



postnote

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UK HEALTH IMPACTS OF CLIMATE CHANGE

How we respond to climate change, both globally and in the UK, is an issue of public concern. To date, the main focus has been on the likely environmental and economic outcomes. However, there is growing recognition that there may be significant impacts from climate change on human health. This POSTnote outlines the potential impacts of climate change on health in the UK and examines the options open to public policy makers.

Background

Climate change

Climate change is a global phenomenon. There is growing international consensus about its occurrence; for instance, the average global air temperature rose by around 0.6°C over the twentieth century and the 1990s was the warmest decade in the last 100 years. It is widely accepted that the biggest single human influence on global climate is via emission of greenhouse gases.

UK projections and emission scenarios

Climate change scenarios for the UK have been developed for UKCIP (box 1); the most recent were published in 2002. These are being used to assess the potential impacts of climate change, our vulnerability to these impacts and what measures will help us to adapt. The UKCIP scenarios are based on four emission scenarios described by the IPCC (box 1), with the climate outcomes calculated using the Hadley Centre global climate model (box 1). As outlined in box 2, the main changes in climate for the UK by the 2080s predicted by UKCIP are an increase in average summer temperature of 2-3.5°C, milder but wetter winters, increased frequency of extreme weather events, reduced levels of cloud cover and rising sea levels. A DoH expert group (box 1) used the then most recent (1998) UKCIP scenarios as the

Box 1 Key players in UK climate change policy

- IPCC - the Intergovernmental Panel on Climate Change was established in 1988 to evaluate the risk of human-induced climate change, assess its potential impacts and identify options for adaptation and mitigation.
- UKCIP - the UK Climate Impacts Programme provides scenarios showing how UK climate might change and co-ordinates research on how to deal with this change. It shares this information with organisations in the commercial and public sectors to help them prepare for the impacts of climate change.
- Defra – the Department for environment, food and rural affairs published the UK's Climate Change Programme in November 2000. It details how the UK will achieve its target to cut greenhouse gas emissions by 12.5%, and move towards its domestic goal to cut carbon dioxide emissions by 20% below 1990 levels by 2010.
- Met Office – the Met Office's Hadley Centre provides a focus in the UK for the scientific issues associated with climate change. It monitors global and national climate change, develops climate models and uses them to predict likely climate change over the next 100 years.
- DoH – the Department of Health set up an expert group on climate change and health in the UK in 1999, which reported in 2002.¹ This group took the UKCIP's scenarios for climate change and used them to consider the likely impact on health in the UK up to the 2080s.
- HPA - the Health Protection Agency advises government on public health protection and provides services and support to the NHS and other agencies to protect people from infectious diseases. It has set up a co-ordination unit to protect the public from zoonoses (infections transmitted from animals to man).
- EA – the Environment Agency assesses the potential future impact of climate change on flood risks and develops precautionary strategies.

basis of a national assessment of the potential UK health impacts of climate change.¹

Box 2: Key findings from UKCIP climate scenarios

The most recently published (2002) UKCIP climate change scenarios² are based on four emission scenarios described by the IPCC³ and are calculated using the latest global climate model from the Hadley Centre. The results suggest that in the period up to 2080:

- Temperature - the average annual temperature in the UK may rise by between 2°C (based on the low emissions scenario) and 3.5°C (high emissions scenario). High summer temperature will become more frequent and very cold winters increasingly rare.
- Precipitation (rain and snow) - winters will become wetter and summers drier throughout the UK. Heavy winter precipitation will become more frequent.
- Sea level changes - relative sea level will continue to rise around most of the UK's shoreline. Extreme sea levels will be experienced more frequently.
- Cloud cover - summer cloud cover may decrease in the southern part of the country by an estimated 10% (low emission scenario) to 20% (high emission scenario).
- UV radiation – increases with sunnier summers. Sunnier and warmer summers might encourage people to spend more time outdoors, thus increasing their UV exposure.

UKCIP also published climate change scenarios in 1998 that provided the basis for the DoH's expert group assessment of health impacts. The two sets of scenarios are essentially similar, although the 2002 scenarios predict higher warming rates and smaller rates of sea level rise compared with the 1998 scenarios.

