



Chartered
Institute of
Environmental
Health



Climate Change, Public Health and Health Inequalities

A resource for environmental health practitioners

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Message from the President

We believe that human health must be at the heart of action on climate change. It must be embedded in the political debate, in strategies to change how we live and in how we plan for the future

It has taken heatwaves, floods and crop failures in Europe and the USA to force climate change up the political agenda. The existence of climate change or as some prefer 'global warming' is now rarely denied, the debate is more about the degree to which human activity is contributing to it.

There is however a growing recognition of the link between climate change and our health and wellbeing. It is also true that if we reduced our carbon emissions tomorrow, the effects of past emissions will still lead to increased temperatures.

Once climate change was discussed in terms of sea-levels and ice caps, now it has become one of the most significant challenges to public health we have ever faced, putting at risk the very pillars of life: clean water, sanitation, air quality and food. It is a challenge to us as individuals but also to environmental health practitioners (EHPs) who have a key role both in adaptation and mitigation of climate change. At the very least EHPs have a key role in increasing our resilience to the effects of climate change.

Climate change mitigation strategies are almost synonymous with health improvement, whether through improved housing, active transport, changes to patterns of food consumption or economic localisation.

We believe that human health must be at the heart of action on climate change. It must be embedded in the political debate, in strategies to change how we live and in how we plan for the future. Environmental health practitioners should be key players and enablers.

Environmental health is all about the relationship between people's health and the environment – environmental stressors – whether at home, at work or at leisure, in the food they eat and what they drink or in the communities to which they belong.

Environmental health practitioners, whether they work in the private, public or voluntary sectors, have the essential skills and expertise to make an important contribution to what must be a shared priority for all of society. The CIEH with its partners will work to ensure that EHPs remain equipped to maximise their contribution.

This contribution can be made in three core areas: externally with the businesses, organisations and communities with which we work on a daily basis; internally within our own organisations and how they operate; and at a personal level.

This work needs to include both activities and interventions designed to reduce carbon emissions (mitigation), as well as to prepare for events such as heatwaves and other extremes of weather, floods, food and water shortages, infectious diseases and population movements (adaptation).

It is those least able to cope with climate change – older people, the poor, the sick and the young – who are and will be hardest hit, even in Europe and the so-called developed nations.

Although climate change places a spotlight on health and social inequalities; all society will be affected. This presents us with multiple challenges on how to keep people safe and to work with the wider public health community.

... the economy and the environment are interdependent – as has been recognised in the principles of sustainable development

Economic development has been a key priority and strategic goal around the world. However the economy and the environment are interdependent – as has been recognised in the principles of sustainable development.

The conference on 20 November aims to examine the impact of climate change on environmental and public health. Key issues facing environmental health practitioners, like securing a safe food supply and combating the threat of pest borne disease will be considered.

This new CIEH publication is the first of a series of resources that will be developed, working with our members, to provide motivation and support.

It sets out the basic arguments and is a call to action. It includes a comprehensive list of references and links for practitioners wanting to examine the issues that this document raises. This document, and a full report summarising the health implications of climate change, are available on the CIEH website www.cieh.org/climatechange

Finally if you are attending the conference, I would like to take this opportunity to welcome you. I hope you will find the debates and discussions inspiring and informative.



Dr Stephen Battersby
CIEH President

What is climate change?

Put simply, climates around the world are changing as a result of rising global temperatures

Put simply, climates around the world are changing as a result of rising global temperatures. There may still be disagreement about what has caused this phenomenon, but there is little doubt about its effect on our weather and ecosystems.

Global temperatures rose by three quarters of a degree centigrade (0.74°C) between 1906 and 2005 and many predict they will continue to climb. Scientists on the UN's Intergovernmental Panel on Climate Change (IPCC) in 2007 stated that this warming, in their opinion, was almost entirely due to human activity and they predicted that average global temperatures will rise by another 1.1 to 6.4°C by the end of this century.

What causes it?

Certain gases in the earth's atmosphere trap heat like a blanket. This is necessary for life on earth because without it the earth would be 30°C cooler.

But modern lifestyles have increased the amount of these so called 'greenhouse gases' in the atmosphere. A useful analogy here might be that of layers of clothing on a person – the more layers you add, the less heat escapes from your body and the warmer you get. The end result of the thicker layers of greenhouse gases is that the planet is over-heating.

Among the most significant of the greenhouse gases are water vapour, methane and carbon dioxide. There's now 35 percent more carbon dioxide in the atmosphere than at any time in the last 650,000 years (The Royal Society website: *Climate Change controversies, a simple guide*).

The increase in carbon dioxide comes from using fossil fuels (reserves of coal, oil, and

gas) and destroying forests. Other critical greenhouse gases – methane and nitrous oxide – come from rice paddies, animal husbandry, biomass burning, landfill, industrial processes and agricultural fertilisers.

About 40 percent of greenhouse gas emissions in the UK come from using energy at home, driving and travelling by plane, according to the UK Government.¹

How does it affect us?

In the UK, 2006 was our warmest summer in 348 years. In 2007 we had the wettest summer in meteorological history. The sea level around our island has risen by about 10 centimetres in the last century. Swallows are arriving earlier, there are more productive vineyards and the growing season for crops has changed. We're experiencing more flooding, storm surges, and other extremes of weather, but less snow.

On a global scale, climate change is affecting the abundance of flora and fauna and survival chances of many endangered species, raising sea levels, melting the polar ice caps and underground permafrost and devastating agriculture.

Climate affects our health in two ways – directly, for instance through increased exposure or physical injury as a result of storms or floods. Or indirectly by altering ecosystems which can interrupt the supply of water and food or by fostering disease.

People can adapt to some variations in climate but it is more difficult if fluctuations are short term or severe.

