

Summary of the Key Findings from the UK Climate Change Risk Assessment 2012



Contents

Introduction	2
The Scope of this Summary	3
The Key Messages from the CCRA	4
The Extent of the Risk to the UK	6
Cause for Concern	8
Selection of Impacts on...Agriculture & Forestry	9
Selection of Impacts on...Business	10
Selection of Impacts on...Health & Wellbeing	11
Selection of Impacts on...Buildings & Infrastructure	12
Selection of Impacts on...the Natural Environment	14
A Summary of Potential Opportunities and Threats for the UK	15

Introduction

The global climate is changing and will continue to change over the coming century.¹ Most climate scientists agree that much of this is attributable to increased atmospheric concentrations of 'greenhouse' gases produced by human activities. Even if we manage to limit future greenhouse gas emissions, current and historical emissions mean that a certain amount of additional warming is inevitable.²

This summary presents key findings from the Climate Change Risk Assessment (CCRA), the first-ever comprehensive assessment of potential risks and opportunities for the UK arising from climate change. The CCRA represents a key part of the Government's response to the Climate Change Act 2008, which requires a series of assessments of climate risks to the UK, both under current conditions and over the long term.

The CCRA has used currently available evidence to produce an initial snapshot of how a changing climate may affect the UK up to the year 2100. It will be updated every five years, taking account of new climate observations and improved understanding of future climate change and risk.

¹ For historical analysis, see the Met Office and UK Climate Impacts Programme web pages, e.g. <http://www.metoffice.gov.uk/climate-change/guide> and <http://www.ukcip.org.uk/faq/> or refer to recent peer-reviewed literature, such as P. Brohan, J.J. Kennedy, I. Harris, S.F.B. Tett and P.D. Jones (2006): Uncertainty Estimates in Regional and Global Observed Temperature Changes: A New Dataset from 1850. *Journal of Geophysical Research*, 111, D12106, doi: 10.1029/2005JD006548. For future rates of global warming, refer to the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (see below).

² IPCC Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change 2007, S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.). Cambridge University Press, Cambridge, UK and New York, USA.

The Scope of this Summary

This publication outlines some of the most important risks and opportunities that climate change may present. It provides an indication of their potential magnitude, when they might become significant and the level of confidence in each finding. As well as the overall picture, specific findings are presented for five complementary themes: Agriculture & Forestry, Business, Health & Wellbeing, Buildings & Infrastructure and the Natural Environment.

Potential climate impacts are discussed within three timeframes: 'the 2020s' (2010-2039), 'the 2050s' (2040-2069) and 'the 2080s' (2070-2099). In most cases a range of outcomes is presented, consistent with the UK Climate Projections published by Defra in 2009 (UKCP09), from the lower end of the Low emissions scenario to the upper end of the High emissions scenario. This does not cover every possible outcome.

The CCRA methodology is novel in that it allows for comparison of over 100 impacts (prioritised from an initial list of over 700) from a number of disparate sectors, based on the magnitude of the impact and confidence in the evidence base. A key strength of the analysis is the use of a consistent method and set of climate projections to look at current and future risks and opportunities. A representative selection of these 100+ risks and opportunities is presented in this summary.

The CCRA methodology has been developed through a number of stages involving expert peer review. The approach developed is a manageable, repeatable methodology that is not dependent on changes in Government policy and planning between the five-year cycles of the CCRA.

With the exception of population growth, the assessment and the results produced do not take account of changes in society (e.g. economic growth and developments in new technologies); nor do they take account of responses to climate risks (e.g. future or planned Government policies or private adaptation investment plans). The UK CCRA Government Report [www.defra.gov.uk/environment/climate/government/] outlines actions already in place to address the risks identified in the CCRA and outlines the Government's plans for the future. Unless stated otherwise, the results presented in this summary do not take into account population growth.

Excluding these factors from the analysis provides a robust baseline against which the effects of different plans and policies can be more easily assessed. However, when utilising the outputs of the CCRA, it is essential to recognise that the Government and key organisations are already taking action in many areas to minimise climate change risks and these interventions need to be considered when assessing where further action may be needed or best directed.

The findings presented in this summary therefore reflect potential risks and opportunities and are *not* a prediction of what the future consequences of climate change will be.

