



# postnote

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## ADAPTING TO CLIMATE CHANGE IN THE UK

**Scientists believe that a certain amount of climate change is inevitable over the next few decades, irrespective of future carbon emissions. The Government and businesses are beginning to assess what the impacts might be for the UK and to develop strategies and tools for dealing with them. This POSTnote outlines some of the impacts climate change may have and discusses remaining areas of uncertainty and debate.**

### Background

Societies already modify their actions to suit the climate: flood defences are designed to cope with a given flood risk and buildings to cope with the expected temperatures and storms. The question facing us now is, if we expect the climate to change, how, and when, should we prepare?

It is eight years since POST looked at this question<sup>1</sup>. Then, most of the effort directed at climate change in the UK concentrated on 'mitigation': minimising change by reducing greenhouse gas emissions. However, as it has become more widely accepted that certain changes are likely to happen in the next 30 to 40 years, planning for and adapting to them has become more important.

This note focuses on adapting to climate change in the UK. There is also a lot of interest in how developing countries can adapt to climate change as they are thought to be particularly vulnerable. This topic will be the subject of a forthcoming POSTnote.

### Future climate and its impacts

The main source of advice on preparing for climate change is the UK Climate Impacts Programme (UKCIP). It offers information about the future climate and various

tools to help organisations assess the likely impacts on them and how to prepare.

### Future climate

UKCIP has published a set of climate change scenarios for the UK, called the UKCIP02 scenarios (see Box 1). These offer location-specific (50km resolution) information about changes in climate for different times and different future emissions scenarios. There is a wide range of possible outcomes but in many cases the direction of change is clear, although its magnitude may not be (see 'Issues'.) Climate scientists broadly agree that the UK is likely to face:

- rising sea levels;
- more extreme events such as heat waves and torrential downpours;
- hotter, drier summers; and
- warmer, wetter winters, with more frequent storms;

Changes are not expected to be uniform across the country. For example, the south-east of England will experience greater increases in winter rainfall and greater decreases in summer rainfall than the north-west of Scotland.

### Impacts

Some of the most climate-sensitive sectors for the UK are water supply, flood risk, new housing, agriculture and human health. For some of these, such as agriculture, planning horizons are short enough that adaptation can be delayed. The impacts on human health have been examined in a separate POSTnote<sup>2</sup>. Impacts on the other sectors are briefly discussed below.

### Box 1. UKCIP02 climate change scenarios

These scenarios are based on one model of global climate change and four emissions scenarios (that is, four 'storylines' about the way greenhouse gas emissions could change). The emissions scenarios are drawn from those used by the Intergovernmental Panel on Climate Change. The change in climate is calculated for three time periods: 2020s, 2050s and 2080s.

For each period, changes in annual, seasonal and monthly averages are calculated for a range of climate variables, such as rainfall, temperature and wind speed. These are displayed on maps of the UK, with a resolution of 50km grid squares.

The scenarios also give the change in the frequency of some extreme events, such as very windy, hot or wet days.

The maps are all available on UKCIP's website.

Source: [http://www.ukcip.org.uk/scenarios/ukcip02/ukcip02\\_nutshell.asp](http://www.ukcip.org.uk/scenarios/ukcip02/ukcip02_nutshell.asp)

#### Water supply

The UKCIP02 scenarios indicate that the pattern of precipitation may become more seasonal, with more rain falling in the winter and less in summer. The biggest seasonal changes in rainfall are expected in eastern and southern England, which already experience water shortages. One study also found that climate change is likely to lead to a moderate increase in the demand for water.<sup>3</sup> So, overall seasonal water shortages are expected to increase for some parts of the country.

#### Flood risk

In 2004, the then Office of Science and Technology's Foresight report 'Future Flooding' examined future flood and coastal defence in the UK<sup>4</sup>. It concluded that, under current flood-management policies and expenditure, annual economic losses to flooding would increase by the 2080s. However, the amount of that increase varies, from less than £1 billion to around £27 billion in the 2080s depending on the emissions and economic scenarios used.

