



Doctors taking action on climate change

The scientific community has expressed in no uncertain terms that the Earth's climate is rapidly approaching a threshold, beyond which there are likely to be major and irreversible changes.

The BMA recognises the important role doctors have in tackling climate change and promoting the public health benefits of low carbon living. As a member of the [Climate and Health Council](#) we support the call for healthcare professionals across the world to take action to limit climate change. With the direct threat to human health continuing to increase, the time to act is now.

If you would like to know more about the work of the Board of Science or have any comments please email us at friendsBoS@bma.org.uk

Find out more by clicking on the following links

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Why is tackling climate change important to doctors?

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1. Because climate change is a major threat to public health globally and in the UK. Rising temperatures, changing sea levels and more frequent and extreme weather patterns will lead to increased morbidity and mortality associated with:

- changing patterns of infectious diseases
- increased air pollution and UV radiation
- flooding
- heat waves
- food and water shortages.

The negative impacts of climate change on human health are already appearing. Failure to act decisively and quickly will have severe health consequences now and in the future.

2. Because taking action on climate change will have substantial indirect public health benefits as a result of increased physical activity levels and reduced health inequalities.

QUICK FACTS – climate science:

- climate change is a natural phenomenon, but the sharp increase in greenhouse gas (GHG) emissions as a result of human activities (including burning fossil fuels and deforestation) has drastically altered the process
- the rate of change has become alarming and unsustainable in the long-term
- the main GHG responsible for recent climate change is carbon dioxide (CO₂) although human activities have also led to higher levels of methane (CH₄) and nitrous oxide (NO₂)
- UK GHG emissions are among the highest per person worldwide (behind Australia, the USA, Canada, Russia, Germany and South Korea).

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QUICK FACTS – climate change impacts:

- climate change has already claimed many lives worldwide through deaths, disease and injury associated with:
 - thermal stress
 - floods, storms, cyclones and bushfires
 - microbial proliferation (food poisoning and unsafe drinking water)
 - changes in vector-pathogen-host relationships and infectious disease patterns
 - reduced crop, livestock and fisheries yields leading to impaired nutrition, health and survival
 - loss of livelihoods and displacement leading to poverty
- between the mid-1970s and 2000 climate change was estimated to have caused over 150,000 deaths and 5.5 million disability adjusted life years (DALYs) per year worldwide
- in the UK, direct impacts are likely to include increased deaths, disease and injury due to:
 - heatwaves (with the greatest impact on the elderly, babies and young children, and people with ill-health)
 - flooding and storms (including drowning, chemical hazards and contamination of drinking water and mental stress)
 - increased spread of infections previously only seen in other parts of the world (such as tick-borne encephalitis, lyme disease, malaria, dengue, leptospirosis and West Nile Virus)
 - reduced food safety associated with warmer temperatures
 - greater exposure to ultraviolet radiation with increased risk of sunburn, sunstroke and skin cancers
 - reduced air quality and increased pollens
- climate change will also lead to a widening of health and social inequalities between and within countries (including the UK), with the effects most severe in developing countries and among the poorest people.

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Why is the BMA taking action on climate change?

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As the leading professional organisation for doctors in the UK, the BMA represents the collective voice of the profession in improving and protecting public health. By working together through medical associations and special interest groups, doctors can be powerful and effective lobbyists in informing and influencing public health policy.

Members have repeatedly called on the BMA to act on climate change to increase awareness among the profession and lobby for decisive action to tackle this global health threat. The following provides details of resolutions passed at the BMA Annual Representative Meeting (ARM).

2009

That this Meeting considers the BMA's response to increasing evidence of global warming has been muted at best and calls on the BMA to:

- (i) increase awareness in the profession of potential global health problems related to climate change;
- (ii) increase awareness of the public of potential global health problems related to climate change;
- (iii) lobby UK governments to act more decisively and quickly to introduce effective action on climate change;
- (iv) lobby UK Medical Schools to sign the Climate and Health Council Declaration;
- (v) encourage its members to sign the Climate and Health Council Declaration;
- (vi) highlight the enormous carbon footprint of the NHS and the poor progress to date in reducing this;
- (vii) work with government to develop binding and enforceable carbon footprint reduction guidelines for the NHS.

2008

That this Meeting recognises the negative effect that climate change will have nationally and globally and:

- (i) calls for all new health sector buildings to be sustainable and carbon neutral (carried as Reference);
- (ii) calls for a review of health sector processes to maximise re-use and recycling;
- (iii) calls on health sector employers to support staff in making sustainable transport choices; (iv) calls on the BMA to develop guidance for health sector workers on reducing personal and professional carbon footprints;
- (v) calls on the BMA to promote the public health benefits of low carbon living.

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2007

That this Meeting notes the overwhelming evidence that human behaviour is contributing to global warming. It calls upon the BMA to:

- (i) affirm that climate change will have a significant impact on global health, particularly in developing countries where food and water shortages, and water borne, food borne and vector borne diseases, are all likely to increase;
- (ii) lobby the government to ensure that adequate resources are provided to developing countries so that they may cope with the effects of climate change;
- (iii) lobby the Health Departments to employ sustainable forms of transport for the NHS, its staff and patients;
- (iv) investigate what a realistic timescale for reducing its own carbon footprint to zero would be and commit to meeting this target within the timescale specified;
- (v) assist its members in reducing their own carbon footprint;
- (vi) support members in reducing carbon footprint in the workplace.

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What is the BMA working to achieve?

There is an urgent need for action at an individual, organisational, political and global level to prevent unmanageable climate change

We believe the UK governments should act more decisively and quickly to introduce effective action on climate change. Adequate resources are also required for developing countries to mitigate the effects of climate change.

In reducing the enormous carbon footprint of the NHS there is a need to:

- develop binding and enforceable carbon footprint reduction guidelines
- implement measures to promote energy efficiency, including processes to maximise re-use and recycling
- encourage and facilitate sustainable forms of transport for NHS staff and patients.

The BMA is also working to support its members in reducing their own carbon footprint, influencing others and promoting social change. To find out more see [How can you make a difference?](#)

Influence in action:

- The BMA is a member of the [Climate and Health Council](#) which is an international organisation aiming to mobilise healthcare professionals across the world to take action to limit climate change. The Council is calling on healthcare professionals to [sign their pledge](#) calling for urgent government-led international action on climate change.
- Through our [public affairs offices](#) we work with politicians at Westminster, in the Scottish Parliament, the Welsh Assembly, the Northern Ireland Assembly and in the European Parliament to provide briefs on BMA policy, lobby on legislation and co-ordinate the BMA's activities with parliamentary committees.
- We regularly meet with key stakeholders (such as the [Department of Energy and Climate Change](#)) and respond to relevant consultations.
- From an international perspective we took a lead role in the development of the 2009 [World Medical Association declaration on health and climate change](#), maintain links with the [Standing Committee of European Doctors](#), and are represented on the Climate and Health Council International expert advisory group. The 2007 BMA International Department report [Improving health for the world's poor: what can health professionals do?](#) examines the need for health leadership in tackling climate change (Chapter 3).

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How is the Association adopting good environmental practices?

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The BMA and British Medical Journal Publishing Group (BMJPG) recognise that we have a responsibility to both promote and adopt good environmental practices.

The BMA Senior Management Group (SMG) have set up an informal group (our green team) to look at practical ways of reducing the BMA's carbon foot print, and have issued internal guidance to all BMA and BMJ staff on how they can make a difference (eg by switching off lights and electronic equipment, recycling office stationary etc).

Our carbon footprint

We are also working with [Best Foot Forward](#) to measure our carbon footprint with a view to reducing it further. This includes gathering data on:

- heating, electricity, and lighting in BMA House
- procurement (stationary, computers, food, furniture etc)
- print and distribution of journals and other publications
- business travel and commuting
- the amounts of waste we produce.

The following provides an overview of the ranges of current and planned initiatives to help us continue to reduce our carbon footprint.

Stationery

The BMA is now buying more environmentally friendly stationery than ever before; currently 66 per cent of everyday items purchased are classed as environmentally friendly products. The organisation has a single source agreement with their stationary supplier (who are themselves fully certified to ISO 14001) which minimises the number of deliveries. It also encourages its staff to utilise online ordering from a dedicated website (paperless system) and the usage of this system has increased steadily from zero in 2005 to 32 per cent in 2007, and is currently 66 per cent, with a target of 80 per cent by the end of 2010. All our printer and copier paper is either recycled or procured from pulp originating from managed forestry/sustainable sources.

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The BMA purchase the 'Evolve' brand of recycled papers which include in its manufacture, waste paper collected by Paper Round, our recycling partner (allowing for 'closed loop' recycling). In 2010, the BMA will introduced further measures including:

- less frequent deliveries to reduce the carbon footprint of the delivery process
- deliveries to be made in recyclable/re-usable packaging
- increased uptake of environmentally friendly products from its 'core list'
- the introduction of a separate 'Green core list' consisting only of Eco-friendly products that are either partly/fully recycled or recyclable.

Waste management

In 2008, BMA House produced approximately 331 tonnes of waste, consisting of:

- 227 tonnes of compacted waste including general office and food waste
- 84 tonnes of mixed waste including construction materials (80% of which are re-used)
- 20 tonnes of (mainly paper based) waste which was collected for recycling.

In 2009, the BMA recycled a record amount of 84 tonnes, including 45 tonnes of paper, 14 tonnes of cardboard, 16 tonnes of food waste and five tonnes of glass. Other products now being recycled include batteries, ink and toner cartridges and electrical items. Since 2007, the BMA has introduced over 100 recycling bins into office and kitchen areas. This allows us to separate waste at source for onward recycling. Looking forward, the BMA will continue to increase its recycling activity and where possible, minimise waste reaching landfill sites, with a view to having zero to landfill. Waste that cannot be recycled will be sent to Energy from Waste (EFW) facilities where it is incinerated under controlled conditions to reduce its volume and hazardousness, and to generate electricity.

Estates

The BMA Estates department has implemented a number of measures including:

- low energy light fittings
- infra red light sensors
- recycling of florescent low energy lamps
- more environmentally friendly water systems
- versa twin toilet roll dispensers to minimise paper waste
- environmentally friendly toilet and tissue paper.

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Drinking water

We have increased the number of mains fed chilled water outlets at BMA House from 10 (2007) to 24, plus three additional units in the catering kitchens. Only three remaining areas use free standing bottled water coolers, albeit in small volumes.

Information management and technology

The BMA Information Management and Technology (IM&T) department has implemented a number of measures including:

- the replacement of older style cathode ray tube (CRT) screens with flat screens
- disposing of old equipment responsibly or to charity
- reducing the number of printers and servers in use
- lobbying IT suppliers to adopt more environmentally friendly practices.

Catering and hospitality services

Baxter Storey, the BMA contract caterer is committed to supporting the BMA Environmental Policy and actively promotes the following areas:

- we endeavour to source local produce, both to support local growers and to reduce food miles
- approximately 95 per cent of our disposable products are fully bio-degradable
- coffee grounds are an excellent accelerant for food composting, and are available upon request
- our waste oil is collected by an environmental waste management company who then convert the oil into bio-fuel
- our suppliers are briefed to minimise packaging waste, food miles and vehicle use
- we bottle our own UV treated and filtered water using the Vivreau Water System.

Travel

The investment in enhanced telephone and video conferencing equipment has helped minimise business travel and reduce our carbon footprint. The introduction and development of online travel bookings (ie paperless system) together with e-tickets has proved to be successful. A record 81 per cent of all travel bookings were made online in September 2009. More domestic committee travel is also being switched from air to (more environmentally friendly) rail.

In 2008, the BMA introduced the Government Green Car Service (GGCS) as an alternative, environmentally friendly taxi company, whose fleet predominantly use the Toyota Prius electric hybrid vehicles. The use of these vehicles saves (on average) between 55 and 63 per cent of carbon emissions compared to a regular taxi. The GGCS

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also offset the rest, via the Government Carbon Offsetting Fund. Within a year of its introduction, this organisation became the BMA's largest single taxi cab supplier, by spend. Where the BMA is attending meetings internationally, we have reduced the number BMA representatives in order to reduce the carbon footprint.