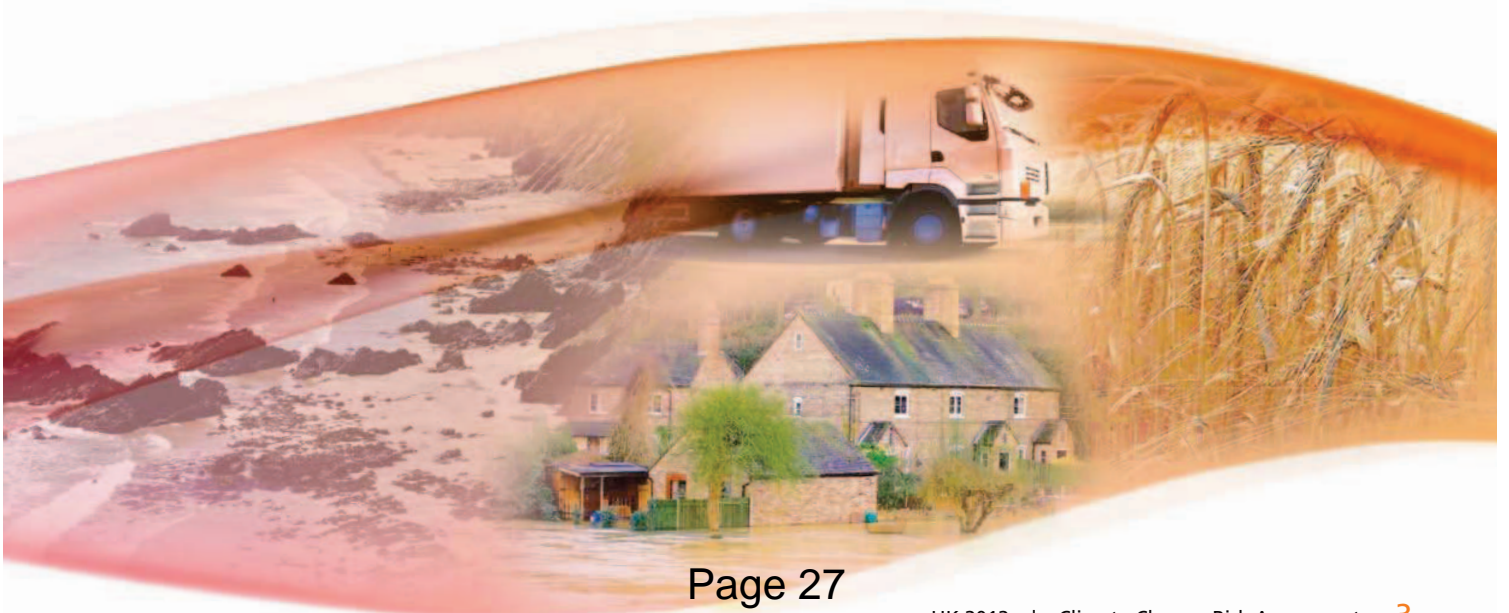
Limitations & Uncertainties

Uncertainty remains over the magnitude and timing of climate change impacts, especially at regional and local levels. This is due to the limitations in our ability to model the climate system, biophysical impacts and the social and economic responses to changes in climate. For example, there is uncertainty related to:

- **Future global emissions of greenhouse gases.** Three different emissions scenarios have therefore been used for the CCRA: High, Medium and Low emissions.
- **Climate models,** particularly modelling certain processes that affect natural variations from year to year, the location of storm tracks and the causes of more extreme flood and drought conditions.
- **Socio-economic changes** that will influence our vulnerability to a changing climate.

In addition, how impacts relate to each other and how this may lead to additional or compound risks is a complex issue and has not been fully explored as part of this first CCRA.

For these reasons, further research is needed on how global climatic changes may affect the UK and how climate, social and economic changes may influence the UK's overall 'risk landscape'.