#### New housing

The vulnerability of new housing to climate change depends on two things; where it is built and how it is designed. A large amount of new housing is planned for the south east of England, which is likely to face both increased water shortages and more frequent flooding. Buildings in these areas may need to be designed to cope with both. Design changes may also be needed to keep occupants comfortable at higher temperatures.

#### Regional impacts

Scoping studies have been carried out for the devolved administrations and each of the English regions to assess the likely impacts of climate change and the particular vulnerabilities and opportunities. The studies have been locally funded and led and each has a different format and focus.

### Adaptation policy

This year, an OECD report found that its 30 member states have paid little attention to climate change impacts or adaptation. The UK was listed as one of five

that were 'moving towards implementing adaptation', which was the category of furthest progress. The other four were the United States, Australia, New Zealand and the Netherlands<sup>5</sup>.

In Government, the Department for Environment, Food and Rural Affairs (Defra) leads on adapting to climate change. However, many departments, agencies, regulators and private businesses have a role (see Box 2). To try to ensure that adaptation policies across Government are developed in a coherent way, Defra is preparing an Adaptation Policy Framework<sup>6</sup>. At the moment, it is drawing together information about how different groups are tackling adaptation. It then aims to identify roles and responsibilities for developing adaptation strategies.

The Government has also commissioned an independent review of the economics of climate change: the Stern review<sup>7</sup>. This is considering adaptation as part of its remit and is expected to report in Autumn 2006.

### Box 2. Who's who in adaptation policy

- **Defra** is the lead Government department and is working on an adaptation policy framework.
- **Environment Agency** is the environmental regulator for England and Wales with responsibilities for, for example, managing flood risk and water abstraction licensing.
- **UKCIP** is funded by Defra. It provides the most commonly used scenarios for future UK climate and advises organisations on adaptation.
- **Local authorities** are responsible for many services that are vulnerable to the climate e.g. planning, waste.
- **Regional climate impacts partnerships** assess impacts and build adaptive capacity in Scotland and the English regions.
- A wide variety of **businesses** are working on adaptation. Insurers bear some of the financial risks of climate change impacts such as flooding and are actively pressing for adaptation.

### Issues

The impacts of climate change depend on social and economic factors as well as climate variables like temperature and rainfall. There is inevitably uncertainty about the future development of all these factors. Some believe that adaptation will happen largely through the adjustment of habitual processes: people and organisations will learn as they go. Others argue that adaptation should be a more active process. This section examines some of the remaining areas of debate and uncertainty about the most appropriate strategies for the UK.

### Principles of good adaptation

Although suffering the consequences of a climate related event like a flood has costs, so do adaptive steps like building flood barriers. Government and business need to strike an appropriate balance between the two. Climate risks also need to be balanced against other risks. These factors, combined with some uncertainty over the timing and exact nature of impacts make low cost, low risk or

'no regrets' strategies particularly attractive. These could include:

- **reducing vulnerability** e.g. by screening infrastructure proposals for climate risk;
- **improving disaster preparedness** and recovery: improved resilience to current extremes of weather may help us to adapt to expected future norms. For example, following the hot summer of 2003, the Department of Health produced a heat wave plan to reduce the impacts of any future heat waves irrespective of whether it is attributed to climate change<sup>8</sup>;
- **improving information** available about likely impacts and its dissemination;
- taking action that is **cheaper to do now than later**. This might include modifying the design of long lived investments like buildings;
- taking action that has **early benefits**. These benefits may not be related to climate change. Since the disadvantaged are often worst affected, investing in healthcare, economic development and education can help communities prepare for climate change as well as having inherent benefits;
- **avoiding irreversible damage**, such as the loss of unique ecosystems; and
- **avoiding foreclosing future options**.