Some of the key health dangers from climate change include:

¹ www.direct.gov.uk/en/Environmentandgreenerliving/Greenerlivingaquickguide/DG_072885

- Infectious diseases: vector borne, waterborne and food related
- Death from extremes of temperature
- Malnutrition and global food supply shortages due to crop failure
- Trauma and mental health problems caused by extreme weather
- Illness related to poor air quality and pollution
- Cancer and cataracts caused by ozone depletion

The importance of climate change to health is also underlined in The Department of Health Guidance, April 2008, *The Health Impact of Climate Change: Promoting Sustainable Communities*:

Global issue – Climate change is global in its causes and consequences, and solving the problem requires an international collective action. It poses increased threats to global food security, social cohesion, exacerbates conflicts, migration trends, international security, natural disasters (through flooding/droughts) and links with the Chief Medical Officer's (CMO's) Global Health Strategy.²

Magnitude – The impact of climate change is already being felt. The magnitude of the challenge is formidable. It will not affect human health in isolation, but will simultaneously affect ecological, economic, social, political and demographic changes widening health inequalities between rich and poor parts of the world.

Economics – According to the Stern Review³, it presents a unique challenge for economic strategies: it is the greatest and widest-ranging market failure ever seen. By not acting, the overall costs and risks of climate change will be equivalent to losing at least 5 to 20 percent of global GDP each year, (Stern Review, 2006). The entire economy depends upon a stable and healthy planet.

Health – If not addressed, climate change will impact negatively, countering the dramatic improvements in health and life expectancy achieved so far. Many of the measures taken to reduce greenhouse gas (GHG) emissions are themselves likely to have a positive impact on health. For example promoting alternatives to carbon based transport such as walking and cycling which would additionally contribute to improved physical health as well as improvements in air quality. This in turn could reduce the risk of respiratory illness.

Feasibility of solutions – Collective action to tackle climate change is daunting but achievable. There are several examples where Government policy has overcome similar challenges. For example the Government's Clean Air Act of 1956, in response to the 'Great Smog of 1952' and the '1987 Montreal Protocol' banning chlorofluorocarbons to tackle ozone depletion are evidence to this. However, these problems were simple and technically easy to address compared to climate change. Even so, there is a range of cross cutting mitigation and adaptation options that can make a significant impact on the climate problem; strong, deliberate policy action is required to motivate their take-up.

Challenges – Climate change poses unprecedented challenges ranging from global policy to personal and social action.

² www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_072697

³ www.occ.gov.uk/activities/stern.htm

Not only does climate change carry a direct and indirect health warning. It is already contributing towards widening the gap in health inequalities between people living in the developing and developed world

There is a growing body of information and evidence on the health impacts of climate change. And there is an increasing realisation of the need to know and do more. As recently as October 2008 the World Health Organization agreed a research agenda to develop an evidence-based framework for action on the human health implications of climate change.

This plan will build on a comprehensive review of what is already known about health risks from climate change.

But not only does climate change carry a direct and indirect health warning. It is already contributing towards widening the gap in health inequalities between people living in the developing and developed world. In other words the health impacts of climate change will – perversely, unjustly and inequitably – affect those in our society who are most disadvantaged and who arguably have contributed least to it – certainly in terms of their consumption of natural resources. One example of this is the rapid and exponential price rise in commodities such as fuel and food. The reasons behind these are fundamentally linked to the developed world's insatiable hunger for fossil fuels – and the drive to find 'greener' alternatives to what is ultimately an infinite natural resource in the form of oil. It is very likely that we will see increasing numbers of people in our society in both food and fuel poverty as a result of this along with the adverse health effects that often follow.

It is not the intention of this document to provide in depth information regarding the wide and diverse potential health impacts that climate change may bring about without adequate interventions – as already alluded to in the earlier paragraphs.

However this section does provide a summary of some of the main issues that

need to be considered both now and in the future. As public health professionals EHPs will need to consider these in terms of contingency and resilience planning as well as in their advocacy role.

The following are some of the anticipated or likely increased threats to health and wellbeing in the British Isles as a result of climate change. These have been predicted based on current evidence and modeling. They are grouped under three main headings in terms of the anticipated or predicted impact:

- Increasing temperatures
- Increasing rainfall
- Global issues

Increasing temperatures

At the core of climate change is the increase in average global temperatures. Eleven of the last twelve years (1995-2006) rank among the twelve warmest years in the instrumental record of global surface temperature (since 1850), (IPCC 4th Assessment Report 2007)⁴. This rise in temperature has subsequently caused an increase in sea levels in the main due to thermal expansion and melting glaciers, ice caps and polar ice sheets.

The following are some of the anticipated, predicted, and in some cases recorded instances of resulting impacts with clear and unequivocal health implications.

Heatwaves

Heatwaves are potentially lethal for vulnerable people, particularly those living in cities. Associated air pollution can further add to the dangers. For northern European countries, the heatwave threat is perhaps one of the most dramatic manifestations of climate change.

⁴ www.ipcc.ch

By 2050 it is highly likely that summer temperature peaks will be significantly higher

For Europe, one of the most significant examples of the danger of climate change was the 2003 heatwave in France. In an advanced nation with excellent healthcare, 35,000 people died. In the UK that summer it is estimated that there were 2,000 to 3,000 excess deaths [more than usual] in England.⁵

We know people die in extremes of temperature – yet we seem unprepared when it happens.

There is a 1 in 40 chance that by 2012, southern England will have a severe heatwave which could again cause up to 10,000 heat related deaths.⁶ A wide variety of people are at risk, but particularly the most vulnerable in society including the elderly and those already ill.

It is worth pointing out that our national UK targets for reductions in greenhouse gas emissions and international targets such as Kyoto (soon to be updated) are calculated in an attempt to contain global temperature rise to no more than 2°C above pre-industrial levels by around 2050. In other words, by 2050 it is highly likely that summer temperature peaks will be significantly higher.