British Medical Journal

The BMJPG is looking at using recycled high quality paper for the journal publication:

- currently the BMJ is printed on a light weight coated paper that is a mixture of virgin pulp and washed pulp
- the wrapper is biodegradable and the BMJ will be investigating in lower weights of biodegradable polythenes that take less time to break down. The BMJ Journals will also use biodegradable wrappers.
- the mills used to produce the paper for all BMJ products are certified as having good environmental practices and take their wood from sustainable forests situated in Europe, thus avoiding long transport times
- all BMJ printers are signed up to standards of environmental practice.

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How can you make a difference?

As a doctor you have a unique opportunity to lead in taking action on climate change through the number of patients and colleagues you can reach, and as opinion polls have repeatedly shown, the trust the public has in the medical profession [1].

At the top of the scale, nine in ten people said they trust doctors (92%), an occupation which has remained at this level of trust over the decade.

There are a number of ways in which you can make a difference:

Ways to mitigate:

1. **Inform** your patients and the public about the need to act on climate change and the health benefits of doing so. [Read more here.](#)
2. **Lead by example** on tackling climate change by ensuring your own life style is climate friendly. [Find out how to reduce your carbon footprint.](#)
3. **Advocate** for change within your healthcare setting and among policy makers. [Find out how you can be an advocate for change.](#)

Ways to adapt:

4. **Promote** adaptive responses by helping to prepare for the health effects of climate change. [Read more here.](#)

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Reference

1. Ipsos MORI (2008) Doctors still top the poll as the most trusted profession. London: Ipsos MORI.

1. Inform yourself so you can inform others

As a doctor you can play an important role in informing your patients and the public about the need to take action on climate change, and the health benefits of doing so.

You can also help your patients to improve their health and lower their carbon emissions by encouraging them to:

- walk and cycle more (as this will reduce motor vehicle use and increase exercise levels)
- eat less meat (as this will reduce carbon emissions associated with livestock farming and provide substantial cardiovascular health benefits through an improved diet).

To assist you, the following links provide key information on climate change:

- [What is climate change?](#)
- [What are the causes of climate change?](#)
- [How has the climate changed?](#)
- [What are the consequences and implications of climate change?](#)
- [What are the health impacts of climate change?](#)
- [What are the public health co-benefits of action on climate change?](#)
- [How can the impact of climate change be reduced?](#)

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2. Lead by example

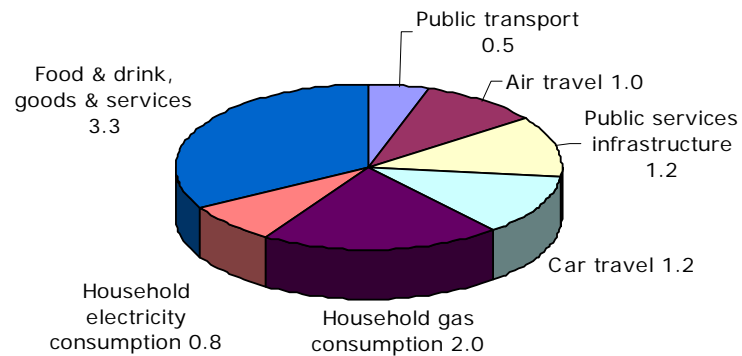
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As a doctor you can set an example by living a low-carbon, healthy lifestyle. This will not only be good for your health and the environment, but it will encourage others to follow your example.

Key to this is reducing your 'carbon footprint' – the amount of carbon dioxide (CO₂) emitted as a result of your activities. On average, each person in the UK is responsible for approximately 10 tonnes of CO₂ emissions every year, with just over half of this amount a result of personal travel and household energy needs (see Figure 1).

Figure 1 – average carbon emissions in the UK per person (tonnes per year)



Source: Griffiths J & Stewart L (2009) *Sustaining a healthy future: taking action on climate change* (2nd edition). London: Faculty of Public Health and NHS Sustainable Development Unit.

How to calculate your carbon footprint

An important first step in taking action on climate change is to calculate your carbon footprint. This can be done using an online carbon calculator such as the [Act on CO₂ calculator](#), which has been set up by the UK Government to provide you with a measure of your carbon footprint and an action plan to reduce it.

Tips for reducing your carbon footprint

There are a number of simple measures to reduce your carbon footprint in the way you travel, use energy, manage your waste and use water. The extent to which you implement these changes will depend on your personal circumstances.

- **Energy efficiency**

- turn off all appliances and lights when not in use, and do not leave appliances on standby
- use energy saving light bulbs, fewer bulbs and maximise natural lighting
- wash your clothes at 30°C or lower
- ensure the appliances you use have the highest energy-efficiency ratings and that they are properly maintained and repaired
- turn down unnecessary heating and air-conditioning systems, use automatic time-controlled thermostats, and opt for increasing clothing layers rather than turning up the heating where possible
- make the most of natural ventilation by opening windows to cool buildings, rather than turning on air-conditioning or fans
- install insulation for walls, floors, loftspace, roofing, boilers, pipework and windows (including replacing single-glazing with double-glazing)
- unplug your mobile telephone charger when not in use
- ensure refrigerators and freezers are set for optimal energy efficiency by making sure they are not next to the cooker or boiler and are on the correct cooling setting
- switch to an energy supplier which uses renewable sources such as solar, wind and wave energy
- invest in your own energy systems (eg solar panels and mini-wind turbines)

- **Water**

- repair all dripping taps and leaks immediately
- do not overfill kettles (ie only boil the amount of water you need)
- use spray taps to reduce water wastage

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- convert toilets from single to dual flush systems or install cistern regulators
 - install low flow showerheads
 - cover your pots while cooking
 - avoid drinking bottled water (where possible)
 - take a shower instead of a bath
 - turn off the tap while brushing your teeth
 - use the washing machine and dishwasher sparingly and only when they are full
 - use a tumble dryer only when absolutely necessary
 - conserve household water by re-using 'greywater' (wastewater from baths, showers, washing machines etc) eg for watering gardens
- **Reduce waste and maximise reuse and recycling**
 - buy only what you are going to use and do not overstock products/goods which may expire before use
 - buy intelligently by choosing products that come with little packaging and require less energy to produce (eg a 1.5 litre bottle requires less energy to produce than three bottles of 0.5 litres)
 - compost as much as you can (including garden and kitchen waste, teabags, shredded newspaper and eggshells)
 - recycle where possible (including glass, cans, plastic, paper, cardboard, printer cartridges)
 - lobby your local authority to provide improved recycling options and join a local recycling scheme
 - reduce waste by reusing items where possible (eg shopping bags and food containers)
 - use recycled toilet paper, kitchen towel and tissues made from recycled materials
 - do not burn household rubbish
 - reduce paper use by communicating by email or telephone, maintaining electronic records, removing yourself from mailing lists, and when you need to print, using both sides of the paper
- **Food and drink**
 - buy fresh, locally-produced, seasonal products, which generally use less energy to produce
 - reduce the amount of meat and dairy products in your diet, which can contribute to a reduction in methane levels (from animals) and CO₂ (from land clearance for farming) and will benefit your health by lowering your intake of saturated fat
 - avoid wasting food by only buying (or ordering in restaurants) what you actually need
 - try to avoid drinking bottled water or using products with excess packaging

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- use a system of recyclable glass water bottles

- **On the move**
 - walk, cycle or use public transport rather than using your own car
 - when you have to travel by car, ensure you are as energy-efficient as possible (reduce your speed, accelerate slowly, turn down air conditioning, share your journey with others, and keep your car well maintained)
 - avoid all short car journeys
 - travel by train where possible
 - explore alternatives to flying
 - use tele- and videoconferencing instead of travelling to meetings where possible

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3. Advocate for change

'Improving population health and well-being may be the most persuasive basis for collective action on climate change'.

Malo Rao

Doctors have a long history of combating major public health concerns. Advocating for action on climate change provides an unrivalled opportunity to improve human health and social justice worldwide. Key to this advocacy role is arguing that changes are essential, achievable, affordable and will create a healthier and better society.

There are a number of ways in which you can get involved, from stimulating action in your local community and workplace, to influencing national and international policy:

- **taking action in your healthcare setting**
- **taking action in your community**
- **influencing local, national and international policy.**



Get involved! Find out what other doctors and health professionals are doing

You can find out what other doctors and health professionals are doing, and get involved via the [Climate and Health Council](#).

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Taking action in your healthcare setting

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Healthcare services have a dual role: to provide high-quality healthcare to a population, and to prevent illness and promote health. Providers of healthcare must ensure that the way in which health services are delivered now does not compromise the ability to meet the needs of future generations. This requires substantial and long-term changes, not just through improved energy efficiency, but also through transformed care pathways that reduce activity, changes in the way new buildings are designed, and commitment to reforming the procurement of goods and commissioning of services.

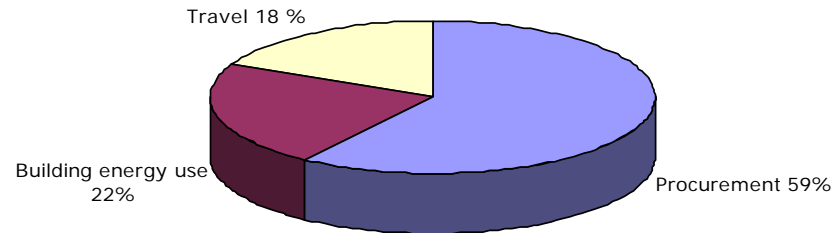
Why is action in the NHS so important?

In protecting and promoting health, the NHS has a responsibility to substantially reduce its carbon emissions and develop low carbon care pathways that deliver high quality patient care.

The NHS is the largest single organisation in the UK, with an annual purchasing budget of around £17 billion. It employs over one million people, is responsible for over 18 million tonnes of CO₂ per annum (3 per cent of the UK's emissions and 30 per cent of the public sector's total) and the energy use in NHS healthcare facilities costs over £400 million annually. [1]

Three key NHS sectors are responsible for the 18 million tonnes of carbon emissions produced annually: procurement (including waste), building energy use, and travel (see Figure 2).

Figure 2 – Annual NHS primary sector CO₂ emissions (2004)



Source: NHS Sustainable Development Unit (2008) NHS England carbon emissions carbon footprinting report. London: NHS Sustainable Development Unit.

Action in the NHS is also needed to meet the legally mandated targets set out in the 2008 [UK Climate Change Act](#) and the 2009 [Climate Change \(Scotland\) Act](#).

What can you do in your healthcare setting?

Whether you are GP running your own business or a doctor working in a large hospital, you can help shape the response in your healthcare setting. The challenge is to convince your colleagues, managers and senior leaders that the need for action on climate change should be a central issue in organisational objectives and risk management.

Why should your healthcare organisation act on climate change?

- To lead by example in meeting its responsibility to protect and promote health
- To save resources (particularly money) which can be redirected to patient care
- To meet the requirements of NHS to reduce its carbon emissions
- To protect and promote organisational reputation (ie to be seen to be taking action)
- To meet the expectations of patients for a low-carbon healthcare service
- To protect against operational risks such as rising energy prices and energy insecurity



Get involved! Find out what other doctors and health professionals are doing

You can find out what other doctors and health professionals are doing, and share your experiences through the [Health and Sustainability Network](#), the [Centre for Sustainable Healthcare](#), or via the [Climate and Health Council website](#).

The following provides an overview of the actions you can promote in your healthcare setting.

Calculating the carbon footprint: The first step to achieving significant and long-term carbon savings within your organisation is knowing its overall carbon footprint: this should include an organisation's direct carbon footprint (ie emissions from energy use) as well as its indirect carbon footprint (eg the emissions generated through travel and procurement). This is a crucial tool for organisational change as it provides a way to measure, set targets and monitor progress. A range of organisations offer online tools and assistance in measuring organisational carbon footprints.

Develop a carbon reduction strategy: Once your organisation's carbon footprint is known, a carbon reduction strategy will help to identify areas for action. There are a number of areas to consider and the extent to which these changes can be implemented will depend on the healthcare setting you work in. These include:

- **Energy efficiency**

Building energy use is responsible for 22 per cent of the 18 million tonnes of carbon emitted by the NHS annually. [1] A range of small scale measures and short-term investments can help to drastically improve an organisation's energy-efficiency:

- consider energy-efficiency as well as initial cost when purchasing office and specialist equipment

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- ensure all appliances are properly maintained, set for optimal energy efficiency and used only when necessary
- install automatic time-controlled thermostats to reduce unnecessary heating and air-conditioning
- switch to an electricity supplier which uses renewable sources such as solar, wind and wave energy
- invest in independent energy systems (eg solar panels and mini-wind turbines)
- maximise combined heat and power by ensuring that the heat produced by on-site electricity generation is used for heating
- install insulation for walls, floors, loftspace, roofing, pipework and windows (including replacing single-glazing with double-glazing)
- maintain and promptly repair boilers and pipework
- install motion-sensitive lighting and energy saving light bulbs, use fewer bulbs and maximise natural lighting.