Health impact of climate change in the UK

While the UK national assessment acknowledged the uncertainties surrounding predictions of likely effects of climate change, it identified a number of potential health impacts by the 2050s:¹

- Extremes of temperature - heat-related deaths could increase to around 2,800 cases per year. This is likely to be offset by milder winters leading to a fall in cold-related winter deaths of up to 20,000 cases per year.
- Flooding – it is predicted that there will be an increased frequency of severe coastal and river floods, both of which can have severe impacts on health. Analysis of more recent river flooding in the UK shows that mental health problems are the most important health impact among flood victims due to experience of personal and economic loss and stress.⁴
- UV exposure – levels of UV radiation reaching the earth's surface may increase due to sunnier summers, a decline in cloud cover and ozone depletion (which reduces the capacity of the ozone layer to absorb UV). Whether this will lead to increased UV exposure depends on people's behaviour. Overall, the DoH assessment predicted an extra 5,000 cases of skin cancer and 2,000 of cataract per year by 2050.
- Vector-borne diseases – various diseases transmitted by mosquitoes or ticks are climate-sensitive and can increase or be introduced due to climate change. Malaria might be re-established in the UK. The health impacts of this are likely to be localised, but more cases could be imported among travellers returning to the UK. The emergence of tick-borne encephalitis is unlikely; the impact of climate change on the incidence of Lyme disease is difficult to predict. Monitoring will also need to look for the emergence of other vector-borne diseases, such as West Nile Fever.

- Food poisoning - higher temperatures in summer could cause an estimated 10,000 extra cases of salmonella infection per year.
- Water-borne disease – climate change might increase levels of cryptosporidium and campylobacter in water. Secure sanitation systems should safeguard supplies of drinking water, but possible contamination of storm-water outflows could carry disease into basements and nearby rivers, affecting the health of residents and river users.
- Storms – any increase in the frequency of severe winter storms could lead to an increase in personal injuries from flying debris and falling trees.
- Air pollution - a reduction in the cold, calm winter weather associated with winter air pollution episodes together with reduced emissions of key pollutants including particles, oxides of nitrogen and sulphur dioxide could lead to a reduction (up to 50%) in the adverse health effects of winter air pollution. A small overall increase in the number of summer ozone episodes coupled with a longer-term increase in background levels of ozone could cause a rise in the number of premature deaths.

**ISSUES
Adaptation policies**

The World Health Organisation (WHO) has identified a range of policy challenges at both national and global levels.⁵ These include both adaptation policies to minimise the health impacts of climate change and mitigation policies to reduce the scale of climate change in the future. The following sections examine some of the specific adaptation issues for the UK (mitigation policies lie beyond the scope of this POSTnote).

UK issues**Extreme weather events**

Progress has been made in recent years in the UK on developing early warning systems and plans for handling extreme weather events such as heatwaves and floods.

Heatwaves

Heatwaves can cause deaths among certain sub-groups of the population such as the elderly (over 75), the young (under 4) or those who are already ill. The heatwave in August 2003 is estimated to have caused 15,000 extra deaths in Northern France and around 2,000 extra deaths in England and Wales,⁶ mainly among older people. In response to concerns that climate change will increase the frequency of heatwaves, the DoH and NHS published a *Heatwave Plan for England* in July 2004.⁷ As outlined in box 3, the plan defines four levels of response that are triggered when threshold temperatures are forecast or exceeded. It also lays down areas of responsibility for the HPA, Met Office, DoH, Strategic Health Authorities, Primary Care Trusts, Local Authorities and Regional Directors of Public Health. The plan has yet to be tested, but it is widely acknowledged that other adaptive measures will also be needed to shift the policy emphasis away from 'disaster management' and towards 'risk management'. For instance, the Environmental Change Institute at the University of Oxford is exploring ways to build houses that stay cool in hot weather

Box 3 The Heatwave plan for England

The plan details a 'heat-health watch' that will operate from June 1 to September 15 each year. It defines 4 levels of response based on threshold temperatures (these vary from region to region, but are ~30°C at day and ~15°C at night):

- Level 1 (awareness) – the minimum state of awareness that is maintained until thresholds are exceeded.
- Level 2 (alert) – triggered as soon as the Met Office forecasts threshold temperatures will be exceeded in any region for at least 3 days ahead or for 2 consecutive days of extremely high temperatures.
- Level 3 (heatwave) – triggered as soon as threshold temperatures are reached in any region.
- Level 4 (emergency) – reached when a heatwave is so severe that the effects threaten the integrity of, or extend beyond, the health and social care systems.