UKCIP has developed an 'adaptation wizard' to help businesses and other organisations to integrate climate risks into their decision-making<sup>9</sup>. It has been suggested that society's tolerance of risk is decreasing and that people are likely to value higher resilience and levels of protection. If so, this may favour early adaptation.

### Long term planning

Some decisions taken now will influence future adaptation. To return to the example of water supply on p.2, there are two potentially complementary, approaches to addressing likely seasonal shortages. One is to build reservoirs and store winter rainfall. Another is to manage demand. Both would require long term planning to implement. However, a recent House of Lords Science and Technology Committee report concluded that there was little evidence that the potential consequences of climate change were being adequately factored into long-term planning for water management<sup>10</sup>.

Regarding new housing, there is widespread public debate about the extent to which the planning process considers future climate impacts. In 2004, the House of Commons Environment, Food and Rural Affairs Committee concluded that "housing developments built now will be in place for up to 100 years: it would be foolish to plan them in the future without an eye to their future water security"<sup>11</sup>. A UKCIP project has been reviewing the adequacy of current national planning policy in the UK in responding to climate change.

### The role of Government

There is a spectrum of views about the Government's role in preparing for climate change. Two areas where it could act are in building adaptive capacity and through legislation.

#### *Building adaptive capacity*

Here, the Government's role is largely to set conditions that allow others to adapt and to offer tools to help them do so. It could aim to encourage a broad range of strategies and build capacity through sharing information and best practice.

A disadvantage to this approach is that it can be hard to maintain and support a wide array of options: each requires its own knowledge and skills and resources. Another is that, unless there are short term incentives like reduced insurance costs or an enhanced reputation, markets may not reward long term planning now, and businesses are unlikely to invest yet.

#### *Legislation*

Some take the view that the Government should take a more active role, as it is responsible for spending a large proportion of GDP and drives major infrastructure projects, so can set an example. It regulates some of the industries most likely to be affected, such as utilities. In these areas, the Government may need to legislate or provide fiscal incentives to act where market signals are weak.

Returning to the example of new housing, there are few incentives for developers to climate proof new buildings. Although insurance costs reflect flood protection, future climate resilience is not currently reflected in the price of a new home and there is little legislation that requires it. For instance, changes to Part L of the building regulations (thermal performance) have been driven by concerns about carbon emissions and have little to say about coping with a changing climate. The new Code for Sustainable Buildings has no requirement for climate-proofing.

As for flooding, Local Planning Authorities (LPAs) are advised to consult the Environment Agency (EA) on development proposals that are at risk from flooding. The EA may object if the flooding implications are too great. However, the LPA can choose not to follow its advice.

### Vulnerable groups

Some groups are more vulnerable to climate change impacts than others and careful planning may be needed to protect them. Even in developed nations, the poor are often more vulnerable to natural disasters than the wealthy, as was illustrated by the effects of Hurricane Katrina in the United States in 2005. Disadvantaged groups often have less access to information than others and have fewer resources with which to prepare and recover. They may also be disproportionately exposed to climate risks. Studies for the Environment Agency have found that there are eight times more people in the most

deprived 10% of the population living in tidal floodplains than the least deprived 10%<sup>12</sup>.

### Adaptation and mitigation

In the past, adaptation and mitigation have sometimes been seen as competing approaches to dealing with climate change. In the simplest of terms, this view states that if we could prevent any climate change from happening we would not need to adapt and if we had perfect adaptation strategies, we may not need to prevent climate change.

Some argue that there need not be a trade off between the two as they are dealt with through different policies. Others point out that true synergies between them are rare. One example is planting trees in cities, which both absorb carbon dioxide and provide shade. It is now more generally accepted that a mixture of mitigation and adaptation is necessary because a certain amount of change is inevitable and societies may wish to avoid the most severe impacts. For examples, areas facing inundation by rising sea level could be evacuated, but at a great cost. However, there is still disagreement, particularly at the international level, about where the balance should lie.