It is absolutely imperative that we meet our carbon reduction targets to ensure that such incidents do not become common place. To this end, as with all of the health impacts, efforts to mitigate the effects of climate change must be considerably stepped up.

However it is also equally important to ensure that appropriate resilience plans are in place in order to best manage such incidents if and when they occur.

Many countries have early warning systems with a range of strategies. The Heatwave Plan for England published in 2008 sets out a 'Heat-Health Watch' from 1 June to 15

September based on average daytime temperature of 30°C and 15°C at night. There are three levels:

- **Green:** Summer preparedness and long-term planning
- **Amber:** Alert and readiness. Triggered when forecasts for threshold temperatures will be exceeded at least three days ahead or there's a 60 percent chance of extremely high temperatures on two consecutive days
- **Red:** Heatwave action/emergency. Triggered when threshold temperatures are reached in one or more regions. There is a focus on high-risk groups

Advance planning is at the core of all early warning systems, together with identification of these high-risk groups so they can be protected. At risk groups include urban populations, the elderly (particularly women over 75), chronically sick, the bed ridden, disabled, isolated, those living in care homes, mentally ill, Alzheimer's sufferers, babies and the very young, deprived populations, those suffering endocrine disorders (for example diabetes), skin disease and infections, residents of top floor flats, the homeless and workers with physically demanding outside jobs.

Local authorities have a key role to play in plans to practically assist vulnerable people within their communities in such an incident. As with the national early warning system, advance planning is critical. To what extent local authorities have considered this type of emergency and have made the necessary plans to best deal with an occurrence is unclear.

What is critical is that they should make all the necessary preparations. At the very least local authorities should have systems in place to identify where vulnerable people are, to ensure that contingency planning is

⁵ www.nhs.uk/Livewell/Summerhealth/Pages/Heatwave.aspx

⁶ www.dh.gov.uk/en/PublicationsAndStatistics/Publications/PublicationsStatistics/DH_074439

Climate change could cause about 10,000 extra cases of food poisoning a year in the UK

in place, and to make sure that clear, practical and achievable advice is on hand for the public which can be effectively disseminated and communicated.

Cold related illness

In the UK, deaths are likely to fall because of milder winters. However cold related illness should remain a public health priority given the fact during the last five years, more than 130,000 people over 65 have died from cold related illnesses during the winter months in Britain.⁷

To what extent this will be offset by even further fuel poverty due to increasing fuel and energy costs is unclear. What is clear is that efforts to reduce the number of people living in fuel poverty need to be substantially increased.

For EHPs working in housing there are clear opportunities for input. Providing advice and assistance for occupants on issues such as improved insulation and alternative, lower cost, renewable energy could make a significant contribution towards alleviating fuel poverty.

At the simplest level, EHPs should ensure that they are familiar with all relevant sources of help and assistance for occupiers who they come into contact with and who they believe may be in fuel poverty. Again this is more likely to be the elderly or those who are disadvantaged. They could play key roles in simply 'signposting' such assistance for such individuals as often they will be unaware themselves of help that may be available.

Alternatively EHPs may wish to consider specific proactive interventions designed to identify and assist particular individuals or types of property. Improving our housing stock is a key component of reducing carbon emissions and has clear health benefits. Earlier this year the CIEH produced

a landmark publication entitled *Good Housing leads to Good Health* (see page 17, under CIEH) which promotes the vital role fuel efficient, well insulated homes have on health.

EHPs could and should be at the forefront advocating for and delivering local interventions on energy efficiency and ensuring that improvements to housing stock is central to climate change action.

Food poisoning

Climate change could cause about 10,000 extra cases of food poisoning a year in the UK. (*Cooking up a Storm*, Tara Garnett, Centre for Environmental Strategy, University of Surrey, 2008. Prof. G. Bentham, Centre for Environmental Risk, University of East Anglia).⁸

In fact, there is a strong enough correlation between notified food poisoning, *Salmonella* infections and temperature in the UK to consider public warnings during hot weather.

Higher temperatures also increase the rate of infection in animals, multiply bacteria in animal feed and add risk to the food chain.

It is highly likely that a majority of these cases will potentially arise from food prepared and cooked at home whether through inappropriate food storage, poor preparation or increased outdoor cooking and eating.

There is clearly a need to ensure that public awareness and basic education in simple hygiene is assured and EHPs could play a major role in this.

Waterborne diseases due to increases in temperature

Pipes and reservoirs are more vulnerable to micro-organisms during frequent droughts, particularly in coastal areas and at the end

⁷ www.ageconcern.org.uk/AgeConcern/fff_winter_deaths.asp

⁸ www.fcrn.org.uk/fcrnResearch/publications/PDFs/CuaS_web.pdf

The potential for the frequency of flooding incidents is increasing not only because of increasing rainfall in the UK, but also due to rising sea levels

of water distribution systems. Algal blooms (cyanobacteria) are likely to increase. Health problems associated with cyanobacteria range from skin irritation to severe systemic disease.

Drinking water quality is more vulnerable in warmer climates. The risks from increased consumption of bottled water in warm weather are contamination, multiplication during storage and re-use of containers. Importing and transporting bottled water also increases our carbon footprint.

Water shortages and standpipes during drought periods could indirectly increase infections because of difficulties maintaining hygiene. Upland sources in peat-covered catchments would contain higher levels of dissolved organic carbon, risking trihalomethane formation on disinfection with chlorine. This would be more likely after dry periods.

Water-associated diseases like *legionellosis* (Legionnaires' disease) could increase with the increased use of air conditioning and humidifiers.

Swimming pool outbreaks have increased in the UK (particularly due to *Cryptosporidium spp* – and usually related to faecal accidents or poor pool maintenance). As pathogens survive longer in warmer water, there are implications for wider leisure use of untreated fresh and marine waters contaminated by sewage and animals.