The Key Messages from the CCRA

- **The global climate is changing and warming will continue over the next century.** The latest projections for the UK show increases in summer and winter temperatures, increases in winter rainfall, decreases in summer rainfall (although small increases are also possible), more days of heavy rainfall and rising sea levels.³
- **The UK is already vulnerable to extreme weather, including flooding and heatwaves.** Continued action is needed to manage these risks even if additional pressures due to climate change are not taken into account.
- **Flood risk is projected to increase significantly across the UK.** Increases in the frequency of flooding would affect people's homes and wellbeing, especially for vulnerable groups (e.g. those affected by poverty, older people, people in poor health and those with disabilities), and the operation of businesses and critical infrastructure systems. Annual damage to UK properties due to flooding from rivers and the sea currently totals around £1.3 billion. For England and Wales alone, the figure is projected to rise to between £2.1 billion and £12 billion by the 2080s, based on future population growth and if no adaptive action is taken.
- **UK water resources are projected to come under increased pressure.** This is a potential consequence of climate-driven changes in hydrological conditions, as well as population growth and the desire to improve the ecological status of rivers. By the 2050s, between 27 million and 59 million people in the UK may be living in areas affected by water supply-demand deficits (based on existing population levels). Adaptation action will be needed to increase water efficiency across all sectors and decrease levels of water abstraction in the summer months.
- **Potentially, there are health benefits as well as threats related to climate change, affecting the most vulnerable groups in our society.** These are likely to place different burdens on National Health Service (NHS), public health and social care services. For example, premature deaths due to cold winters are projected to decrease significantly (e.g. by between 3900 and 24,000 by the 2050s) and premature deaths due to hotter summers are projected to increase (e.g. by between 580 and 5900 by the 2050s). Other health risks that may increase include problems caused by ground-level ozone and by marine and freshwater pathogens.



■ **Sensitive ecosystems are likely to come under increasing pressure.** Although some species could benefit, many more would be negatively impacted. These impacts would have knock-on effects on habitats and on the goods and services that ecosystems provide (e.g. regulating water flows, pollination services).

■ **Potential climate risks in other parts of the world are thought to be much greater than those directly affecting the UK, but could have a significant indirect impact here.** These risks include effects on global health, political stability and international supply chains.

■ **Some changes projected for the UK as a result of climate change could provide opportunities for agriculture and other businesses, although not outweighing the threats.** For example, there are potential benefits for crop growth (assuming water is not a limiting factor) and hence food production, while climate change may also encourage more efficient use of resources and the development and provision of products and services that can help manage climate risks.

■ **Despite the uncertainties related to future climate change and its impacts, the evidence is now sufficient to identify a range of possible outcomes that can inform adaptation policies and planning.** Decision makers need to consider uncertainties and to allow flexibility in their policies and plans. Specific climate change guidance is available in many sectors that describes suitable methods and tools for assessing future risks and adaptation options.⁴

■ **Significant gaps in evidence still exist.** For example, further work is needed to improve understanding of the relationships between different climate risks and of how climate risk compares to risks from pressures such as population growth and land-use change.

³ These are long-term trends. Natural variability means that other changes may be seen in the short-term that do not reflect these trends. For example, cooler summers and colder winters may still be seen and so too may drier winters and wetter summers. Even in the long term, conditions in some years may be counter to long-term trends.

⁴ For example, see the Treasury Green Book on appraisal methods and recent sector-by-sector guidance, such as Defra's guidance on considering climate change in the appraisal of flood risk management options.



The Extent of the Risk to the UK

A Global Phenomenon

Since the 1970s, average global temperatures over land have increased by around 0.7°C. The IPCC projects a further rise of between about 1°C and 6°C by the end of the century.⁵ Whilst it is vital to reduce future greenhouse gas emissions, inertia in the climate system from past emissions means that some climate change is inevitable.

In the UK

In recent years, the UK annual average temperature has generally been between about 0.5°C and 1°C warmer than the 1961-1990 average,⁶ although some years have been above and below this range due to significant year-to-year variability.

The UK's National Risk Assessment (which looks at a range of risks from a number of sources) already recognises current severe weather and major coastal and inland flooding as significant risks to this country.⁷ The CCRA projects that these will pose an increasing threat as the climate changes. Other climate risks and also opportunities are projected to become more significant during the 21st century. By the 2080s, the UKCP09 projections for different parts of the UK suggest: an increase in average summer temperatures of between about 1°C and 8°C; an increase in average winter rainfall volumes of between around 3% and 70%; a projected change in average summer rainfall volumes ranging from a decrease of about 60% to an increase of about 10%; and by 2095 a projected rise in sea levels around London, for instance, of between about 20 cm and 70 cm.⁸

Threats and Opportunities

The UK Climate Change Act 2008 makes the UK the first country in the world to have a national, legally binding, long-term framework to cut carbon emissions. Continued efforts to mitigate climate change by cutting UK and other countries' emissions will benefit the UK and reduce the greater risks faced by vulnerable developing countries. The CCRA has shown that, for the 2080s, the negative consequences of global Low and Medium emissions scenarios are substantially less than those of High emissions scenarios.