In addition, the plan sets out the responsibilities of the various health and social services bodies:

- HPA is responsible for surveillance of heat-related illnesses (e.g. through monitoring calls to NHS direct and GP consultations) and reporting to the DoH.
- Met Office is responsible for providing three day forecasts, notifying DoH when these predict threshold temperatures, confirming when thresholds have been met and forecasting the likely duration of heatwaves.
- DoH, in collaboration with Met Office and Strategic Health Authorities, will issue advice to the public and to health and social service professionals in affected regions via the media.
- Primary care trusts and local authorities will issue advice to occupants and staff of residential and nursing homes. They will also support community and primary care staff in identifying individuals who are most at risk from extreme heat and ensuring simple protective measures (fans, fridges, etc.) are in place.
- Regional directors of public health will work with utility companies to maintain continuity of water and power supplies to those in affected regions.

without air conditioning, and the DoH and the Met Office are piloting a system that predicts the load on the health system during cold spells as well as during hot weather.

Floods

The HPA published guidelines on the public health implications of flooding in November 2000, which include general advice on protecting against infection, and specific advice about returning to a flooded home, food preparation and storage and drinking water.⁸ The UK national assessment also concluded that there is an urgent need to assess the existing disaster preparedness measures for both coastal and river floods. In April 2004, the Department of Trade and Industry (DTI) published a Foresight report on *Flood and coastal defence*, which suggested that the number of people at high risk of coastal or river floods would increase from the current 1.6 million to 2.3-3.6 million by the 2080s.⁹ It identified the biggest health impacts as being from pollutants, foul waters and mental health consequences.

Defra is currently undertaking a consultation exercise, *Making space for water*, which closes in November 2004. The main thrust of this is on flood prevention, management and adaptation strategies to reduce the impact of flooding. It includes sections on flood warning/emergency responses, raising awareness of

flooding and how to make properties more flood resilient. However, it does not specifically address the health-related measures that are needed when flood mitigation responses fail. These include support for flood victims (both practical and psychological), advice and assistance with hygiene and access to medical services.

Surveillance and control of infectious disease

Surveillance and control of infectious (vector-, water- and food-borne) diseases will become increasingly important in the light of climate change. The DoH published a new strategy for tackling infectious disease in January 2002.¹⁰ This led to the establishment of the HPA, which is responsible for all aspects of human health protection, including infectious diseases. The House of Lords Select Committee on Science and Technology looked at infectious diseases services in England as part of its *Fighting infection* inquiry.¹¹ It identified several key areas:

- the role of the HPA in integrating surveillance on human, animal and food-borne infections at national, regional and local levels;
- the need to develop close collaborative relationships between the HPA (human disease), Defra (animal disease), FSA (food-borne disease) and other organisations involved with tackling infection, including the devolved administrations;
- funding of research to provide an evidence base for improving diagnosis, treatment, prevention and control of infection;
- provision of clear advice and information to the public.

In its response to the Committee's inquiry, the government noted that it would encourage even closer collaboration and integration of data between the bodies involved in monitoring and controlling infectious disease.¹² Detailed surveillance data are essential as a yardstick against which to detect changes in patterns of climate sensitive infectious diseases. Recent initiatives include *Scanning the horizon*, by the HPA Microbial Risk Assessment team, which looked at the impact of climate change on existing and emerging infectious disease threats such as West Nile virus.

Public information

As noted above, the House of Lords inquiry into *Fighting infection* highlighted the importance of providing clear advice and information to the public on the risks posed by infectious disease. It also identified a need to educate health professionals to recognise and treat rare or 'unusual' diseases that may appear more frequently as a result of climate change.

In other areas the emphasis is on providing information on risks in an attempt to influence people's behaviour. For instance, the DoH Sun Safe and UK Sun Smart campaigns provide the public with information on the health risks of UV exposure. Campaigns to increase public awareness and disseminate information are also particularly important in the area of flood early warning. While surveys show that such approaches make people more aware of the risks, it is unclear how effective they

are at changing individual or community behaviour. Schools are also a useful setting for providing general information and education on climate change and its likely impacts.