Increased rainfall and rising sea levels

Floods are the most common natural disaster in Europe. They can cause death and serious injury as well as psychological distress through the devastating effects that such events can lead to, such as the loss of one's home or material possessions.

Apart from the obvious direct health impacts of flooding there are also additional potential risks created as a result of secondary consequences that may arise, for example pollution incidents (chemical or biological and including the potential contamination of drinking water supplies); an increase in breeding grounds for disease carrying organisms due to high volumes of standing water; soil disturbances as a result of flood water which may increase exposure of agents such as anthrax and toxic contaminants such as heavy metals and disease and hazards associated with evacuation.

The potential for the frequency of flooding incidents is increasing not only because of increasing rainfall in the UK, but also due to rising sea levels. In fact there are parts of the UK which, if sea level continues to rise as a result of increasing global temperature, may well become uninhabitable in the future. Sea level rise also affects the drainage capabilities of substantial river basins and estuaries.

Waterborne diseases and water pollution

Waterborne disease outbreaks, like cholera, are low risk in industrialised countries. However after Hurricane Katrina in the USA in August 2005 a cluster of *Vibrio* organisms were attributed to flood water and other environmental exposure. This did not include *Vibrio cholerae 01*, or other toxogenic subtypes that cause cholera.

Severe flooding has the potential to significantly affect drinking water supplies through contamination of the mains supply. Most at risk are poorly treated private water supplies, unfiltered surface water and groundwater. More surface water turbidity caused by heavy rain escalates indicator bacteria and pathogens – a challenge for water treatment works, particularly those abstracting direct from rivers.

Pests could become even more important disease vectors in the UK as a result of climate change

Cryptosporidium parvum, *Giardia lamblia* and *microsporidia* are found in higher numbers after heavy rainfall. They can cause diarrhoea, stomach cramps and vomiting.

Acute gastroenteritis proved to be another consequence of Hurricane Katrina. A Norovirus outbreak was reported in Texas among evacuees in overcrowded temporary shelters.

Floods can also increase the risk of rodent-borne disease. Flood-related outbreaks of *leptospirosis* have been reported in several developing countries. Given that there are significant concerns over the increasing prevalence of urban pests in the UK, this is a risk which needs to be considered more seriously.

Breeding of other potential insect vectors following floods could become a matter of concern in the UK, particularly if coupled with warmer weather. Standing water as a result of flooding creates an ideal breeding ground for mosquitoes.

Flooding of industrial plants and waste storage facilities could potentially pollute water supplies.

Psychological and mental health impacts

There were recorded suicide attempts following Hurricane Katrina. Mental ill health reported after floods ranges from depression to anxiety, increased alcohol dependence or drug misuse and exacerbation of existing mental health problems at all ages.

Other health effects

Pests

Pests could become even more important disease vectors in the UK as a result of climate change. The spread of West Nile fever in the US and Lyme disease in Europe are warning signals of the impact of pests on public health.

The World Health Organization report, *Public health significance of urban pests*⁹, argues that control of significant pests in the UK is declining when it could be argued that it should be increasing.

As temperatures and rainfall increase, mosquitoes carrying the malaria parasite will extend their range. The Australian Centre for Epidemiology and Public Health estimates that up to 80 million more people will be living in malarial regions by 2080. Indigenous malaria may be re-established in the UK by 2050, since the mosquitoes capable of carrying temperate and tropical strains of vivax malaria are present and *P.vivax* survives at lower temperatures than *P.falciparum*, the cause of more serious malaria. Areas next to extensive wetland would be most affected. Parts of middle and southern UK could allow *P.vivax* transmission for 3-4 months a year by 2020. *Stegomyia albopicta* (*Aedes albopictus*), a mosquito that can be a vector of dengue fever and malaria, has entered the USA via used car tyres. The potential for new species coming into the UK is also high.

The risk of disease from tick bites, such as tick borne encephalitis (TBE) and Lyme disease (*Borrelia* species transmitted by the tick common in Europe, *Ixodes ricinus*) is harder to estimate, but the trend is upwards. According to the Health Protection Agency there were 797 cases identified during 2007 (268 in 2001).¹⁰ Mean annual incidence rates for laboratory-confirmed cases have risen from 0.38 per 100,000 total population for the period 1997-2000, to 0.64 cases per 100,000 total population in 2002, and to 1.46 cases per 100,000 total population. However the increase in Lyme disease has also been attributed to changes to living patterns and developments in the wrong places.

⁹ www.cieh-npap.org/documents/Urban-pests-publichealth-significanceJULY08.pdf

¹⁰ www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1195733837876

Melanoma skin cancer rates could treble over the next 30 years

West Nile Virus, predominantly a bird infection transmitted by Culex, Aedes and other species of mosquitoes, has increased in parts of Europe and the USA. While 80 percent of people show no symptoms, a small (1 percent) percentage develops a severe infection with encephalitis or meningitis.

Other insect vectors that could be re-introduced in a warmer climate include fleas responsible for plague, associated with an increase in rodent populations or movement of rats during flooding.

There will be more cat and dog fleas in warm conditions and in southern England, blood sucking black flies, such as the Blandford Fly.

Stinging and biting insects (bees, wasps, horseflies, hornets) could increase, along with the danger of severe allergic reactions.

Some species of moth caterpillars cause painful swellings, skin rashes and allergies. These may increase.

The 'midge menace' may become more of an issue in tourist areas (and midges blown across from the continent were implicated in the recent epidemic of bluetongue disease in the UK).

House dust mites could increase under warmer 'damper' conditions. They increase their breeding when the relative humidity exceeds 60 percent and it is the faecal pellets that are the allergen.

Sunburn and skin cancer

Rates of melanoma¹¹, the most dangerous form of skin cancer, have risen by over 40 percent in the past decade, making it the fastest rising cancer in the UK. Melanoma skin cancer rates could treble over the next 30 years. More sunny days lead to increased skin burn, particularly in spring. There are more than 76,000 new cases of skin

cancer¹² in the UK each year and they have been rising dramatically in recent decades.