Nevertheless, adaptation is needed to reduce the costs and damages of inevitable climate change and to take advantage of opportunities. In the field of flood risk management, major decisions on overall levels of funding and on the need for specific schemes will be required before 2020 to ensure that the UK is prepared.

How Confident Are We About Future Climate Risks?

Climate monitoring and climate modelling have improved significantly over the last two decades, but there are many limits to our understanding of our future climate. For example, we do not know the relative extent of the warming and the cooling effects of some atmospheric pollutants (e.g. aerosols and particulates) or how quickly and how much melting of polar ice caps might occur. These and other uncertainties result in a wide range of possible rates of warming, precipitation and sea level rise.



It is also important to be aware that the findings, including those for the 2020s, do not represent year-on-year changes driven by natural variability, as they are based on projections of the 30-year average climate. Short-term fluctuations will sometimes oppose the long-term trend (for example, very cold winters are still possible in the short-term, despite a long-term trend towards warmer winters).

Confidence in a large number of the CCRA findings is generally 'low' to 'medium', with only risks that are already being experienced and those related to increased temperatures classified as 'high'. A number of the emerging risks examined are potentially very significant, but our current level of knowledge means that there are also large uncertainties, especially with respect to potential climate impacts on ecosystems and business networks.

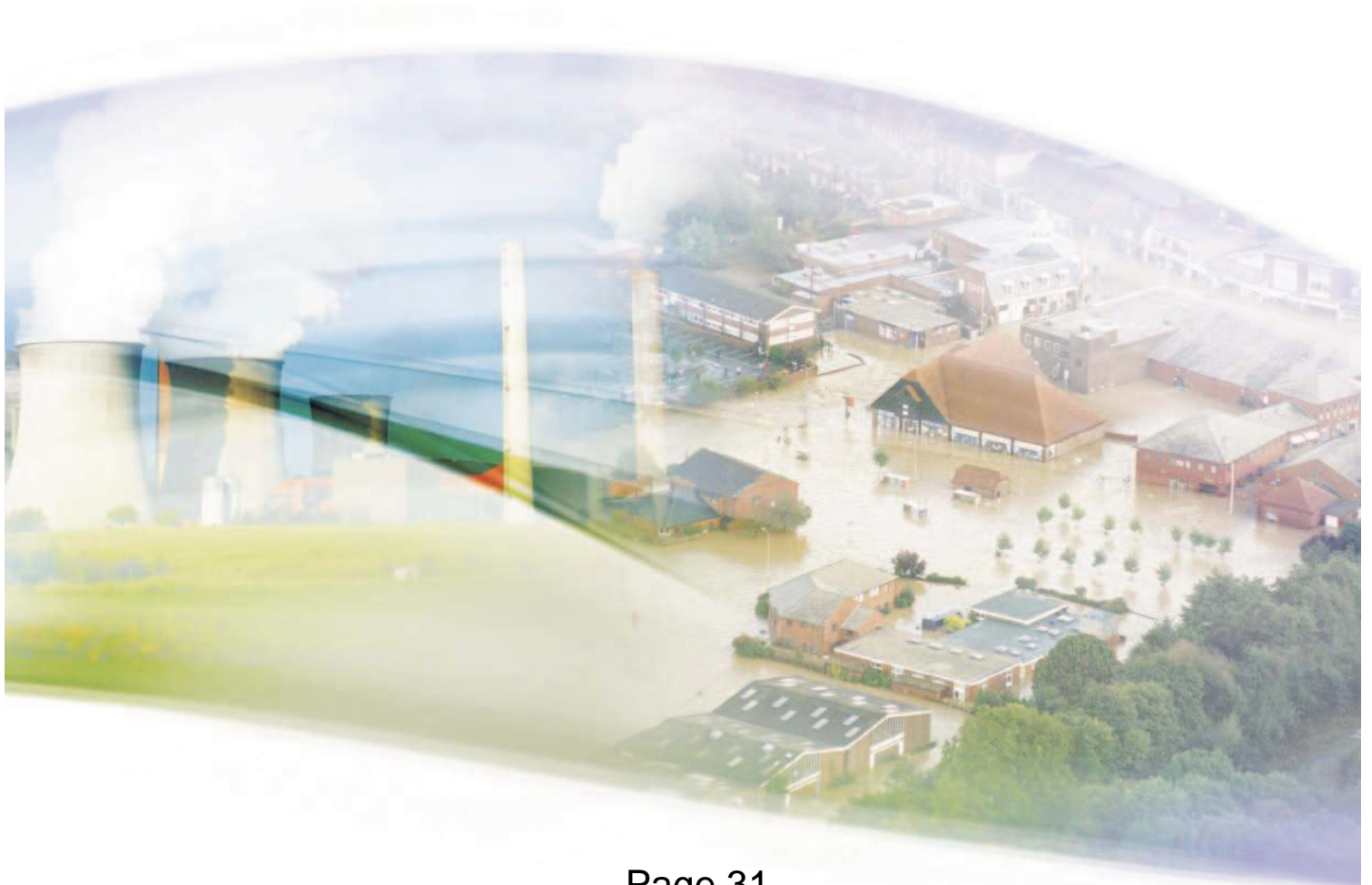
Nevertheless, the CCRA constitutes the best available overview of the climate risks that the UK is projected to face during the coming century. The broad picture that has emerged as a result of the assessment process is believed to provide a credible interpretation of what climate change could mean if the UK does not implement effective and timely adaptation actions alongside ongoing mitigation actions. However, for decision makers, dealing with these risks and their uncertainties is not a unique challenge; good risk management is integral to dealing with all future challenges, whatever their nature.