- **New building design**

Buildings are a significant part of an organisation's carbon footprint and it is much more difficult to reduce emissions retrospectively from a building already designed. In designing and constructing new buildings, it is important to incorporate low-carbon considerations, including:

- selecting the most suitable building materials to maximise energy-efficiency savings, improve staff productivity and patient care
- optimising the orientation of new buildings to incorporate sunlight and shade which will reduce the reliance on and cost of heating and air conditioning
- using designs that encourage walking, cycling and the use of public transport
- assessing long-term social, financial and environmental costs.

- **Procurement and commissioning**

The way an organisation procures goods and commissions services can radically influence its carbon footprint. It has been estimated that over half the NHS's carbon emissions result from the way it buys and disposes of products, with the most significant contributions associated with pharmaceuticals, medical instruments/equipment, business services, paper products and NHS freight transport. [1]

- reducing this burden requires contracts with suppliers that stipulate a genuine and demonstrable commitment to sustainability and lower carbon operations, from the supply chain to delivery (eg reduced waste production, minimising the need to transport goods, local sourcing). This will also help drive competition between suppliers towards improved sustainability.
- informing groups such as local pharmacies will also help to generate a commitment to low carbon procurement and commissioning.

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- **Food and drink**

Healthcare organisations are often responsible for providing a significant number of patient meals. Reducing the carbon footprint associated with this food production can be achieved by:

- buying fresh, locally-produced, seasonal products, which generally use less energy to produce (eg through lower transport-related emissions) and has the added benefit of helping the local economy
- lowering the amount of meat and dairy products used which will reduce methane emissions (from animals) and carbon emissions (from land clearance for farming), and will benefit patient's health by lowering their intake of saturated fat
- installing water filters at source to avoid transportation of filtered bottled water for dispensers.

- **Water management**

Efficient water usage is an important way to limit wastage and energy use by:

- repairing dripping taps and water leaks immediately
- installing water meters
- using spray taps to reduce the volume of water used in sinks and basins
- installing urinal water management systems, and cistern regulators or dual flush systems.

- **Travel and transport**

Five per cent of the UK's road transport emissions are attributable to NHS-related journeys by staff, patients and visitors, and 18 per cent of the NHS's total carbon footprint is travel-related. [1] By developing a sustainable transport plan, an organisation can reduce its carbon footprint (through lower transport emissions), save money (eg by reduced travel expenses and increased staff productivity from time saved in travel), and deliver multiple public health benefits (through increased physical activity levels). A sustainable transport plan should include consideration for:

- measures that encourage staff to cycle or walk to work (eg providing adequate bicycle storage and changing facilities)
- schemes to promote and develop public transport initiatives, and where car use is essential, car-sharing (eg through rewards for multi-occupancy car use such as reserved parking and reduced charges)
- adequate facilities for tele- and video-conferencing to keep business travel to a minimum
- ensuring all organisational vehicles are as energy-efficient as possible and well maintained.

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- **Reduce waste and maximise reuse and recycling**

The way waste is managed can significantly impact on an organisation's carbon footprint. There are a number of ways the impact of this waste can be reduced:

- providing adequate and regular recycling facilities (eg for glass, cans, plastic, paper, cardboard, printer cartridges) which are available to staff, patients and visitors
- consider recycled products (eg paper, plastics etc) when purchasing office and specialist equipment as well as the ability to further recycle and reuse them
- minimise, and where possible eliminate, the use of landfill and incineration for waste disposal
- ensure efficient stocktaking to prevent products/goods expiring before use.

- **Raising awareness and encouraging behaviour change**

Engaging staff and patients is an essential component for effective organisational change as they play a key role in implementing new ways of doing things and can monitor and feedback progress and problems.

Ensure staff and patients are aware of the threat from climate change and understand the importance of taking action. This can be done by providing information about climate change in staff and patient areas. Further information can be found via our Informing others webpages.

Develop a staff policy on ways to reduce both personal and organisational carbon footprints. Use the information provided in this resource to help you.

- **Corporate governance**

Embedding action on climate change in all organisational and employment policies will help address its threat as a corporate issue. This can be achieved by:

- encouraging your healthcare organisation to have a lead for sustainability and taking action on climate change
- incorporating objectives relating to sustainability in all staff roles
- establishing systems to monitor action on climate change as a part of an organisation's risk management.

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Where can I find examples of good practice in other healthcare settings?

One way to find examples of good practice and share ideas with your peers is through the [NHS Good Corporate Citizenship Assessment Model \(GCCAM\)](#). This tool has been developed to help you and your organisation contribute to sustainable development. In particular it provides [case studies](#) so you can see what other organisations are doing to become more sustainable, and a [forum](#) so you can discuss and share your ideas.

You can also share your experiences through the [Health and Sustainability Network](#), the [Centre for Sustainable Healthcare](#), or via the [Climate and Health Council website](#).

References

1. NHS Sustainable Development Unit (2008) NHS England carbon emissions carbon footprinting report. London: NHS Sustainable Development Unit.

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Taking action in your community

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The way in which individuals behave is shaped by the social and cultural norms in their community. Creating a healthy, sustainable and low-carbon community requires an environment that encourages people to change their routines and everyday habits.

As a doctor, while we appreciate that time may be limited, here are some of the ways in which you can get involved in community activities and groups, and seek to influence local policy making

1. Getting involved in community activities and groups

Action at the community level is likely to be the most effective means to achieving real change. By working together, it is possible to secure sustainable communities, and avoid and reduce the effects of climate change.

Engaging the community

Getting involved with community groups will provide the opportunity to promote action on climate change. For example, by encouraging community members to reduce their gas and electricity usage, use active forms of transport, and eat healthier diets. There are many opportunities for like-minded individuals to get together informally to do their bit - this could be through a health-related community project as a part of your job, or as a volunteer with a community group.

➔ Why not find out what groups are already active in your local area? Ask friends and colleagues if they are aware of any local initiatives you could get involved in, or investigate online community forums for advice. Your local library may have a notice board advertising upcoming events/meetings.



Get involved! Explore what others have done – examples of community-based initiatives

Winchester Action on Climate Change

Winchester Action on Climate Change was set up with the aim of encouraging, persuading and advising all households and public, private and voluntary organisations in the Winchester district to reduce their carbon footprints. It has support from local councils, educational institutions and other prominent local organisations. The group encourages members to get involved by joining local action and neighbourhood groups or organising local events. You can find out more about Winchester Action on Climate Change at: <http://www.winacc.org.uk>

Energy reduction in Ealing, London

The Ealing Transition Initiative is a Transition Town which has been set up by ordinary members of the community to help build Ealing's self-reliance in areas such as food, energy, jobs, community and economy. The initiative aims to raise awareness of climate change and promote a low energy community through various community-based action groups including:

- a local food distribution group – which aims to increase the availability and production of locally grown food
- Ealing Transition Community Gardens – which promotes garden sharing schemes, the use of disused land for growing food and the creation of a community garden
- a local composting group – which aims to maximise the use of compost through initiatives such as compost-share schemes
- a first time growers group – which provides support for anyone interested in growing vegetables but has very little experience.

You can find out more information on this programmes and other Transition Towns at: <http://www.transitionnetwork.org>

Ashton Hayes Going Carbon Neutral Project

The Ashton Hayes Going Carbon Neutral Project is a community-led initiative that aims to make Ashton Hayes village the first carbon neutral community in England. The project was started in 2006 and is supported by local businesses, councils and the University of Chester. Through annual resident's surveys and feedback on ways to reduce carbon emissions it has achieved substantial reductions in the domestic footprint of the village, and is now working on developing its own community owned renewable energy power station. You can find out more about this project at: <http://www.goingcarbonneutral.co.uk>

Encouraging behaviour change

As people tend to act as a collective, encouraging them to break long-standing habits in their carbon consumption requires strong community leadership, and local 'champions' with the passion and skills to make a difference.



Get involved! Do you have the qualities to become a climate and health champion!

Champions are people with both the passion and the ability to lead others to follow their example. The presence of a champion has been proven to be a key factor in the success of any initiative. Key qualities include:

- cool-headedness and patience
- courage, tenacity and resilience
- networking skills
- good communication skills

Doctors have to use many of these qualities in their professional lives. Could you become a champion? Do you know people who are champions with whom you can link up with?

Ensuring the success of community projects/initiatives

Successful community initiatives reward those who get involved, by providing social support, a sense of belonging and the creation of a common purpose. Key factors in successful projects are:

1. **Creating strong relationships in the community.** Engaging people is not an easy task. There are various reasons why it is difficult for people to change their behaviour, including: uncertainty, a lack of time and the need for long-term commitment.
➔ Think about how you could you engage your community. Could you get your colleagues/patients involved in a community initiative that you are part of? How could you encourage others to change long-standing habits, such as swapping the bus for a bike?
2. **Forging partnerships.** Create networks to strengthen your message by linking what you are doing with other active groups/organisations. For example:
 - 2.1. Join your local residents' association. These are local groups representing the interests and views of everyone living in a particular area or building, with the aim of making their community a better place to live. Some associations meet to discuss one specific issue while others address a wider spectrum of issues.
➔ Find out if your area has a group you could join, if not, why not consider setting one up? For more information visit www.residentsassociations.co.uk
 - 2.2. Contact your local council. Local government is in a key position to affect people's day-to-day lives. A number of local councils have made a commitment to tackle climate change, including improving the energy performance of their properties and running local campaigns.
➔ Find out what your council is doing by visiting their website. Alternatively why not contact key individuals directly? For example, write to your local councillor or council officer and ask them to meet with you to discuss local carbon-reduction strategies.
 - 2.3. Get in touch with local businesses and charities.
➔ Are there initiatives in the business community which you could engage with? Talk to people and find out what they are doing. Consider organising a meeting in your local town hall and invite members of the business community along. Why not encourage local businesses to become part of a network to address climate

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change and become more sustainable? For example, the [Prince's Mayday Network](#), convened by [Business in the Community](#), is a collaboration of more than 3,000 businesses. It aims to inspire, engage, support and challenge as many businesses as possible as they work together towards a sustainable future.

3. **Targeting your audience.** Create publicity and circulate information using appropriate language and imagery for your target group.

→ Think about who you are trying to reach. Who will your target audience listen to? Where does your target audience get their information? For example, a local initiative to try and get more people to cycle could initially focus on young people between the ages of 16 and 25. A key starting point would then be to approach local schools, colleges and youth clubs (offering to speak to students, hand out leaflets in physical education classes, or put up posters in recreational areas).

Tips for successfully engaging people in your community

- Be positive about the benefits to health
- Encourage and support people to put their own ideas into practice
- Focus on the practical actions people can take eg walking to work, switching off appliances
- Encourage people to connect with green spaces and understand the sources of their food/energy
- Involve children as well as adults.



Get involved! Take part in Climate Week (date TBC)

What is this? Climate Week is an opportunity to raise awareness of the need to tackle climate change. Thousands of businesses, charities, schools, councils and others will run events during Climate Week. They will show what can be achieved, share ideas and encourage thousands more to act during the rest of the year.

What can you do? You can help create a massive movement for change by making Climate Week happen where you are. Ask an organisation or group you know – such as your workplace or local school – to run an event. The event could be a talk, workshop, training session, open day, exhibition, party or any other kind of activity.

Find out more – visit the climate week website at www.climateweek.com

2. Influencing local policy making

Taking action to influence local policy is essential to ensure that public health remains central to the design of local communities. There are a number of ways in which you can influence local policy-making, with the aim of getting health and climate change objectives into key documents, frameworks and plans.