Health and social services infrastructure

Climate change and its impact on health may put additional strain on the UK health care system. There is thus a need to ensure that health and social services can cope with the predicted increased frequency of extreme events. In its response to the *Fighting infection* inquiry, the government stated that *We continue to keep training numbers under review, in consultation with Royal Colleges and professional bodies, that it is aware of factors influencing demand for trained specialists and that these are taken into account when considering the need for future numbers of trained specialists.*

However, it is also widely acknowledged that the health impacts of climate change can be minimised by building climate change considerations into the UK's health and social care infrastructure. For instance, improved health care provision generally reduces the vulnerability of the population and the health system with regard to health impacts of climate change. Targeting improvements in health and social services at the most at risk groups – for example by improving social services for elderly people living on their own, or the design of residential care homes – may also help to reduce the potential health impacts of climate change. Such initiatives could form part of a more holistic risk management approach to climate change issues.

Research needs

The UK national assessment of the likely health impacts of climate change identified a wide range of areas where more research is needed:

- research into the vulnerability of individuals and groups and into connecting disease prevention and social care to community monitoring;
- assessment of the effectiveness of education campaigns such as Sun Safe in changing people's behaviour;
- refinement of the methodology to quantify health impacts due to climate change;
- assessment of the effectiveness of adaptation policies such as warning schemes;
- better estimates of likely impacts of climate change on human health;
- research into how best to communicate remaining uncertainties to policy makers and the public.

Global issues

People in developing countries are more vulnerable to the impacts of climate change than those in developed countries. There is thus a need for developed countries to assist developing countries in preparing for, and adapting to, climate change. Experience from previous programmes in developing countries suggests that climate change adaptation policies need to:¹³

- take account of how climate variability impacts on vulnerability;

- be fully integrated into existing programmes to relieve poverty and improve health care infrastructure.

Training and capacity building for health professionals from developing countries (e.g. post-graduate training in international health) is one way of supporting them in adapting to climate change impacts. The UK Department for International Development (DfID) has identified the impact of climate change on poverty as one of its key research areas for 2005-07. It will carry out scoping work during 2004 to identify the main research needs of developing countries and to catalogue other relevant work in this area. Changing patterns of disease around the world related to climate change may also pose risks to the UK.

Overview

- A national assessment suggests that the main impacts of climate change on health in the UK will be through increased frequency of extreme weather events such as heatwaves and floods, through changing patterns of infectious disease, and via increased exposure to UV radiation (but this depends on people's behaviour).
- The UK has started to respond to such challenges through initiatives such as the Heatwave plan and the *Making space for water* consultation. Such initiatives require close co-ordination across a wide range of bodies. Consideration of health impacts is a fairly recent development in the climate change debate.
- Further research is needed across a wide range of areas to reduce uncertainties in the predicted impacts, to assess the most effective adaptation and education approaches, and to ensure co-ordination occurs.
- Climate change is a global phenomenon and the UK has a role to play in minimising the resulting health impacts in developing countries, particularly through improving health care provision and relieving poverty.

Endnotes

- 1 *Health effects of Climate Change in the UK*, DoH, 2002
- 2 Hulme M et al, *Climate change scenarios for the United Kingdom: the UKCIP02 Scientific report*, UEA, 2002
- 3 www.grida.no/climate/ipcc/emission/
- 4 Tapsell S et al *Vulnerability to flooding: health and social dimensions*, Phil Trans R Soc Lond, 360, 1511-25, 2002
- 5 *Climate change and human health; risks & responses*, WHO, 2002
- 6 www.statistics.gov.uk/cci/nugget.asp?id=480
- 7 *Heatwave Plan for England*, DoH, July 2004.
- 8 hpa.org.uk/infections/topics_az/flooding/menu.htm
- 9 www.foresight.gov.uk/fcd.html
- 10 *Getting ahead of the curve*, DoH, January 2002
- 11 *Fighting infection*, 4th report, Session 2002/03, July 2003
- 12 *Government response to Fighting infection*, DoH, November 2003
- 13 *Taking initial steps towards adaptation*, DFID, 2003

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