⁵ IPCC Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change 2007, S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.). Cambridge University Press, Cambridge, UK and New York, USA.

⁶ G. Jenkins, M. Perry and J. Prior (2009): The Climate of the United Kingdom and Recent Trends.

⁷ <http://uknea.unep-wcmc.org/>

⁸ These figures are based on UKCP09, but have been rounded to one significant figure.



Cause for Concern

Counting the Cost

Few parts of the UK have been unaffected by extreme weather in recent years. For example:

- In 2003, around 2000 excess deaths were recorded in England and Wales during the August heatwave. In London, the Urban Heat Island effect meant that night-time temperatures were as much as 9°C higher than in the surrounding countryside.
- In 2007, summer floods affected England, Wales and Northern Ireland, costing the economy more than £3 billion in England alone. In 2009, the Cumbria floods resulted in £100s of millions of damage, including the loss of 20 road bridges and long-term disruption for local communities.
- In 2009 and 2010, prolonged cold caused wide-ranging problems for UK transport and water infrastructure. For example, in December 2009, thousands of households in Northern Ireland experienced difficulties with water supplies; in December 2010, heavy snow across Scotland's Central Belt resulted in hundreds of motorists being stranded overnight.
- In 2011, parts of the UK experienced a much drier than average spring, resulting in insufficient rainfall for some crops. Over Easter, the higher temperatures, static weather pattern and increased sunshine contributed to a pollution warning across England and Wales unusually early in the year. In Berkshire, forest fires led to the closure of businesses and schools and evacuation of homes.

Natural climatic variability means that, with or without climate change, episodes like these will continue to occur in future. However, events such as heatwaves, flooding and drought are all projected to become more severe due to a changing climate, with vulnerable groups tending to experience disproportionate negative effects.

Climate Change in Context

Climate change is not the only important issue that will shape the UK's future. Population growth, changing consumer values, changes in land use, economic factors and a range of other key drivers are also projected to play a fundamental and, in many respects, more influential role in determining the UK's social, economic and environmental development in the years and decades ahead.