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Getting involved in local planning processes

'Spatial planning' incorporates many different types of planning (town and country, urban, land use etc) and provides the opportunity to shape new developments and redevelopment projects. There are three distinct areas where you can get involved:

- **in local collaborative partnerships.** It is common for collaborative partnerships to be set up to address problems, allocate funding, and discuss strategies and initiatives in your local area (eg Local Strategic Partnerships). These often bring together representatives from the local statutory, voluntary, community and private sectors.
 - ➔ Visit your local council or borough website to find out more about the partnerships in your area – [find your council here](#).
- **in statutory planning and land-use systems.** All developments and redevelopments in your local area are subject to approval by your local planning authority, and there are several ways you can feed into this process (see **Box 1**).
 - ➔ Is there a new development or redevelopment in your area? New developments and redevelopments are required to post notices near or proposed site and/or write letters to those closest to the proposed development. Larger developments will be advertised in local newspapers. Find out more information – why not get in touch with your local authority planning officer? Alternatively, do some research - your community may have an online forum. Check your local library notice-board, or look out for leaflets and posters informing about new developments. In some cases, local authorities also keep local civic and environment societies informed of all applications in the area. The details of the proposals, including architects' drawings, will be available for inspection at the local council offices.
- **in impact assessments.** New developments and redevelopments are required to undergo an evaluation of the impacts on the built environment (eg an Environmental Impact Assessment or Strategic Environmental Assessment). A part of these assessments is to consider the effects on the local population, which provides a useful opportunity to highlight any positive or negative impacts on health.
 - ➔ Why not consider getting in touch with your local authority planning officer and asking for more information on how to input into the assessment of a particular development?

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Box 1 – overview of the UK national planning system

Your local planning authority is responsible for deciding whether a development or redevelopment – anything from an extension on a house to a new shopping centre – should go ahead. The authority is usually the district or borough council – not the parish or town council. Key elements of the planning system include:

- within the framework of legislation approved by Parliament, councils should try to ensure that development is allowed where it is needed, while ensuring that the character and amenity of the area are not adversely affected by new buildings or changes in the use of existing buildings or land.
- the majority of new buildings or major changes to existing buildings or to the local environment need consent – known as planning permission.
- each application for planning permission is made to the local planning authority, and must include enough detail to see what effect the development could have on the area.

➔ Get involved and have your say on a local planning application:

- be aware of any proposed developments in your area – developers/local councils will often launch a participatory process that you can get involved in. Each council website has a planning applications register – search this for applications in your area.
- if you would like to comment on a planning application, be aware that there is a limited amount of time in which you can send comments to the local planning office. Comments can normally be emailed or posted directly to the planning office (remember to include the planning application number).
- the amount of consultation carried out and the method(s) used will vary depending on the scale and type of development being proposed and will be done in accordance with national statutory requirements and each council's agreed policy and guidance.
- it may be possible to attend committee meetings dealing with larger planning applications. In many cases, members of the public can speak briefly to ensure that the committee is aware of their views. However, only elected members of the council can vote on the application decision itself.

For further information, and to see applications in England and Wales, please see the UK government's [Planning Portal](#) website.

For information on planning applications in Scotland please see the [Directorate for Planning and Environmental Appeals](#) website.

For information on planning applications in Northern Ireland please see the [Planning Service](#) website

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Where can doctors make a difference?

Every community will have different issues and priorities. Think about the community you live in – understanding the issues and problems your community faces will help you decide on how to focus your influence. For example, two key areas where doctors can seek to influence local policy are neighbourhood planning and transport and accessibility.

→ Ideas include:

- be aware of planning proposals in your area. For example, a new school may be planned but the proposed site does not have the space for playing fields. Could you use your influence to campaign for a better site?
- lobby local government officials to ensure that local carbon-reduction strategies focus on reducing people's reliance on car use, and take action to encourage other, healthier forms of transport, such as walking and cycling. Why not write to your local transport planning professionals and ask what strategies are currently in place, how much funding has been set aside for such strategies, and how they are monitoring progress? Alternatively, you could offer to meet with your local councillor to outline the health benefits of active transport.
- advocate for safer, more attractive walking and cycling conditions in your local area. Consider getting in touch with your local authority and informing of the need for more accessible and better quality networks and asking how they intend to develop these.

Tips for successfully influencing in local policy making

- Be strategic – look for key documents where it would be helpful to respond to eg relevant consultation documents. Documents related to planning applications will be registered on your local authority website.
- Network – make contacts with the leaders of the project eg politicians, developers, major investing companies.
- Approach elected officials – write to your MP or local councillor and let them know your views.



Get involved! Join the Big Climate Connection.

The Stop Climate Chaos Coalition is the UK's largest group of people (with over 11 million supporters) dedicated to action on climate change. The [Big Climate Connection](#) initiative was launched in November 2010 to encourage people to connect with others in their communities and to lobby their local MPs to take action on climate change. To see what's being organised for the Big Climate Connection in your area, and to sign up to (or set up) a lobby in your constituency check out the [interactive map](#).

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Influencing national and international policy

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‘Climate change is the defining issue for public health this century and the health sector must add its voice – loud and clear – to the growing concern...we must fight to place health issues at the centre of the climate agenda’.

Dr Margaret Chan, Director-General of the World Health Organization (WHO), 2007

Doctors can use individual and collective action to influence national and international policy on climate change. Successfully influencing policy development requires an understanding of the pressures governments are under nationally and internationally, and identification of ways that ensure the medical profession’s voice is heard.

How can doctors influence the political process?

Decisions are made every day in the UK and in the European Union (EU) on policy, legislation and regulation. UK governments depend on a constant flow of information and views from those who may be affected by its actions. Doctors can influence these decisions by forming a strong, collective voice, and by understanding the pressure points in the system where they can effectively make a difference to policy development.

In order to successfully influence the political systems, both in the UK and Europe, it is useful to have a good understanding of the various institutional spheres of influence (see **Box 2** for links to further sources of information).

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Box 2 – Key UK and EU institutions/spheres of influence:

- [Civil Service](#) (Whitehall)
- [UK Parliament](#) in Westminster
- [Scottish Parliament](#)
- [National Assembly for Wales](#)
- [Northern Ireland Executive](#)
- [European Commission](#)
- [Council of Ministers of the European Union](#)
- [European Parliament](#)
- Prime Minister (PM) and the [Number 10](#) Policy Unit
- [Cabinet](#) and Ministers
- [Special Advisors](#) and [Parliamentary Private Secretaries](#)
- [Departments, executive agencies and non-departmental public bodies](#) (NDPBs)
- [Westminster parliamentary committees](#) and devolved equivalents

Decisions on future policy and legislation will be the product of many different stakeholders and parts of government – for example, pressure from government departments, parliament, public and media opinion, the Policy Unit, the Prime Minister and declared party policy. Decisions in the UK:

- will often initially be formed in Whitehall, by the civil service
- need to be shown to be evidence-based
- are usually the outcome of negotiation, although high profile campaigns are often the exception to the rule.

Key points regarding legislation and regulation in the UK:

- development of new 'primary legislation' (ie Bills) is only opted for if new powers are required
- governments generally prefer to opt for policy decisions or 'secondary legislation' ie Regulations, Orders or Statutory Instruments (SIs) which are made under existing primary legislation
- primary legislation can take up to two to three years to become law. This incorporates the conception of the idea, internal consideration, consultation and eventual drafting of a Bill, which would then follow necessary parliamentary process to become law.

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It is important to influence the passage of legislation/regulation early on. Once the proposal is at consultation stage it is likely that key decisions will already have been taken and the consultation is viewed as a tool to ensure nothing has been missed. Influencing the questions will be more effective than providing the answers.



Discover key legislation – the [UK Climate Change Act 2008](#)

The UK Climate Change Act became law in November 2008, introducing the world's first long-term legally binding framework to tackle the dangers of climate change. Some of the key provisions of the Climate Change Act 2008 include:

- a legally binding target of at least an 80 per cent cut in greenhouse gas emissions by 2050, to be achieved through action in the UK and abroad. Also a reduction in emissions of at least 34 percent by 2020. Both these targets are against a 1990 baseline
- a carbon budgeting system which caps emissions over five-year periods, with three budgets set at a time, to help us stay on track for our 2050 target
- the creation of the Committee on Climate Change to act as an independent expert body to advise the Government
- a requirement for the Government to report at least every five years on the risks to the UK of climate change, and to publish a programme setting out how these will be addressed.

You can find out more information via the [Department of Energy and Climate Change](#).

Influencing policy-making in the EU:

- most of the legislative and policy decisions originate from the European Commission, although the European Parliament has a particularly active role in modifying legislative proposals, and the Council of Ministers has the power to reject proposals.
- seeking to influence EU policy-making could involve lobbying the Commission, essentially the 'civil service' of the EU. Representations would normally come from larger trade associations, rather than individuals.
- the European Parliament is the approval body for legislation. Details of UK Members of the European Parliament (MEPs) can be found on the [Europa website](#).
- each member state has a team of officials in Brussels, known as Permanent Representatives. For more information, see the [UK representation to the EU website](#).



Discover key legislation – [EU 20-20-20 targets](#)

In March 2007, the EU Heads of State and Government endorsed an integrated approach to climate and energy policy that aims to combat climate change and increase the EU's energy security. In 2009, member states signed up to legally binding climate and energy targets, known as the "20-20-20" targets. By 2020, member states, are required to have met the following targets:

- a reduction in EU greenhouse gas emissions of at least 20 per cent below 1990 level
- twenty per cent of EU energy consumption to come from renewable resources
- a 20 per cent reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency.

The EU leaders have also offered to increase the EU's emissions reduction to 30 per cent, on the condition that other major emitting countries in the developed and developing worlds commit to do their fair share under a global climate agreement. United Nations (UN) negotiations on such an agreement are ongoing.

→ Practical ideas for action:

1. Think about your own views. What role do you think the UK government should have in taking action on climate change? Consider how you would use health-based arguments effectively to get your message across.

2. Get involved in the work of your medical association or professional body? By working together through medical associations and special interest groups, doctors can be powerful and effective lobbyists in informing and influencing public health policy.

- **Find out how the BMA is taking action on climate change.** As the leading professional organisation for doctors in the UK, the BMA represents the collective voice of the profession in improving and protecting public health. The BMA recognises the important role doctors have in tackling climate change and promoting the public health benefits of low carbon living. As a member of the [Climate and Health Council](#) we support the call for healthcare professionals across the world to take action to limit climate change. As a member of the World Medical Association (WMA), the BMA is able to influence the international health agenda and support action by doctors worldwide. For more information on what the BMA is doing, please go to the section 'What is the BMA working to achieve?'
- **Find out what your Royal College is doing.** Why not write to your Royal College to find out what they are doing on climate change? Visit the [Academy of Medical Royal Colleges website](#) for contact details.

3. Get involved in a health-based network. These networks allow you to share your ideas and plans with other health professionals, and help ensure the medical profession presents a unified voice for action on climate change. There are a number of such networks in the UK.



Get involved! - could you join one of these health-based networks?

- **The Sustainable Development Commission (SDC)** develops organisations, people, tools, policy and research to help the NHS become more sustainable and reduce its carbon footprint.
- **Campaign for Greener Healthcare** is an independent team working on the interface between health and sustainability to bring health messages into the centre of the climate change agenda and to transform healthcare for a sustainable future.

4. Join the Climate and Health Council. The Council is a charitable organisation overseen by a board of prominent health professionals and students. It seeks to articulate and coordinate the activities of health professionals to take meaningful action on climate change. One of the Council's key aims is to mobilise health professionals into an international movement of advocates – get involved and **sign the [Council's pledge](#)**:

5. Influence the political process directly.

Have you considered writing to your local councillors and/or member of the European Parliament, local Westminster MP, Member of the Scottish Parliament or Assembly Members in Wales and Northern Ireland to highlight your support for action? Consider writing to him/her outlining your views or requesting a meeting. Please see www.writetothem.com to find out who your local representatives are.

6. Join an environmental campaign. Have you considered joining an environmental lobby group? High-profile environmental lobby groups in the UK (eg Friends of the Earth and Greenpeace) will get involved in legislative processes at local, national and international levels.

Tips for successfully influencing in national and international policy making:

When seeking to influence national and international policy, it is important to use health arguments effectively. Key points include:

1. What's good for health is good for the environment. Much of what we should be doing to mitigate climate change, we should be doing *anyway*, to protect and promote public health. Tackling climate change involves tackling unhealthy, obesity-causing, inequality-generating, and unsustainable lifestyles.
2. Health arguments are more attractive to people than climate-change-based ones; these focus on the positive changes people can make, leading to better health and wellbeing, and a better quality of life.
3. The public trust in doctors and the prominence of science and evidence in the profession is such that doctors have strength as a collective force to convey their health messages.