### Uncertainty about future climate<sup>13</sup>

Although climate modellers are confident about many of the aspects of future climate scenarios, some areas of uncertainty remain, some of which are discussed below. Some argue that good preparation does not depend on very precise scenarios; a lot can be done by understanding the sensitivity of investments and activities to climate and climate changes.

#### Natural climate variation

Climate changes due to greenhouse gas emissions sit on top of the natural variability of the climate. The uncertainty that results from this is addressed by running climate models several times assuming different natural climate conditions. UKCIP says that this provides a more robust picture of the climate over the thirty year periods covered by their scenarios.

#### Models

Different climate models produce different climate scenarios. The UKCIP02 scenarios are based on one model developed by the Hadley Centre, part of the UK's Meteorological Office. However, this is not the only one available. The Republic of Ireland, for example, uses a German climate model for its impact assessments, which gives different results. Some have argued that it is no longer defensible to rely on a single climate model when planning for climate change, so the forthcoming set of scenarios is based on the outputs of many different models (see below).

#### Emissions scenarios

The extent of climate change depends on future greenhouse gas emissions, but it is not yet known what those emissions will be. Modellers have to rely on scenarios based on plausible patterns of economic

development and energy use. The UKCIP02 uses four scenarios drawn from those used by the Inter-Governmental Panel on Climate Change, which cover a broad range of possible outcomes. In UKCIP's view, in practice, the uncertainty about emissions affects only the timing of impacts and therefore the timing of adaptation responses.

#### New scenarios

UKCIP is planning to publish a new set of scenarios in the next couple of years and is consulting on what the new scenarios should offer. Instead of the single deterministic numbers given now, they will present the probability of a certain change happening within a certain time frame. This may be more helpful to those making decisions, as it can describe the degree of uncertainty in the scenario.

## Overview

- The UK faces rising sea level, higher temperatures, and more frequent floods and storms as a result of climate change, but there is still significant uncertainty about the extent and timing of these changes.
- The Government, UKCIP and other organisations are developing tools to help plan for and adapt to climate change.
- Some groups and types of business are more vulnerable to climate change and preparation may need to begin earlier for these.
- At present, lower cost 'no regrets' strategies are most likely to be adopted, but stronger action may be needed in future. Given the uncertainty about future climate change, improving resilience to current extremes of weather could be a cost-effective approach.

#### Endnotes

- 1 [www.parliament.uk/post/pn121.pdf](http://www.parliament.uk/post/pn121.pdf)
- 2 [www.parliament.uk/documents/upload/POSTpn232](http://www.parliament.uk/documents/upload/POSTpn232)
- 3 [www.sei.se/oxford/ccdew/](http://www.sei.se/oxford/ccdew/)
- 4 [www.foresight.gov.uk](http://www.foresight.gov.uk)
- 5 OECD (2006) *Progress on adaptation to climate change in developed countries: an analysis of broad trends*
- 6 [www.defra.gov.uk/environment/climatechange/uk](http://www.defra.gov.uk/environment/climatechange/uk)
- 7 [www.hm-treasury.gov.uk/independent\\_reviews](http://www.hm-treasury.gov.uk/independent_reviews)
- 8 [www.dh.gov.uk/assetRoot/04/13/52/97/04135297.pdf](http://www.dh.gov.uk/assetRoot/04/13/52/97/04135297.pdf)
- 9 [www.ukcip.org.uk/resources/tools/wizard](http://www.ukcip.org.uk/resources/tools/wizard)
- 10 House of Lords Science and Technology Committee (2006) Eighth Report of Session 2005-06. *Water management* HL191
- 11 House of Commons Environment, Food and Rural Affairs Committee (2004) Sixteenth Report of Session 2003-04. *Climate change, water security and flooding* HC 558
- 12 <http://www.environment-agency.gov.uk/aboutus/>
- 13 [www.ukcip.org.uk/scenarios/guidance/uncertainty.asp](http://www.ukcip.org.uk/scenarios/guidance/uncertainty.asp)

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