UV levels have increased over the UK because of ozone layer damage extending from the Arctic to northern Europe. UV exposure stops immune systems working properly, leading to eye cataracts and skin cancers.

UV radiation can also damage plants and aquatic wildlife. But sunlight exposure has some health benefits, increasing production of Vitamin D and reducing Seasonal Affective Disorder (SAD).

The CIEH campaigns to raise awareness about the dangers of skin cancer urging councils to provide shade in school playgrounds, protect employees working outdoors and make shade provision a condition of planning permission. We have worked with Cancer Research UK and organised a national conference, Saving Our Skins to help EHPs with skin cancer prevention. A *Saving Our Skins* toolkit (see page 17, under CIEH) helps professionals develop prevention strategies too.

Food poverty and security

The potential impact of climate change on world agriculture is enormous for us in the UK. The UK is not self sufficient in food, in fact we need to import around 40 percent of our food needs.¹³

Some argue that we are heading towards a significant crisis in world food supplies as world crops are already being hit by extreme weather. To give an example, a recent drought in Australia caused wheat prices to rise resulting in increased bread, cereal and animal feed prices across the globe.

Parts of the southern United States, Middle East, northern India, parts of Asia and the Mediterranean are predicted to grow considerably less food as a result of changing weather patterns.

¹¹ <http://info.cancerresearchuk.org/news/archive/pressreleases/2007/august/348735>

¹² www.cancerhelp.org.uk/help/default.asp?page=12000

¹³ <https://statistics.defra.gov.uk/esg/publications/pocketstats/foodpocketstats/FoodPocketbook2008.pdf>

There is, and is likely to be in the future, less land available in the world to grow crops, less oil and water for its production ... and more people to feed

Additionally, countries are increasingly converting agricultural land to the production of bio-fuels – putting further upward price pressure on basic food items like rice, wheat and corn.

There is also a potential looming issue regarding the style of diet eaten, and in particular meat. Food animals, particularly cattle, produce significant amounts of methane. Methane, like carbon dioxide, is also a greenhouse gas – and in actual fact a much more potent one. Methane has been estimated to have around five times the warming potential of CO₂.

Taking this into account Dr Andy Thorpe, an economist at the University of Portsmouth, has calculated that the amount of methane produced by a herd of 200 cows is the same as the CO₂ emissions produced by a car burning 21,400 litres of petrol (or to put it another way driving 149,800 miles assuming an average consumption of 35 miles per gallon).

A radical report, *Cooking up a storm* (Tara Garnett, Food Climate Research Network, Centre for Environmental Strategy, University of Surrey 2008), reveals that half of all UK food-related carbon emissions come from meat and dairy products. The contribution of meat and dairy to harmful emissions is so significant that there is widespread concern about predictions that world meat consumption will double by 2050.

Meat consumption in the developing world, particularly China and India, is increasing significantly as overall affluence increases and those populations aspire to lifestyles that the privileged developed world has enjoyed for decades. In simple terms, a world of global carnivores with meat consumption levels akin to that of the US and UK is environmentally unsustainable.

Another very significant factor that is likely to impact world food supplies is population growth and demographics. The global population is currently increasing by around 7 million per month. Demographics, particularly in the developed world, are changing in tandem – in particular older people are living longer lives.

Equally significant for the future may well be substantial increases in migration. Even in the best case scenario several scientific models already predict severe climate change impacts, in low lying deltas such as North East Africa, Bangladesh and Southern Asia. Predictions would indicate that by 2050 up to 1 million people could be displaced from each of these regions as a result of rising sea levels. These areas are also significant in terms of food production, particularly rice.

Finally, as a result of all of the above coupled with the inextricable link between food production and two key natural resources – oil and water – food prices are accelerating exponentially. Food prices have risen by 45 percent since end-2006, mirroring earlier price run-ups in other commodities.¹⁴

There is, and is likely to be in the future, less land available in the world to grow crops, less oil and water for its production (while increased rainfall may be a phenomenon of climate change we see in these latitudes, drought will be equally significant in other major food production areas of the world) and more people to feed. Food security is a very real and poignant threat. The 2006 interdependence report, published by the New Economics Foundation, indicated that the UK was at that stage, reliant on the rest of the World by 16th April each year. That reliance includes food. To what extent this has been considered in adaptation and resilience planning is unclear.

¹⁴ Source: IMF Commodity Price Index

We need a radical rethink of both policy at national and regional level coupled with significant changes to our lifestyles ... environmental health practitioners have a potentially vital role to play in all of this

Even without global food shortages it is virtually certain that increasing food prices, coupled with other increasing vital daily living costs such as energy and water, will see increasing numbers of vulnerable people in the British Isles facing life threatening poverty whether that be food, fuel, or both.

We need a radical rethink of both policy at national and regional level coupled with significant changes to our lifestyles in order to address these challenges. Environmental health practitioners have a potentially vital role to play in all of this.

What local authorities can do

Local authorities need to not only lead by example in their communities, but also be key enablers and facilitators

Local authorities need to not only lead by example in their communities, but also be key enablers and facilitators. They are an absolutely fundamental player in efforts to combat the impacts of climate change and can do so in a multitude of ways. The following are just some possibilities:

- Collectively commit to action through mechanisms like the Nottingham declaration or its equivalent
- Ensure climate change is considered in all its work and in particular features in sustainable community strategies as well as housing, transport, regeneration, the economy and environment
- Ensure Local Area Agreements (LAAs) and Local Strategic Partnerships (LSPs) include climate change and sustainable development

In Northern Ireland, local authorities need to ensure that they run their business in an environmentally sustainable way. Many have already made significant progress on this. This needs to include:

- Cutting emissions in buildings
- Reducing the use of vehicle fleets
- Reducing street lighting (where safe and appropriate)
- Reducing the amount waste deposited in landfill sites (improve recycling facilities)
- Using technology and other innovative solutions to reduce the carbon footprint of their staff

There are numerous sources of help and assistance available for EHPs working towards this. We have included some of these in the Resources section. There may also be financial assistance available through various funding streams, including Europe, particularly where partnerships can be forged.