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4. Helping to prepare for the health effects of climate change

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Climate change and rising global temperatures are likely to bring changes in weather patterns, rising sea levels and increased frequency and intensity of extreme weather such as heatwaves. In responding to this challenge it is necessary to consider strategies to adapt to these risks. Doctors can play an important role in achieving this at a local level.

What is adaptation?

Adapting to climate change means adapting the way things are done to respond to changing circumstances. This involves making decisions that are sustainable, made at the right time, and that maximise the benefits and minimise the costs of climate change. Adaptation needs to be built into planning and risk management *now* to ensure the continued and improved success of businesses, government policies and social operations. It means not only protecting against negative impacts, but also helping to take advantage of any benefits.

How can doctors support adaptation to climate change?

Doctors can make a vital contribution to adaptation to climate change by:

- **providing information on the health impacts of climate change.** Consider the kind of information you could contribute. What are the likely health impacts in your area? How could you document and communicate the health risks of climate change? What surveillance systems are in place and who is the main contact for this?
- **supporting patients to adapt to climate change.** In 2009, the World Medical Association (WMA) recommended that members work to improve the ability of patients to adapt to climate change and catastrophic weather events (including creating targeted programmes designed to address specific exposures; providing health promotion information and education on self-management of the symptoms of climate-associated illness). What information can you provide to your patients to help them manage any health risks? Have you considered using a local campaign to raise awareness of the health impacts of climate change in your area? Are there any community-alert systems for vulnerable groups?
- **ensuring the local healthcare systems is prepared.** Do you know the person responsible in your organisation for responding to extreme weather events? Ask them to give you information on the current plans in place. How can you support them in their role and contribute to develop these plans? Could you contribute knowledge of those members of the community that you know are more vulnerable? Do you know what early warning systems there are in your local area?
- **anticipating the 'pressure points' where health impacts are most likely to appear and ensure monitoring and surveillance measures are in place.** Consider the risks in your community/region. Are health impacts associated with climate change already appearing? Are such impacts being recorded and

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evaluated? If yes, how can you feed into this process? If not, how could you go about setting up appropriate surveillance measures? Have you consider what resource implications there may be in your area?

- **ensuring that the public and policy-makers are aware that climate change is already contributing to adverse 'natural' events such as flooding.** Extreme weather events – including heatwaves, droughts and floods – are expected to increase in frequency and severity with climate change. Take advantage of opportunities to raise awareness of and inform about how climate change is linked to these events. Discuss the links with patients, colleagues and other contacts. Inform policy-makers of the links (see sections on 'influencing local policy-making' and 'influencing national and international policy').
- **learning from adaptation strategies in other countries.** Explore responses to adverse weather events in other parts of the world. Do you have contact with health professionals in other countries who could provide information and evaluation on the response of their health systems?

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What is climate change?

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The climate is 'a complex, interactive system consisting of the atmosphere, land surface, snow and ice, oceans and other bodies of water, and living things.' [1]

A range of factors may influence the balance of the climate system including both natural and anthropogenic factors. Climate is often described in regard to the average and variability of temperature, precipitation and wind over a period of time (eg 30 years); [1] or more simply, climate may be defined as 'average weather'.

There are varying definitions and interpretations of climate change (see **Box 3**).

Box 3: Definitions of climate change

The [Intergovernmental Panel on Climate Change \(IPCC\)](#) defines climate change as 'any change in climate over time, whether due to natural variability or as a result of human activity'. [2]

The [United Nations Framework Convention on Climate Change \(UNFCCC\)](#) defines climate change as 'a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods'. [3]

The [World Meteorological Organisation \(WMO\)](#) defines climate change as 'a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use'. [4]

These definitions differ in relation to the contribution of natural variation versus anthropogenic factors. The IPCC and WMO definitions take into account both natural climate variability and anthropogenic alterations in climate, while the UNFCCC definition places natural climate variability outside of their definition.

The term climate change is often incorrectly conflated with other terms, for example ozone depletion or air pollution. Misinterpretation and confusion over the differences

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between global warming, climate change and processes such as the greenhouse effect are also common. For a glossary of terms please see the IPCC glossary at www.ipcc.ch/glossary/index.htm.

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What are the causes of climate change?

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A key process in the regulation of the climate is the greenhouse effect. For the Earth's climate to remain stable, a balance is required between incoming solar radiation and outgoing radiation. The greenhouse effect is the process by which greenhouse gases (GHGs) - including carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) - and water vapour absorb and re-emit solar infrared radiation. [1] It is a natural process which contributes to keeping the Earth's temperature at a level that is warm enough to support life.

Alterations to the concentrations of GHGs have a significant effect on the climate (see **Figure 3**).

There are both natural and anthropogenic factors that affect the climate:

Natural factors:

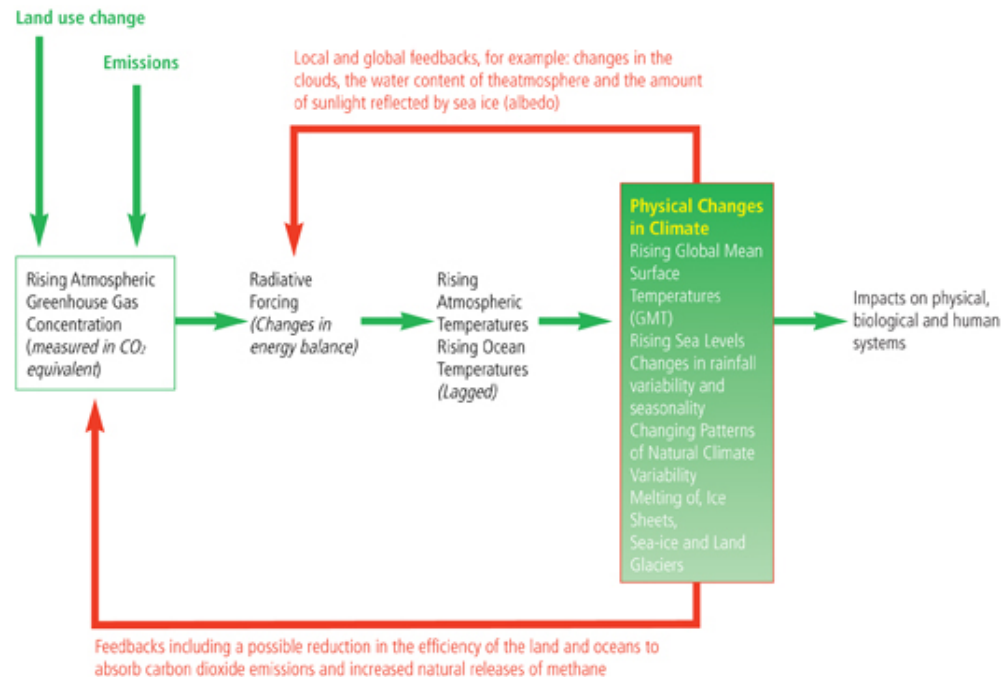
The climate is affected by a number of natural forces. Volcanic eruptions can lead to a cooling of the Earth's surface temperature as they project aerosols into the atmosphere, which in turn reflect the incoming sunlight back into space.[2] Changes in the planet's orbit, including alterations to the eccentricity, tilt and precession (these are known as Milankovitch Cycles) can alter the seasonal and latitudinal distribution of solar radiation, which can result in changes in the climate.[2] Other natural factors that can affect the climate include differing fluctuations of energy received from the sun and changes in the radiation reflected, which can be caused by changes in cloud cover or land cover.[2]

Anthropogenic factors:

Human activities, including the burning of fossil fuels and deforestation have contributed to an increase in GHGs, intensifying the greenhouse effect and thus contributing to changes in the Earth's climate. Analysis of ice cores has shown that over the last 650,000 years the levels of GHGs in the atmosphere have experienced natural fluctuation. [2] Atmospheric concentrations of CO₂, CH₄ and N₂O however, now far eclipse pre-industrial levels [3] (see **Figure 4**). CO₂ levels have risen by 36 per cent from a range of 275 to 285 ppm [a] in the pre-industrial era (AD 1000-1750) to 379 ppm in 2005. The global atmospheric concentration of methane has increased from a pre-industrial value of about 715ppb to 1774 ppb in 2005. The global atmospheric concentration of nitrous oxide has increased from a pre-industrial value of about 270 ppb to 319 ppb in 2005. The rises in CO₂ levels are mainly due to the burning of fossil fuels and land-use change, while the rises in CH₄ and N₂O are largely due to agriculture.[3]

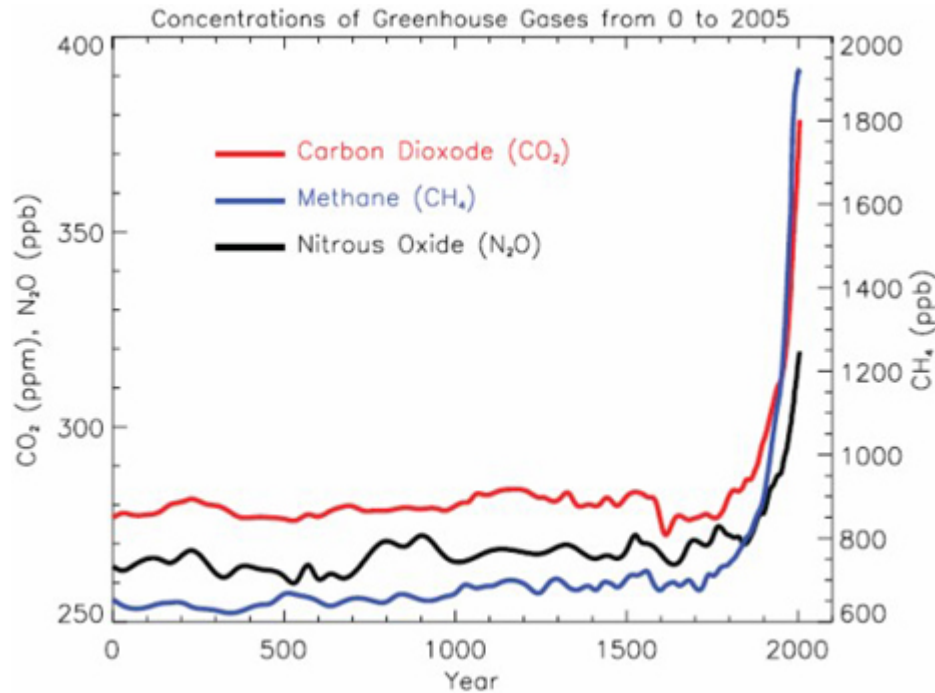
The Earth is now very close to witnessing a global average temperature increase of 2°C (from pre-industrial levels). In order to avoid this increase, the concentration of GHGs needs to be stabilised at no more than 450 parts per million (ppm) carbon dioxide equivalent [\[b\]](#) (CO₂e). [4] Once a level of 450 ppm CO₂e has been reached, the 2°C increase is probable and beyond which, dangerous climate change is most likely inevitable. [4]

Figure 3: The link between greenhouse gases and climate change



Source: based on Stern N (2006) Stern review on the economics of climate change. Cambridge: Cambridge University Press.

Figure 4: Changes in atmospheric greenhouse gases concentrations over the last 2000 years



Increases since about 1750 are attributed to human activities in the industrial era. (Data combined and simplified from Chapters 6 and 2 of the IPCC report).

Source: Intergovernmental Panel on Climate Change (2007) Climate Change 2007: The physical science basis. Frequently Asked Questions.

While the significant majority of the scientific community directly links human activity to the recent trends in climate change, there is a small proportion that contests this. Arguments against the human impact on climate change include that the current trend is part of the climate system's natural variation, that climate models that predict future climates are unreliable and that the methods and data used in temperature analysis are contentious. While natural factors such as volcanic eruptions and changes in the planet's orbit can affect the Earth's climate, the increase in levels of anthropogenic GHGs provide the only reasonable explanation for the temperature increases that have occurred over the past 50 years. [5] For a comparison of the radiative forcing [c] of the natural and anthropogenic components of climate change see the Intergovernmental Panel on Climate Change (IPCC) report [Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change](#)

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Further sources of information:

- IPCC, 2007: Climate Change 2007: The physical science basis. Contribution of working group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Available at www.ipcc.ch
- IPCC, 2007: Climate Change 2007 FAQs: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Available at www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-faqs.pdf

[a] ppm (parts per million) and ppb (parts per billion) is the ratio of the number of greenhouse gas molecules to the total number of molecules of dry air.

[b] The CO₂ equivalent is when all the greenhouse gases are added together and expressed as an equivalent in CO₂.