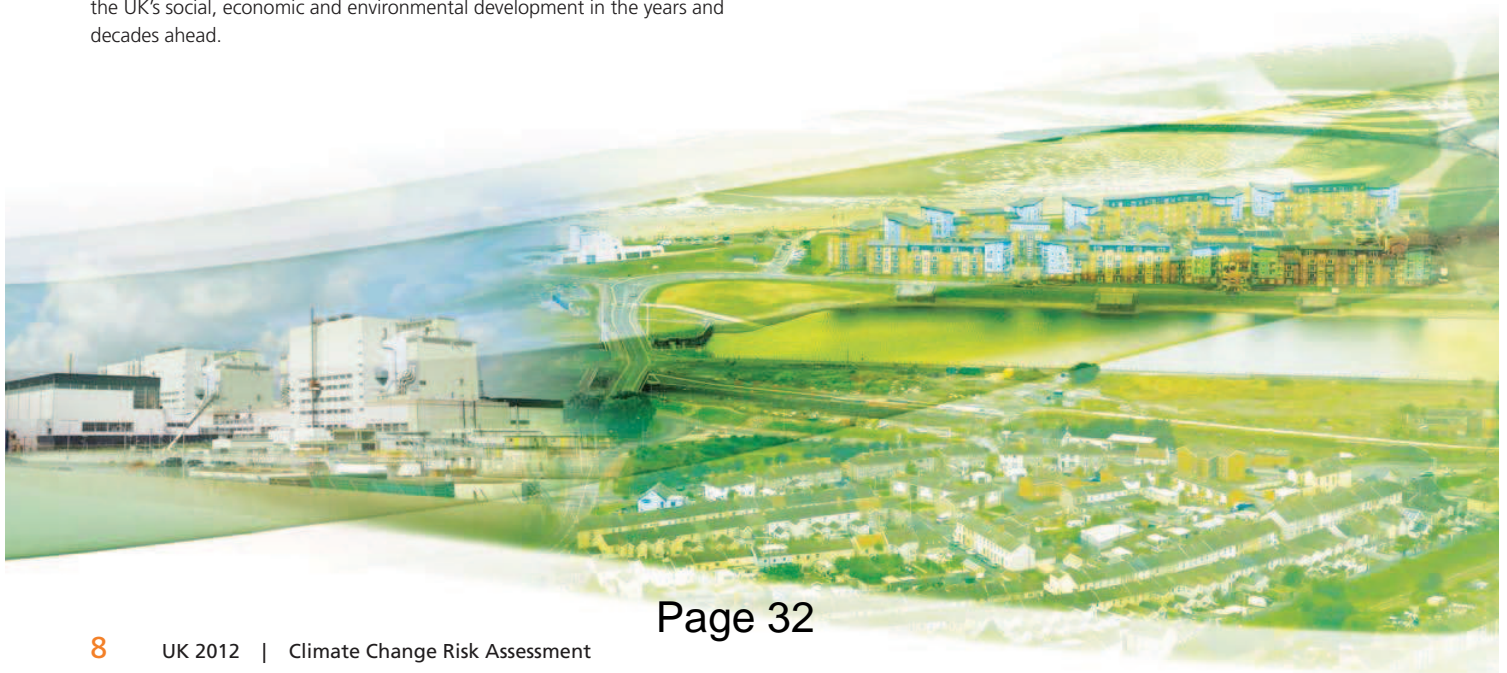
This should not, however, obscure the fact that many of the risks associated with climate change are projected to have a significant impact on lives and livelihoods in the UK. Indeed, many climate impacts may either exacerbate socio-economic pressures or be exacerbated by them. For instance, hotter summers and increasing ground-level air pollution during summertime are projected to add to the healthcare needs of our ageing and growing population. Similarly, climate change and land-use change may mutually reinforce each other to accentuate the threat each poses to natural habitats and ecosystems.

More research is needed, however, to understand the often complex interdependencies that exist between climate change and socio-economic drivers and to assess the potentially major impact of these interdependencies on the UK.

Which Potential Risks Require Early Action?

Although considerable uncertainty surrounds future climate change risks, there is sufficient evidence to start planning adaptation actions. Overall, the CCRA has produced preliminary findings indicating that the greatest need for action within the next five years may be in the following areas:

- Flood and coastal erosion risk management.
- Specific aspects of natural ecosystems (e.g. managing soils, water and biodiversity).
- Management of water resources, particularly in areas with increasing water scarcity.
- Overheating of buildings and other infrastructure in the urban environment.
- Risks to health (e.g. from heatwaves and flooding) and impacts on NHS, public health and social care services.
- Economic opportunities, especially to develop adaptation products and services.



Selection of impacts on...

Agriculture & Forestry

For agriculture and forestry in the UK, climate change is projected to result in both opportunities and threats. The extent of these will depend on the precise balance that develops between beneficially warmer conditions and the negative effects of limitations in water and nutrient availability. Above all, water availability will be the key issue for this sector and the key limiting factor with respect to potential increases in productivity resulting from warmer temperatures.

Confidence

M Warmer temperatures may benefit crop growth, if water is not limiting.

By the 2050s, in the absence of limiting factors such as water availability, warmer temperatures could facilitate a rise of between around 40% and 140% in wheat yields and a rise of between around 20% and 70% in sugar beet yields, with grass yields also projected to increase by between around 20% and 50%.

