgrade wastewater systems to cope with increased rainfall intensity</li> <li>• Managed realignment of some coastal areas, avoid coastal 'squeeze' of habitats</li> </ul>
<b>Agriculture, forestry and land management</b>	<ul style="list-style-type: none"> <li>• Support appropriate diversification of the rural economy</li> </ul>	<ul style="list-style-type: none"> <li>• Switch to more drought- and/or flood-resistant crops</li> <li>• Put in place measures to deal with new/increased diseases and pests that could arise under different climatic conditions</li> </ul>
<b>Wildlife and biodiversity</b>	<ul style="list-style-type: none"> <li>• Create/enhance wildlife corridors, green areas and their connections to develop habitat linkages, help support a range of species and allow species to 'migrate'</li> </ul>	
<b>Economy and tourism</b>	<ul style="list-style-type: none"> <li>• Support opportunities for increased tourism as a result of warmer summers within limits of infrastructure capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Develop skills to respond to climate change, e.g. emergency planning and development of new goods and services</li> <li>• Take advantage of opportunities for increased tourism as a result of warmer summers</li> </ul>

<sup>14</sup> See LUC et al., 2005; ODPM, 2004; SECCP et al., 2005; UKCIP 2009; WAG, 2006, 2009, 2010, 2011; Environment Agency, 2010.

Sector	Examples for spatial plans	Examples for other plans
Human health, risk and insurance		<ul style="list-style-type: none"> <li>• Insure against weather and flood losses</li> <li>• Ensure emergency procedures and equipment are in place to meet increased risks</li> <li>• Increase public awareness on how to cope with flooding and heatwaves</li> </ul>

## Further reading

Note: This is a very rapidly evolving topic, and new sources are emerging regularly. The following weblinks were correct in August 2011.

1. Countryside Council for Wales (CCW) guidance ([2007 Strategic environmental assessment guidance](#) for practitioners, SEA topic: Climate Change.
2. DAC Network on Environment and Development Co-operation (Environet) ([2008 Strategic Environmental Assessment and Adaptation to Climate Change](#))
3. Department for Environment, Food and Rural Affairs (Defra) ([2006 Flood and Coastal Defence Appraisal Guidance](#), FCDPAG3 Economic Appraisal, Supplementary note to operating authorities – climate change impacts.
4. Defra (2011) [Climate Resilient Infrastructure: Preparing for a Changing Climate](#)
5. European Union (2007) Communication (2007) 2 final, Limiting Global Climate Change to 2 degrees Celsius [The way ahead for 2020 and beyond](#)
6. Jones, C. (2007) '[Sustainable Buildings](#)', statement by Minister for Environment, Planning and the Countryside.
7. Land Use Consultants et al. (2005) [Toolkit for Delivering Water Management Climate Change Adaptation through the Planning System](#), report to Environment Agency and SEERA.
8. Office of the Deputy Prime Minister (ODPM), Welsh Government (WG) and Scottish Executive (2004) [The Planning Response to Climate Change](#) - Advice on Better Practice.
9. ODPM, WAG, Scottish Executive and Department of Environment of Northern Ireland (2005) [A Practical Guide to the Strategic Environmental Assessment Directive](#)
10. South East Climate Change Partnership (SECCP), Sustainable Development Round Table for the East of England, and London Climate Change Partnership (2005) [Adapting to climate change: a checklist for development](#)
11. Welsh Government (2006) [Local Development Plan Manual](#)
12. Department for Business Innovation and Skills (BIS) (2011) [The Plan for Growth](#)
13. Office of Science & Technology - [Foresight - Future Flooding](#)
14. ESPACE [support guidance](#)
15. Environment Agency (2010) [Managing the environment in a changing climate](#)
16. Environment Agency (2011) [Adapting to Climate Change, Advice for Flood and Coastal Erosion Risk Managers](#) (England only)

customer service line  
08708 506 506

incident hotline  
0800 80 70 60

floodline  
0845 988 1188

[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

17. Department of Health (DoH) (2008) [Health effects of climate change in the UK](#)
18. UK Government Committee on Climate Change, <http://www.theccc.org.uk/carbon-budgets>
19. Scottish Environmental Protection Agency (SEPA) (2010) [Consideration of Climatic Factors within Strategic Environmental Assessment \(SEA\)](#)

## References

20. Communities and Local Government (CLG) (2010) [Planning Policy Statement 25](#), Development and Flood Risk and [PPS25 Supplement](#), or successive documents.
21. CLG (2007) [Planning Policy Statement: Planning and Climate Change - Supplement to Planning Policy Statement 1](#)
22. [European Directive 2001/42/EC](#) "on the assessment of the effects of certain plans and programmes on the environment".
23. [The Environmental Assessment of Plans and Programmes Regulations 2004](#) – English (SI 2004 No. 1633)
24. [The Environmental Assessment of Plans and Programmes Regulations 2004](#) – Welsh (SI 2004 No. 1656)
25. HM Government (2008) [Climate Change Act](#)
26. Stern, N. (2006) [Stern Review on the Economics of Climate Change](#)
27. [UK Climate Impacts Programme \(UKCIP\)](#) (2009) UK Climate Projections (UKCP09)
28. UKCIP tools: [UKCP09 User Interface](#); UKCIP [Risk framework](#); [AdOpt](#) report; [UKCIP Adaptation Wizard](#)
29. UKCIP (2010) [UKCP09 sea-level change estimates](#)
30. WAG (2011) [Planning Policy Wales](#) (edition 4, February 2011)
31. WAG (2009) [Technical Advice Note 5](#), Nature Conservation and Planning.
32. WAG (2010) [Technical Advice Note 22](#), Sustainable Buildings.
33. WAG (2004) [Technical Advice Note 15](#), Development and Flood Risk.

## English climate change partnerships:

34. East of England: [Sustainability East](#)
35. East Midlands: [East Midlands Councils](#)
36. London: [London Climate Change Partnerships](#)
37. North East: [North East Assembly](#)
38. North West: [Government Office for the North West](#)
39. South East: [Climate South East](#)
40. South West: [Climate South West](#)
41. West Midlands: [Sustainability West Midlands](#)
42. Yorkshire and Humber: [Government Office for Yorkshire and Humber](#)
43. Climate Change Commission for Wales: [Climate Change Commission for Wales](#)

customer service line  
08708 506 506

incident hotline  
0800 80 70 60

floodline  
0845 988 1188

[www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

GEHO0811BUCA-E-E