- Work with Councils for Climate Protection (CCP) – they offer guidance, training and good practice studies on integrating climate protection
- Seek help – there are many sources of expertise: the UK's climate change programme, UKCIP, LGA, Local Authority Energy Advisory, Greening Government website, Energy Saving Trust, Energy Efficiency Best Practice Programme, the Environment Agency and the I&DeA, (Improvement Development Agency)
- Ensure that they have fully considered climate change impacts as part of their emergency and resilience planning

Next steps

As an organisation committed to the maintenance and improvement of environmental and public health, the CIEH is committed to playing its part in rising to the challenge that climate change presents

As an organisation committed to the maintenance and improvement of environmental and public health, the CIEH is committed to playing its part in rising to the challenge that climate change presents. This document is only a part of that, but is an opportunity to set out our future commitments in this area. We will seek to develop our future actions within three distinct strands:

- Policy and advocacy
- Support
- Organisational

Policy and advocacy

Seeking to influence and advocate for public policy development that is directly relevant to the maintenance and improvement of environmental and public health is a core part of CIEH business. Climate change policies, strategies and interventions are very clearly core to this. As such:

- We will ensure that climate change is a central consideration within all of our policy work
- We continue to advocate for both mitigation and adaptation interventions within the public, private and voluntary/ community and NGO sectors
- We will prioritise by contributing to research that expands the evidence base

Support

The CIEH seeks to provide relevant, appropriate, and accessible support to its members across a range of key environmental health issues. Furthermore, as outlined earlier in this document, we believe that environmental health practitioners in whatever sector they work, have a significant contribution to make to this critical agenda.

Broadly speaking that input can take place in three distinct settings namely:

1. The provision of assistance, support and advice to the clients with whom they work on a daily basis be it businesses, other organisations or the public
2. Working within their own organisations to ensure that climate change is given appropriate priority and incorporated into both corporate and departmental strategy and associated plans and interventions
3. Action at a personal level within individual lives and households and local communities

This document is only a starting point. The CIEH will, in the coming months, seek to do the following:

- Develop appropriate support for our members in their efforts to engage with this agenda within each of the settings outlined above
- To do this we will seek to establish meaningful dialogue with a core group of practitioners in order to inform and shape relevant, appropriate support mechanisms and resources and assist with dissemination and communication
- We will also support policymakers and decision makers as and where opportunities arise through the provision of relevant advice and expertise

Organisational

- We will continue to further revise and reform our operational activities, including our offices, to ensure that the organisation minimises its environmental impact
- As an organisation we will continue to ensure that we operate in an ethical manner
- We will continue to develop our international work through our members and with other stakeholders, in particular efforts to assist the developing world

Selected sources of further information

CIEH

www.cieh.org

Good Housing Leads To Good Health: A toolkit for environmental health practitioners, September 2008 www.cieh.org/policy/good_housing_good_health.html

Urban pests and their public health significance: A CIEH summary, June 2008 www.cieh.org/policy/urban_pests_PH_significance.html

Saving our Skins toolkit www.cieh.org/policy/Saving_our_Skins.html?terms=saving+our+skins

UK Government sources

Commission for the Built Environment

www.cabe.org.uk

Department of Business, Enterprise and Regulatory Reform (BERR)

Fuel Poverty Strategy, November 2001

www.berr.gov.uk/whatwedo/energy/fuel-poverty/strategy/index.html

Department of Communities and Local Government

The Planning Response to Climate Change: advice on better practice, September 2004

www.communities.gov.uk/publications/planningandbuilding/planningresponse

Department for Environment, Food and Rural Affairs (DEFRA)

Adapting to Climate Change: A Framework for Action

www.defra.gov.uk/environment/climatechange/adapt/pdf/adapting-to-climate-change.pdf

Climate Change: The UK Programme 2006 sets out policies and priorities for action in the UK and internationally www.defra.gov.uk/environment/climatechange/uk/ukccp/index.htm

Department of Energy and Climate Change

www.decc.gov.uk

Department of Health

Health effects of climate change in the UK: an update of DoH report 2001, draft for comment, May 2007 www.dh.gov.uk/en/PublicHealth/HealthProtection/Climatechange/index.htm

Global health strategy, proposals for a UK government-wide strategy where climate change is a key determinant, March 2007 www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_072697

Health Effects of Climate Change in the UK, 2008 www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_080702

Food Standards Agency

www.food.gov.uk

General

HM Government, Climate Change – the UK programme 2006, Cm 6764, March 2006

House of Commons Environmental Audit Committee: Beyond Stern: From the Climate change Programme Review to the Draft Climate Bill, 7th report of session 2006-7. London: The Stationery Office Limited, July 2007

Murlis J, Davies G. Public perception of the health impacts of climate change, in: Department of Health, UK: Health Effects of Climate Change in the UK, an Expert Review. Department of Health, England, UK: 2001. Chapter 2 pp 57-62
www.dh.gov.uk/en/Publichealth/Healthprotection/Climatechange/index.htm

Rogers DJ, Randolph S, Lindsay S, Thomas C. Vector borne disease and climate change, in: Department of Health, UK: Health Effects of Climate Change in the UK, an Expert Review. Department of Health, England, UK: 2001, Chapter 4.3 pp 101-113. Updated in 2007: see Department of Health, 2007 www.doh.gov.uk

Health Protection Agency

www.hpa.org.uk

The Nature Conservancy

www.nature.org/initiatives/climatechange

HM Treasury

Stern Review on the Economics of Climate Change
www.hm-treasury.gov.uk/stern_review_climate_change.htm