[c] Radiative forcing is a measure of the influence that a factor has in altering the balance of incoming and outgoing energy in the Earth-atmosphere system and is an index of the importance of the factor as a potential climate change mechanism. Positive forcing tends to warm the surface while negative forcing tends to cool it.

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How has the climate changed?

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The Earth's climate has varied naturally throughout history, ranging from glacial periods where ice covered a significant proportion of the Earth's surface, to interglacial periods where ice retreated to the poles or melted entirely. [1]

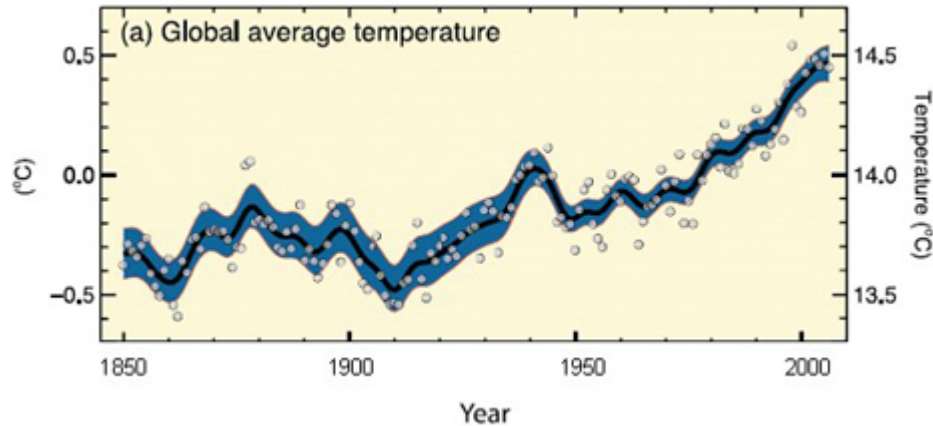
These long-term patterns in climate are generally cyclical in nature. Evidence comes from various sources including ice cores, deep-sea sediments and continental records. In Antarctica, for example, estimates suggest that regional temperatures have varied by around 10°C over glacial and inter-glacial cycles, which normally last between 20,000 and 100,000 years. [2] Since the industrial revolution and more visibly, since the mid 20th century, changes in climate have been occurring more rapidly, most noticeably the increase in temperature.

Global warming:

The rise of average global surface and ocean temperatures is known as global warming. On a global scale, temperatures have increased at around 0.2°C per decade over the last 30 years and the global average temperature is now at its warmest level for the last 12,000 years. [3 and 4] The rise in the Earth's temperature is evident, with eleven of the twelve years between 1995-2006 ranking among the twelve warmest on global surface temperature record since 1850. [5] The projected scenario is that by 2100, the average global temperature will have increased by 1.4 - 5.8°C. [5] These changes are expected to be greater in the Northern hemisphere, especially over landmass, and less perceptible over the Southern oceans. **Figure 5** below shows the change in global average surface temperature from 1850 to 2007.

The Intergovernmental Panel on Climate Change (IPCC) report Climate Change 2007: The physical science basis concludes that 'Most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas (GHG) concentrations.' [5] The report also states that, 'Discernible human influences now extend to other aspects of climate, including ocean warming, continental-average temperatures, temperature extremes and wind patterns.' [5]

Figure 5: Observed changes in global average surface temperature



All changes are relative to corresponding averages for the period 1961-1990. Smoothed curves represent decadal average values while circles show yearly values. The shaded areas are the uncertainty intervals estimated from a comprehensive analysis of known uncertainties. The left-hand axis is the difference in temperature from 1961-1990, while the right-hand axis is average temperature.

Source: IPCC, (2007): Summary for Policymakers. In: Solomon S, Qin D & Manning M et al 'Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change'.

Observations since 1961 show that the warming of the Earth's oceans is also occurring, The oceans are absorbing around 80 per cent of the heat added to the climate system, with temperatures rising by 0.10°C from the surface to a depth of 700m. [6] This warming of the oceans are leading seawater to expand (thermal expansion) which is one of the factors contributing to the rise in sea level [6]

Melting of snow and ice:

The melting of snow and ice - including the loss of mountain snow, glaciers and ice caps [a] - has increased on average. [7] The recent increase in melting is correlated with rising surface air temperatures. [7] In the Northern Hemisphere, there has been a reduction of around 7 per cent in the area covered by seasonally frozen ground since 1900. [7] The loss of glaciers and ice caps is estimated to be equivalent to a rise of 0.50 +/- 0.18 mm yr-1 in sea level between 1961 and 2004. [7] The losses from the Antarctica and Greenland ice sheets have more than likely contributed to a rise in sea levels between 1993 and 2003. [7] Projections are for snow cover to continue to

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contract and for sea ice to continue to shrink. Some projections have Arctic late-summer sea ice disappearing almost entirely towards the end of the 21st century. [8]

Changes in sea levels:

Sea levels have increased at an average rate of 1.8mm per year between 1961 and 2003, and the total rise in sea level during the 20th century is estimated to have been 0.17m. [6] This rate of increase was noticeably more rapid between 1993 and 2003, at about 3.1mm per year. [6] It is unclear, however, if this faster rate is simply reflecting decadal variability or is a direct impact of the recent changes in climate. [6]

Most of the current and predicted sea level rise will be mainly due to thermal expansion. [9] As global temperatures increase so does the possibility of the melting of snow and ice which is also likely to contribute to sea level rise. [10] If the Greenland ice sheet begins to melt irreversibly, or the West Antarctic Ice Sheet collapses, the Earth could witness significant increases in sea level ranging from 5 - 12m over a time period estimated as between centuries to millennia. [10]

Water vapour content:

Increased water vapour content is associated with an increase in the Earth's temperature as warmer air can hold extra water vapour. From 1988 to 2004, the average water vapour content has increased over global oceans by 1.2 +/- 0.3 per cent per decade. [11] Water vapour content is an important variable affecting the climate. Along with GHGs, water vapour is responsible for contributing to the greenhouse effect and thus regulating the temperature of the Earth.

Precipitation patterns and ocean salinity:

Over the last 100 years, long-term trends of increased precipitation have been observed in eastern parts of North and South America, northern Europe and northern and central Asia. [11] The opposite has been witnessed in areas such as the Mediterranean and southern Africa, where an increase in drying has occurred. [11]

Precipitation is highly variable both spatially and temporally. It is predicted that there will be increases in precipitation in high latitudes and decreases in subtropical areas. [5] Changes in precipitation over oceans have also affected salinity, with mid and high latitude waters experiencing increased freshening and low latitude waters experiencing increased salinity. [6]

Extreme weather patterns:

There is a growing concern that the frequency and intensity of extreme weather events may also be changing due to anthropogenic factors. These changes can be observed in the increased occurrence of more intense and longer droughts, increased frequency of heavy rainfall events, heat waves, and increased occurrence of tropical cyclone activity in the North Atlantic. [11] It is predicted that these extreme weather patterns will continue to become increasingly frequent. [8]

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Climate change in the UK:

The mean Central England Temperatures (CET) series [b] has shown that temperatures have increased by nearly 2°C, since the coldest period of the 'Little Ice Age' which occurred around 1690. [12] Half of this increase has occurred over the last 40 years. [12]

The summer of 2003 included record maximum temperatures for both England and Scotland [12] and 2006 was the warmest year on the CET record. [13] It is predicted that extreme temperature patterns will become more frequent after 2030 and increase in intensity and duration after 2060. [12] The duration of annual longest cold spells (a period of days with the lowest daily temperature below 0°C) are expected to decrease; most significantly in Scotland, with a predicted reduction of about 7 days (/-1 day). [12]

UK sea levels rose at a rate of approximately 1mm per year (after adjustment for natural land movements) during the last century. [9] It is projected that the relative sea level will continue to rise around most of the UK shoreline and the rate of increase will depend on region and circumstances. [9] In southeast England for example, by the 2080s, sea level may be between 26cm and 86cm above the current level. [9]

An increase in the contribution to winter rainfall from heavy precipitation events has occurred across all regions of the UK, and in summer there has been a decrease in all regions, except North-East England and Northern Scotland. [13] While there is uncertainty over future changes in rainfall, it is projected that there will be large regional and seasonal differences in precipitation; [9 and 12] Northern Ireland for example, is expected to experience a reduction in precipitation, becoming 10 per cent drier by 2050. [14]

Further sources of information:

- Met Office UK Climate and Weather Statistics www.metoffice.gov.uk/climate/uk/index.html
- Scotland and Northern Ireland Forum For Environmental Research (SNIFFER) www.sniffer.org.uk
- Climate Change 2007: The physical science basis. Contribution of working group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Available at www.ipcc.ch/
- UNFCCC <http://unfccc.int/2860.php>
- UKCIP www.ukcip.org.uk Includes the following the reports:
 - The climate of the UK and recent trends (2008)
 - Climate change scenarios for the UK - The UKCIP02 Scientific Report (2002)

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[a] Glaciers and ice caps are defined as being on land as opposed to floating ice, the melting of which does not materially affect sea level rise.

[b] The CET series provides time-series of air temperature at the surface for an area covered by the triangle with coordinates Preston, Bristol, and London, with records dating back to 1659.

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What are the consequences and implications of climate change?

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There are a number of potential consequences of future changes in climate.

On a global scale, climate change will affect many of the key determinants of wealth and wellbeing, including water supply, food production, human health, availability of land, economic stability, infrastructure, and the environment.

The Stern Commission on Climate Change reported that '...if we don't act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP (gross domestic product) each year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more. In contrast, the costs of action - reducing greenhouse gas emissions to avoid the worst impacts of climate change - can be limited to around 1% of global GDP each year' [1] (for further information on the costs and economic impact of climate change please see the [HM Treasury Stern Review on the economics of climate change](#)).

As climate change accelerates, it will manifest differently across the globe.

The effects of climate change are expected to be most severe in developing countries, but there will also be implications for developed countries, including the UK. In all countries, generally it will be the poorest people who will be most affected. People who are on lower incomes tend to live in higher risk areas in substandard housing and are often unable to cope with the physical and economic strains presented by climate change. [2] The Environment Agency found that in the UK, the most deprived 10 per cent of the population were eight times more likely to be living in the coastal floodplain than the least deprived 10 per cent. [3]

Developing countries:

Climate change presents a real threat to the developing world, especially as many developing countries are already facing problems coping with challenges posed by their existing climate. Geographic exposure, low incomes, high burden of disease, and a greater reliance on climate sensitive sectors such as agriculture mean that developing countries are especially vulnerable. [4]

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Climate change contributes, and will contribute, to obstructing poverty reduction and economic growth of developing countries. Climate change is likely to impact on countries' abilities (particularly developing countries) to achieve sustainable development pathways, as set out by the Millennium Development Goals (MDG) framework. [a][5] These countries may not have the resources to cope with climate change, with agricultural incomes and health in particular being under threat. In Africa, for example, it is expected that the environment needed for sustainable agriculture and yield potential (particularly in arid areas) will decrease. [6] This could result in further problems over food security and intensify levels of malnutrition.

Climate change has the potential to lead to mass migration and conflict, especially when this is coupled with the rapid population growth predicted in the developing world over the next few decades. [4] Conflicts over increasingly scarce natural resources (already witnessed in disputes over land and water in Sudan [7]) are also likely to become more frequent - the United Nations (UN) Security Council now has on its agenda the implications of climate change for international security. [8]

Developed countries:

Developed countries may not be affected by climate change to the same degree as developing countries because:

- their economies generally rely less on sectors such as agriculture than developing countries
- they tend to be located in cooler, higher latitudes [b]
- they have more money and better resources for adaptation. [9]

If carbon dioxide (CO₂) emissions continue to grow and temperatures increase, the impact of climate change is likely to become more significant in developed countries than at present. These effects of temperature increases have already been seen as in 2003, when a heatwave in Europe killed around 35,000 people and agricultural losses reached \$15 billion. [2] A 2008 study by Robine et al concluded that the death toll from the 2003 heatwave in Europe was in fact much greater, with the total number of deaths being around 70,000. [10] Events like these have the potential to be a common occurrence by the middle of the 21st century.