UK Climate Impacts Programme (UKCIP)

UK Climate Impacts Programme (UKCIP) of the Department for the Environment, Food and Rural Affairs (DEFRA) provides climate change scenarios and co-ordinates research on dealing with climate change www.ukcip.org.uk

Welsh Assembly Government

<http://new.wales.gov.uk/topics/sustainabledevelopment/publications/?lang=en>

European and international organisations sources

American Public Health Association

www.apha.org/NR/rdonlyres/1E8BD4EE-2F47-40E3-9B5A-35EC23A2BC11/0/APHAClimateChg_11.pdf

Centres for Disease Control and Prevention (USA)

www.cdc.gov

Commission of the European Communities

Limiting Global Climate Change to 2 degrees Celsius: the way ahead for 2020 and beyond. COM (2007) 2 final; SEC (2007)7, Brussels, January 2007
www.eur-lex.europa.eu/LexUriServ/site/en/com/2007/com2007_0002en01.pdf

Green Paper: Adapting to climate change in Europe – options for EU action. COM (2007) 354, June 2007 [http://64.233.183.104/search?q=cache:pSEEZ1hEO1kJ:eur-lex.europa.eu/LexUriServ/site/en/com/2007/com2007_0354en01.pdf+COM+\(2007\)+354&hl=en&ct=clnk&cd=1](http://64.233.183.104/search?q=cache:pSEEZ1hEO1kJ:eur-lex.europa.eu/LexUriServ/site/en/com/2007/com2007_0354en01.pdf+COM+(2007)+354&hl=en&ct=clnk&cd=1)

European Environment Agency

www.eea.europa.eu/themes/climate

European Physicians and Professionals for Health and the Environment

www.ephe.org

Health and Environment Alliance

www.env-health.org

Intergovernmental Panel on Climate Change (IPCC)

Intergovernmental Panel on Climate Change 2007 www.ipcc.ch

IPCC 1994, Climate change 1994: radiative forcing of climate change and an evaluation of the IPCC IS92 emission scenarios. Houghton JT et al (Eds). Cambridge: Cambridge University Press
IPCC 2001, Climate change 2001: The scientific basis. JT Houghton, Y Ding, DJ Griggs et al (Eds). Cambridge: Cambridge University Press, pp 944

International Energy Agency

www.iea.org/Textbase/subjectqueries/keyresult.asp?KEYWORD_ID=4106

International Institute for Sustainable Development

www.iisd.org/climate

MEDACT

www.medact.org/env_climate_change.php

United Nations

www.unfccc.int/2860.php

United Nations Environment Programme

www.dh.gov.uk/en/PublicHealth/Healthprotection/Climatechange/index.htm
UNEP Climate Change Information Kit, pack produced by the UN Environment Programme, the UN Development Plan, UN Department of Economic and Social Affairs, UN Institute for Training and Research, World Meteorological Organization, World Health Organization, Climate Change Secretariat (UNFCCC). Geneva: UNEP, 1999 www.unep.ch/iuc

World Health Organization

www.who.int/topics/climate/en

Climate Change and Human Health – Risk and Responses, 2003 WHO in collaboration with UNEP and WMO. ISBN 92 4 159081 5 www.who.int/globalchange/publications/cchhsummary/en

McMichael AJ, Haines A, Slooff R, Kovats S (Eds). Climate change and human health: (an assessment prepared by a task group on behalf of the World Health Organization, the World Meteorological Organization and the United Nations Environment Programme). Geneva: WHO, 1996

Menne B, Ebi KL (Eds). Climate Change and Adaptation Strategies for Human Health, Steinkopff Darmstadt (Springer), Germany, 2005, 3798515913

World Wildlife Foundation

www.panda.org/about_wwf/what_we_do/climate_change/index.cfm

General sources

Houghton J. Global warming: the complete briefing, 2nd edition. Cambridge: Cambridge University Press, 1997

Houghton J, Ding Y, Griggs D, Nougher M, van der Linden P, Dai X, Maskell K, Johnson C (Eds). Climate change 2001: the scientific basis. Cambridge University Press, Cambridge, 2001

McKenzie Hedger M, Gawith M, Brown I, Connell R, Downing TE (Eds). Climate change: assessing the impacts – identifying responses. The first three years of the UK Climate Impacts Programme. UKCIP Technical Report, UKCIP and DETR, Oxford, 2000

Optimum Population Trust, Population growth 'bigger threat than climate change'. News release March 2006 www.optimumpopulation.org

Palutikof J. Indicators of Climate Change in the UK. Climate Research Centre Information Sheet no 4 www.cru.uea.ac.uk/cru/info/iccuk

Parry ML (Ed). Assessment of potential effects and adaptations for climate change in Europe: The Europe ACACIA Project. Jackson Environment Institute, University of East Anglia, Norwich UK, 2000, 320pp

Willows RI, Connell R (Eds). Climate Adaptation: risk, uncertainty and decision-making (Technical Report). UKCIP, Oxford, 2003

Local Government

Adaptation guidance Local Communities and Climate Change – How prepared are you? Helps councils to understand the impact on council services of the changing climate and how services need to adapt Local Authority Carbon Management Programme www.carbontrust.co.uk/publications/publicationdetail?productid=PAC047

Advice and support for local government – Environmental Management Systems (EMS)
www.sd-commission.org.uk/pages/local-government.html

Analysis of the applications of the ecological footprint tool, an aggregated indicator of natural resource consumption www.idea.gov.uk/idk/core/page.do?pageId=81085

The Councils for Climate Protection (CCP)
www.idea.gov.uk/idk/core/page.do?pageId=80829

Community Leadership and Climate Change Guidance for Local Authorities guidance on a range of opportunities for councils to develop their response to climate change www.idea-knowledge.gov.uk/idk/aio/396534 also refer to Annex F of the Local Government White Paper to be found at www.communities.gov.uk/publications/localgovernment/strongprosperous