A major effect of climate change for developed countries will be on wealth and the economy. Economic output could be affected in different ways. While developed countries will be able to cope to some degree through adaptation, this process itself will also add to expenditure. [2] Extreme weather events could also have serious repercussions for trade and global financial markets. This could result from disruptions to communications and more unstable costs of insurance and capital. [2]

For a summary of the potential impacts of climate change on various sectors please see table SPM.1 in the [IPCC, 2007: Summary for Policymakers. In: Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. \[11\]](#)

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In the UK:

Climate change is expected to have potential consequences for a number of key sectors in the UK. This can be through global impacts affecting the UK (ie crop failures overseas leading to food insecurity and possibly food shortages) or through direct impacts within the UK. [12] Examples of sectors that may be affected include:

- **Economy, industry and infrastructure**

The costs of extreme weather events, such as storms, floods, droughts, and heatwaves, will increase rapidly at higher temperatures. Flooding events and the number of people at risk from flooding are expected to rise in the UK. There is a risk in the UK of infrastructure damage from flooding and storms, especially in coastal regions. [2] A study by the UK Government's Foresight Programme estimated that a rise in global temperatures of 3 to 4°C could result in an increase in the average annual costs of flood damage to homes, businesses and infrastructure in the UK from around 0.1 per cent of GDP to 0.2 - 0.4 per cent of GDP. [13] The study also suggested that the number of people at high risk from coastal or river floods would increase from 1.6 million today to between 2.3 and 3.6 million by 2080. [13] Increased temperatures during summer months may also affect productivity in urban areas as office buildings could become difficult to work without additional air-conditioning. [2] In already-dry regions (eg South East England), hot summers will further increase soil drying and subsidence damage to properties that are not properly underpinned. [2]

- **Agriculture**

An initial increase in agricultural productivity may occur in the UK due to longer growing seasons and the carbon fertilisation effect; but this will depend on adequate water and requires changing crops and sowing time. [2] As temperature rises become more severe, productivity could be more negatively affected, as during the 2003 heat wave, when a number of European countries, including the UK, witnessed a sharp decline in crop yields. [14]

- **Water**

The water industry is directly responsible for approximately 4 million tonnes of CO₂ emissions annually. [15] Water UK comments that climate change will 'impact every aspect of water services, from infrastructure to operations to demand on finances. Reservoirs will be impacted in terms not just of quantity, but operation, quality and structure. Assets on the coast and in flood plains - in other words, most of them - will be at more risk from floods, storm damage, coastal erosion and rises in sea level. Existing sewerage systems were not designed to cope with climate change. Rainfall will be more intense and likely to overwhelm parts of the network and cause local flooding.' [15] Limitations of water availability as summer run off declines could also be of concern, especially in the South East where population density is on the rise. Droughts could also occur more regularly. [2]

- **Ecosystems**

Natural ecosystems in the UK could be negatively affected by an increase in temperatures and alterations to precipitation patterns. [16] The effective working of the marine ecosystem is dependent on changes to both ocean climate and acidification. 'Marine air and sea surface temperatures (SST) have been rising at a similar rate to land air temperature, but with strong regional variations; 2006 was the second-warmest year in UK coastal waters since records began in 1870. Warmer winters have been strongly linked to reduced breeding success and survival in some seabird populations.' [17]

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[a] The MDG framework is an international agreement consisting of eight targets to which United Nations member states have agreed to aim, in order to achieve sustainable development, reduce poverty and improve living standards. For more information on the MDG please see www.un.org/millenniumgoals/index.html.

[b] It is important to note that while this may be the case, the degree and rate of climate changes (such as temperature and precipitation) may be greater at high latitudes.

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What are the health impacts of climate change?

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'You cannot have well humans on a sick planet'.

Thomas Berry

Climate change is a major threat to public health globally and in the UK.

Direct health impacts include increased deaths, disease and injury associated with environmental changes. Indirectly climate change will also lead to widening of health and social inequalities.

While there are some positive health impacts of climate change (eg fewer cold-related deaths) it is widely acknowledged that the overall health impact will be overwhelmingly negative.

Global burden of disease

Climate change currently contributes to the global burden of disease and premature deaths. [1] It has been estimated that the modest climate change that occurred between the mid-1970s and 2000 caused the loss of over 150,000 lives and 5.5 million disability adjusted life years (DALYs) per year. [2] With the estimated current and projected future impacts of climate change on human health, this global burden of death and DALY is predicted to increase in the future, most noticeably in developing countries. [2]

How does climate change affect health?

Changes in temperature, precipitation, humidity and wind patterns can have a range of environmental impacts including:

- extreme weather events
- disturbance of ecosystems
- sea-level rise
- environmental degradation.

This in turn leads to a number of adverse health effects including:

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- death and illness associated with thermal stress
- injury and death from floods, storms, cyclones, bushfires
- microbial proliferation (food poisoning and unsafe drinking water)
- changes in vector-pathogen-host relationships and infectious disease patterns
- reduced crop, livestock and fisheries yields leading to impaired nutrition, health and survival
- loss of livelihoods and displacement leading to poverty and adverse health. [3]

Health impacts of climate change in the UK

There are a range of direct and indirect health consequences for the UK as a result of climate change.

1. Increased temperatures and heatwaves

- Increased temperatures and heatwaves can have acute consequences for health, resulting in dehydration, heat exhaustion or heat stroke. This in turn can lead to irreversible damage to various organs and even death.
- The greatest impact is witnessed among the elderly, babies and children, and people with ill-health including those with mental health problems.
- The increased frequency and severity of heatwaves that is predicted in the future for the UK, could result in a rise in heat-related deaths. [4]
- While it is predicted that the population of the UK will become more tolerant to hotter temperatures, the increased frequency and severity of heatwaves will be of major concern, as the effect of several hot days in a row is much greater than the effect of the same number of separate hot days. [4]

Climate fact

In 2003, a heatwave that affected much of Western Europe was estimated to have caused around 2,000 extra deaths in England and Wales. The impact was greatest in the southern half of England and among the elderly. [5]

2. Flooding and storms

- The health impacts of flooding and storms are complex and far-reaching. Potential health outcomes include: direct mortality and morbidity due to drowning, chemical hazards and contamination, and a lack of sanitation and safe drinking water.
- Traumatic weather events, such as flooding, can have serious implications for mental health, including increased anxiety and depression, especially in the elderly.
- Flooding can disrupt essentials including communications and power supplies, potentially leading to impacts on healthcare service delivery. A particular concern is the fact that many hospitals in the UK have their generators situated in the basement. [1, 4, 6, 7, 8, 9 and 10]

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Climate fact

The English summer of 2007 was the wettest since records began. As a result 55,000 properties were flooded, 7,000 people were rescued and 13 people died. [11] In July, rising floodwaters from the river Severn severely threatened power supplies in southern England as flood waters enclosed Gloucestershire's main electricity sub-station, at Walham near Gloucester.

3. Infectious diseases

- Higher temperatures, flooding, and changes in climate variability may increase the spread of infections in the UK.
- At present, vector-borne diseases, with the exception of Lyme disease, are of minimal concern to health in the UK. [12] Malaria was previously endemic [13] and it is possible that there may be future small-scale malaria outbreaks. [4]
- It is unlikely that climate change will have a significant effect on the risk of water-borne infections as the UK's water treatment and distribution is of a very high standard. There could potentially be an impact on private water supplies (which are often poorly treated), surface water supplies without filtration and groundwater supplies. [4 and 12]
- Indirectly, with increased cross border networks, there may be increased risks from a number of infectious diseases from other parts of the world with major shifts predicted in the global distribution of tick-borne encephalitis, lyme disease, malaria, dengue, leptospirosis and West Nile Virus [HPGTCC].

4. Food safety

- Instances of food-borne infection have been shown to rise with warmer temperatures [14] and the occurrence of salmonellosis is affected by temperature. [15 and 16]
- Additional food poisoning notifications of 4,000, 9,000 and 14,000 are predicted for +1oC, +2oC and +3oC respectively [4]
- Higher temperatures will also lead to an increased risk of shellfish poisoning resulting from algal blooms. [Ref: Hallegraeff G (2009) Impacts of climate change on harmful algal blooms. *SciTopics*.]

5. Ultraviolet radiation

- Climate change can increase human exposure to ultraviolet radiation (UVR) by altering cloud distribution (ie increasing UVR surface levels), and as a result of changes in human behaviour resulting from increased temperatures such as time spent in the sun and clothing choices. [1]
- Adverse effects of exposure to UVR include an increased risk of skin cancers, sunburn and sunstroke, cataracts, and a weakened immune system in response to immunisations. [1, 4 and 17]

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6. Air quality and aeroallergens

- Concentrations of air pollutants and fine particulate matter may change as a result of climate change, as their formation partly relies on temperature and humidity. [1] Ground level ozone for example, although naturally occurring, is a principal element of urban smog and the chemical reactions that produce ground level ozone are temperature dependent. [1]
- Exposure to elevated levels of ground level ozone could lead to an increase cardio-respiratory morbidity and mortality. [1] The impact of ground level ozone increases could also result in a 15-53 per cent increase in deaths and hospital admissions in the UK from respiratory infections related to air pollution each year. [4]
- Climate change has resulted in the pollen season starting earlier and lasting longer in the northern hemisphere, increasing pollen concentrations and the prevalence of allergenic diseases such as asthma and rhinitis [1]

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What are the public health co-benefits of action on climate change?

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Taking action on climate change to create a sustainable future will have substantial public health co-benefits across society.

Health inter-linkages

There are a number of inter-linkages between climate change and other health problems. Climate change policies that target the reduction of greenhouse gas (GHG) emissions will contribute to reducing the risks of cancer, heart disease, obesity, diabetes, air pollution, road traffic injuries and osteoporosis. [1 and 2]

Action in the following sectors will lead to reductions in GHG emissions and improvements in public health in the UK:

1. **Household energy use** – residential buildings account for just over a quarter of the total UK emissions of CO₂. Research suggests that the introduction of more house insulation, better ventilation and heat recovery, a switch to electric heating, and a reduction in household temperature by 1°C would lead to a 36 per cent reduction in CO₂ emissions compared with 1990 (base-line) [3]. This would in turn lead to net benefits for health through improvements in indoor air quality from reductions in exposure to fine particles, radon, and carbon monoxide.
2. **Urban land transport** – the introduction of policies combining reduced motor vehicle use, more walking and cycling, and low-carbon-emission motor vehicles will lower GHG emissions as well as reduce obesity levels, lower the rate of chronic diseases caused by physical inactivity, lessen the health-damaging effects of air pollution, and make the roads safer for pedestrians and cyclists. In London, for example, it has been estimated that more active travel has been estimated to reduce heart disease and stroke by 10–20 per cent breast cancer by 12–13 per cent, dementia by 8 per cent, and depression by 5 per cent. [4] Further information on the interconnecteness between climate change and sustainable transport polices can be found in the 2009 BMA Board of Science briefing paper [Transport and health](#).
3. **Electricity generation** – altering the way electricity is produced will reduce GHG emissions and the emission of airborne particles that cause damage to the respiratory and cardiovascular systems. It has been estimated, for example, that a 50 per cent reduction in global GHG emissions by 2050 would save 100 life-years per million of the European Union (EU) population in 1 year. [5]

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4. **Food and agriculture** – the agriculture and food sector contributes 10–12 per cent of total global GHG emissions, of which livestock farming is responsible for four-fifths as a result of the methane emitted by ruminant animals. Reducing the production of food from livestock will reduce GHG emissions and the amount of saturated fat and meat in the diet, thereby providing substantial benefits to cardiovascular health. In the UK, for example, it has been estimated that a 30 per cent fall in the adult consumption of saturated fat from animal sources would reduce heart disease by around 15 per cent. [6]

Action to combat climate change will also provide public health co-benefits in low-income countries (see Box 4).

Box 4 – low-emission stove technology

In many low-income countries, especially in sub-Saharan Africa and low-income Asia, many people rely on solid-fuel household stoves for energy for cooking and heating. These simple stoves operate at low combustion efficiency and produce airborne particles, including black carbon, various GHGs and other health-damaging pollutants. This indoor air pollution increases the risk of acute respiratory tract infections in children younger than 5 years and chronic respiratory and heart disease in adults older than 30 years. Globally, almost 1 million children are currently dying every year of respiratory infections induced or exacerbated by the inefficient burning of solid fuels. National programmes offering low-emission stove technology for burning local biomass fuels in poor countries could, over time, avert millions of premature deaths. In India for example, it is estimated that the cumulative effect of a 10-year programme to introduce 150 million low-emission cookstoves would be to lower the national burden of these three diseases by approximately one sixth.