IDeA guidance www.idea.gov.uk/idk/core/page.do?pageId=80829

LACORS, Climate Change and Regulatory Services
www.lacors.gov.uk/LACORS/ContentDetails.aspx?id=19476&authCode=7BB167

Local Evaluation 21, an online self-assessment tool for local sustainable development processes
www.idea.gov.uk/idk/core/page.do?pageId=90743

Local authority sustainable procurement tool
www.forumforthefuture.org.uk

Local Government Association
www.lga.gov.uk/lga/core/page.do?pageId=19120

Nottingham Declaration – Local authority sign up to Climate Change to secure maximum benefit from action for their local communities
www.energysavingtrust.org.uk/nottingham

Tools local authorities are using for measuring sustainability
www.idea.gov.uk/idk/core/page.do?pageId=81083

Other sources

The Environment Agency, to assess vulnerability to climate change and provide advice on other issues www.environment-agency.gov.uk/yourenv/639312/?version=1&lang=_e

Food Standards Agency, England and Wales
www.food.gov.uk

The LARS Weather Generator
www.rothamsted.bbsrc.ac.uk/mas-models/larswg.php

Subject areas

Air pollution

Anderson HR, Derwent RG, Stedman J. Air Pollution and Climate Change, in: Department of Health, UK: Health Effects of Climate Change in the UK, an Expert Review. Department of Health, England, UK: 2001. Chapter 4.7 pp 219-237
www.dh.gov.uk/en/Publichealth/Healthprotection/Climatechange/index.htm

Climate change scenarios

Hadley Centre for Climate Prediction and Research
www.metoffice.gov.uk/research/hadleycentre

Hulme M, Jenkins GJ. (1998), Climate change scenarios for the United Kingdom: Scientific Report. UKCIP Technical Report No.1, Climate Research Unit, Norwich, 80pp

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Tyndall Centre for Climate Change Research. Climate Change Scenarios for the United Kingdom: The UKCIP02 Briefing Report ISBN 0 902 170 65 1
www.tyndall.ac.uk

UKCIP08. Climate Change Scenarios for the United Kingdom: the UKCIP08 Scientific Report
www.ukcip.org.uk/index.php?option=com_content&task=view&id=163

Costing of impacts

Boyd R, Hunt A. Costing the local and regional impacts of climate change using the UKCIP Costing Methodology, paper submitted to Stern Review on climate change, 2006
www.hm-treasury.gov.uk/stern_review_climate_change.htm

Disaster response and emergency planning

UK Resilience www.ukresilience.gov.uk

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Phifer JF. Psychological distress and somatic symptoms after natural disaster: differential vulnerability among older adults. Psychology and Aging, 1990; 5:412-420

Effects of heat/UV

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Van der Leun JC, de Grujil FR. Climate change and skin cancer, *Photochem Photobiol* 2002; 1:324-6

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Energy efficiency

Sustainable Development Commission, the Government's independent watchdog on sustainable development www.sd-commission.org.uk/health

'Securing the Future' March 2005 – the Government's Sustainable Development Strategy for the UK www.sd-commission.org.uk/publications.php

Securing the Regions' Futures – Strengthening delivery of sustainable development in the English regions www.sd-commission.org.uk/publications.php

Climates & Change, The Urgent Need to Connect Health and Sustainable Development, UKPHA www.ukpha.org.uk

Department of Health Sustainable Development Action Plan 2006/07
www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_079682

Energy Performance Certificates (EPCs) The National Home Energy Rating (NHER) scheme
www.nher.co.uk/pages/insight/eu_directive.php

The Carbon Trust www.carbontrust.co.uk/climatechange and the Energy Saving Trust www.energysavingtrust.org.uk run awareness campaigns on climate change for companies and individuals

Marches Energy Agency a leading organisation in the search for a sustainable energy future with a portfolio of innovative and highly successful projects www.me.a.org.uk/what

The Energy Savings Trust www.energysavingtrust.org.uk/commit and 'Every Action Counts' www.everyactioncounts.org.uk – encourage changes in human behaviour and action to remove barriers to energy efficiency

Flooding

Ahern MJ, Kovats RS, Wilkinson P, Few R, Matthies F. Global health impacts of floods: epidemiological evidence. *Epidemiological Reviews*, 2005; 27:36-46

Centers for Disease Control and Prevention, USA www.bt.cdc.gov/disasters/floods/index.asp

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www.tyndall.ac.uk/publications/working_papers/wp63.pdf

Health Protection Agency, England and Wales www.hpa.org.uk/webw/HPAweb&Page&HPAwebAutoListName/Page/1158934608011?p=1158934608011

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Food Standards Agency www.food.gov.uk/news/newsarchive/2007/jul/flooding

Food poisoning

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Housing and the built environment

Building Resource Energy Conservation Support Unit (BRESCU): *Good Practice Guide 82: Energy Efficiency in housing – guidance for local authorities*. BRESCU 1997

The Code for Sustainable Homes sets out standards beyond 'Building Regulations' requirements to decrease the environmental impact of housing growth www.planningportal.gov.uk/england/professionals/en/1115314116927.html

EU directive on the energy performance of buildings (2002/91/EC) www.ec.europa.eu/energy/demand/legislation/buildings_en.htm

Hacker JN, Belcher SE, Connell RK. *Beating the Heat: keeping UK buildings cool in a warming climate*, UKCIP Briefing Report, UKCIP, Oxford, 2005

Planning, Building and the Environment – For a publication on measures that can be taken to reduce the carbon footprint of the existing housing stock see www.communities.gov.uk/publications/planningandbuilding/reviewsustainability

Water

Curriero F, Patz JA, Rose JB, Lele S. The association between extreme precipitation and waterborne disease outbreaks in the United States, 1948-1994. *American Journal of Public Health* 2001; 91(8):1194-1199

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