Source: Wilkinson P, Smith KR, Davies M et al (2009) Public health benefits of strategies to reduce greenhouse-gas emissions: household energy. *Lancet* **374**: 1917-29.

Health equity

Existing health inequalities are likely to be exacerbated as a result of health impacts related to climate change. In general, health and life expectancy are strongly linked to social circumstances and childhood poverty. [7] Those at the lower end of the economic or social scale tend to be less healthy and to have poorer access to healthcare.

As highlighted in [Sir Michael Marmot's 2010 strategic review of health inequalities in England](#), creating a sustainable future is entirely compatible with action to reduce health inequalities: sustainable local communities, active transport, sustainable food production, and zero-carbon houses will have health benefits across society. [7]

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How can the impact of climate change be reduced?

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Sustainable development

It is vital that governments, organisations and individuals are aware of the threat posed by climate change, and are motivated to take urgent action for the mitigation of and adaptation to climate change. This requires the implementation of national and international frameworks for sustainable development, which include environmental protection (including human health), social equity and economic viability.

The UK government's sustainable development strategy is outlined in the publication 'Securing the future' (2005). [1] The strategy identifies four inter-connecting priority areas:

- Sustainable consumption and production
 - Climate change and energy
 - Natural resource protection and environment enhancement
 - Sustainable communities. [1]

Mitigation

There are a number of ways the impact of climate change can be reduced through mitigation processes. [2] These include reducing greenhouse gas (GHG) emissions, reducing the demand for energy and using energy more efficiently, taking action in the transport and housing sectors and promoting reforestation. Some of the mitigation techniques for different sectors available at present and in the future are outlined in **Table 1**.

Changing lifestyles and behaviours, as well as management practices are essential for the mitigation of climate change across all sectors as detailed below. [2] These can include changes in consumption patterns, in behaviour and cultural patterns, and to education and training programmes. [2]

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Table 1: Key mitigation technologies and practices by sector.

Sector	Key mitigation technologies and practices currently commercially available	Key mitigation technologies and practices projected to be commercialized before 2030
Energy supply	Improved supply and distribution efficiency; fuel switching from coal to gas; nuclear power; renewable heat and power (hydropower, solar, wind, geothermal and bioenergy); combined heat and power; early applications of Carbon Capture and Storage (CCS).	CCS for gas, biomass and coal-fired electricity generating facilities; advanced nuclear power; advanced renewable energy, including tidal and waves energy, concentrating solar, and solar PV.
Transport	More fuel efficient vehicles; hybrid vehicles; cleaner diesel vehicles; biofuels; [a] modal shifts from road transport to rail and public transport systems; non-motorised transport (cycling, walking); land-use and transport planning.	Second generation biofuels ; higher efficiency aircraft; advanced electric and hybrid vehicles with more powerful and reliable batteries.
Buildings	Efficient lighting and daylighting; more efficient electrical appliances and heating and cooling devices; improved cook stoves, improved insulation ; passive and active solar design for heating and cooling; alternative refrigeration fluids, recovery and recycle of fluorinated gases.	Integrated design of commercial buildings including technologies, such as intelligent meters that provide feedback and control; solar PV integrated in buildings.
Industry	More efficient end-use electrical equipment; heat and power recovery; material recycling and substitution; control of non-carbon dioxide (CO ₂) gas emissions; and a wide array of process-specific technologies.	Advanced energy efficiency; CCS for cement, ammonia, and iron manufacture; inert electrodes for aluminium manufacture.
Agriculture	Improved crop and grazing land management to increase soil carbon storage; restoration of cultivated peaty soils and degraded lands; improved rice cultivation techniques and livestock and	Improvements of crops yields.

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	manure management to reduce methane (CH4) emissions; improved nitrogen fertilizer application techniques to reduce nitrous oxide (N2O) emissions; dedicated energy crops to replace fossil fuel use; improved energy efficiency.	
Forestry/forests	Afforestation; reforestation; forest management; reduced deforestation; harvested wood product management; use of forestry products for bioenergy to replace fossil fuel use.	Tree species improvement to increase biomass productivity and carbon sequestration. Improved remote sensing technologies for analysis of vegetation/ soil carbon sequestration potential and mapping land use change.
Waste management	Landfill CH4 recovery; waste incineration with energy recovery; composting of organic waste; controlled waste water treatment; recycling and waste minimization.	Biocovers and biofilters to optimize CH4 oxidation.

Source: IPCC, 2007: Summary for Policymakers. In: Metz B, Davidson OR, Bosch PR et al Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.

The mitigation processes and measures that reduce climate change are likely to involve costs ranging from the expense of developing and deploying low-emission and high-efficiency technologies; to the cost consumers may face by switching from emissions-intensive to low-emission goods and services. [3] The costs associated with mitigating GHG emissions will differ depending on how and when the emissions are cut. Early and well-thought out measures need to be taken, otherwise the cost of mitigating emissions could become much greater. [3]

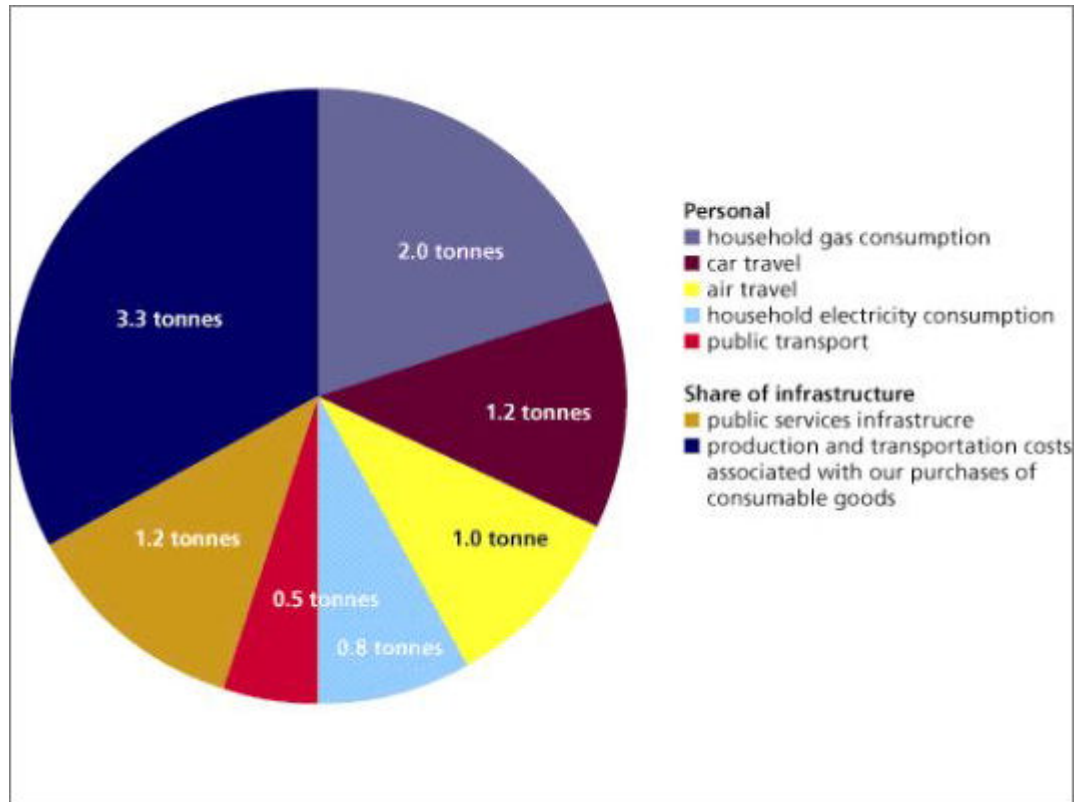
Reducing emissions and carbon footprints

Setting targets for the reduction of GHG emissions is critical at individual, national and international levels. In accordance with the Kyoto Protocol, developed countries are required to reduce their GHG emissions below levels specified in the Protocol. In the UK, the Climate Change Act 2008 sets a legally binding target of at least an 80 per cent cut in GHG emissions by 2050, with a reduction of at least 34 per cent by 2020, against a 1990 baseline. This is to be achieved through action in the UK and abroad. The Scottish Climate Change Act 2009 sets a target of a 26 per cent reduction in CO2 emissions by 2020, and an 80 per cent reduction in GHG emissions by 2050, on a 1990 baseline. Experts suggest that emission reduction targets should now be at least 80 per cent and should aimed to be achieved by 2050 [4, 5 and 6] which is a much greater reduction than currently proposed by the UK Government. At an individual level, carbon reduction targets include meeting the sustainable carbon footprint [\[b\]](#) for every

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person on the planet, which is estimated at two tonnes each year. [7] Currently in the UK the average person uses approximately 10 tonnes per year [c] (see **Figure 6**).

Figure 6: Average annual individual carbon emissions in the UK



Graph adapted from the Faculty of Public Health (2008) Sustaining a Healthy Future: Taking action on climate change.

There are a number of measures (of varying scale) that can be used to reduce the amount of CO₂ that is being emitted, these include:

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- **Carbon offsetting** is a way of mitigating GHG emissions by calculating individual's emissions and then purchasing 'credits' from emission reduction projects. For further information please see www.defra.gov.uk/environment/climatechange/uk/carbonoffset/index.htm
- **Carbon trading** (often called cap and trade) is a way to cut emissions through providing an economic incentive to reduce CO2 emissions. For further information please see www.defra.gov.uk/environment/climatechange/trading/index.htm
- **Contraction and convergence** conceived by the Global Commons Institute (GCI) in the early 1990s consists of reducing overall emissions of GHGs to a safe level, 'Contraction', where the global emissions are reduced because every country brings emissions per capita to a level which is equal for all countries, 'Convergence'. For more information on Contraction and Convergence please see www.gci.org.uk/contconv/cc.html.

Adaptation

Adaptation is important in responding to the impacts of climate change and in supporting economic stability and sustainable development. [8] Potential adaptive responses include technological (eg sea defences), behavioural (eg alterations in lifestyle and food choices), managerial (eg changed farm practices) and policy changes (eg planning regulations). [9] There are potential costs with adaptation; for example, if farmers change to more climate resistant crops, which yield less. [8]

It is important to note that while adaptation can lessen the negative impacts of climate change, it cannot resolve the causes of climate change itself. Therefore adaptation and mitigation are both needed as response strategies to climate change. Strong and early mitigation is essential and, without it, the costs of adaptation will rise, and the ability of countries' and individuals' to adapt successfully will be limited. [8 and 9] In terms of public health, adaptation is critical to lessen the risk of human disease, morbidity and mortality as a result of climate change. [10] Health systems will need to plan for and adapt to climate change, and take into account the associated costs.

Further sources of information:

- Carbon trust www.carbontrust.co.uk
- Energy saving trust www.energysavingtrust.org.uk
- Intergovernmental Panel on Climate Change (2007) Climate Change 2007: Climate change impacts, adaptation and vulnerability. Contribution of working group II to the Fourth Assessment Report of the IPCC. www.ipcc.ch/ipccreports/ar4-wg2.htm
- Intergovernmental Panel on Climate Change (2007) Climate Change 2007: Mitigation of Climate Change. Contribution of Working Group III to the Fourth Assessment Report of the IPCC. www.ipcc.ch/ipccreports/ar4-wg3.htm
- Contraction and Convergence - A healthy response to climate change. www.bmj.com/cgi/content/full/332/7554/1385?ehom.
- UK Government Sustainable Development www.sustainable-development.gov.uk
- Securing the Future - UK Government Sustainable Development Strategy www.sustainable-development.gov.uk/publications/uk-strategy/index.htm

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[a] In principle., biofuels have been seen as a way of reducing GHG emissions compared to conventional transport fuels: while their use releases CO₂, the plants from which they are produced can absorb a comparable amount of the gas from the atmosphere. The use of biofuels as a more climate-friendly fuel source has been questioned, however, due to the energy expenditure involved in their production.

[b] The Carbon Trust defines a carbon footprint as 'The total set of greenhouse gas emissions caused directly and indirectly by an individual, organisation, event or product.' The government has produced a resource for calculating carbon footprint and ways to reduce it. This resource is available at www.direct.gov.uk/en/environmentandgreenerliving/actonco2/DG_067197. Other useful carbon calculators can be found at the World Wildlife Fund www.footprint.wwf.org.uk/ and at www.mycarbonfootprint.eu/.

[c] Estimates of annual average per capita emissions vary from 9 tonnes to 12 tonnes.

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