H Warmer temperatures are projected to provide suitable climatic conditions for new crops in the UK.

Warmer conditions would be more favourable to the cultivation of less common crops such as blueberries and miscanthus and new crops not currently grown in this country. This could present commercial opportunities for agri-businesses in the production of crops for food, pharmaceuticals, energy and industry.

M Less water is projected to be available to meet increased demand for crop irrigation.

Warmer, drier conditions would increase water demand for some crops, including those not currently irrigated. Any increase could coincide with growing competition for less readily available water resources, adding to the potential risk of water shortages.

H Agricultural land is projected to become more prone to flooding.

By the 2080s, the risk of flooding of agricultural land from rivers and the sea could increase significantly. In England and Wales, currently around 50,000 hectares (0.5% of total agricultural land) are flooded very frequently (at least once in three years on average). This is projected to increase to around 200,000 hectares by the 2080s (2% of total agricultural land). Although flooding causes short-term damage, it can boost long-term productivity by depositing nutrients.

Confidence

M Productivity of commercial tree species (e.g. Sitka spruce) is projected to change significantly.

By aiding tree growth, warmer temperatures could boost the productivity of forests in Scotland and Northern Ireland if other factors (e.g. water and nutrient availability) are not limiting. In England, the productivity of conifers and broadleaved trees (e.g. beech) is projected to decline, while in Wales the picture appears more mixed. These changes would potentially affect the supply of wood and wood products.

M Increases in drought, pests and diseases (e.g. red band needle blight) have the potential to reduce timber yield and quality.

For the 2080s, projected drought conditions translate into a drop in timber yields of between around 10% and 20% in south-east England, for example. Pests and diseases, which thrive in warmer conditions, may also pose an increasing threat. Reductions in timber yield and quality have the potential to drive up prices of wood products.



Selection of impacts on...

Business

Climate change is likely to present 'UK plc' with extensive opportunities (e.g. to provide adaptation-related products and services for customers at home and abroad). However, these may be outweighed overall by threats to fixed assets, workforces, supply chains and businesses' day-to-day ability to meet their customers' requirements.

Confidence

M Quicker, cheaper shipping routes could link the UK with key global markets.

Although the melting of Arctic sea ice could have long-term implications for the UK's climate and may damage the Arctic's biodiversity, one potential positive outcome could be the opening up of new container shipping routes to Asia and the Pacific. These offer the potential for shorter journey times, lower fuel costs and savings in Suez and Panama Canal transit fees.

L Warmer temperatures might increase the UK's appeal as a tourist destination.

Hotter summers and warmer year-round temperatures may make the UK a more attractive destination for foreign and domestic holiday makers. In particular, the UK could be well placed to attract visitors deterred by the uncomfortably high temperatures in southern Europe projected to result from climate change.

M Fish and shellfish are projected to shift northwards.

Rising sea temperatures may result in some species of fish (e.g. plaice and sole) becoming more abundant in UK waters, offering new fishing opportunities. However, other species (e.g. cod and haddock) may move away from current fishing grounds.

Confidence

M Increased flooding would negatively affect businesses.

More intense rainfall, more extreme weather and wetter winters are projected to increase the threat to businesses of damage and disruption (including to supply chains) as a result of all types of flooding. Annual insurance payouts resulting from flooding are also projected to rise significantly in future. As flood risk increases, an increasing number of properties may experience an increase in insurance premiums or may even find difficulty in obtaining insurance, resulting in difficulties obtaining mortgages. This has the potential to impact both the insurance industry and mortgage lenders.

M Hotter summers are projected to increase the risk of overheating in workplaces.

An increase in overheating of workplaces may affect businesses' profitability by eroding employee productivity. Greater reliance on air conditioning could significantly increase businesses' energy costs during the summer.



Selection of impacts on... Health & Wellbeing

Climate change is projected to have a significant impact on the health and wellbeing of many people in the UK. There may be some extremely welcome benefits, but these need to be considered alongside a range of negative effects.

Confidence

M **Milder winters are projected to result in a major reduction in the risk of cold-related death and illness.**

Currently, cold weather results in between 26,000 and 57,000 premature deaths each year in the UK. By the 2050s, a reduction in these figures of between 3900 and 24,000 is projected to occur due to increasing average winter temperatures. This would particularly benefit vulnerable groups, including those with existing health problems.

H **Hotter summers are projected to increase the risk of heat-related death and illness.**

On average, hot weather accounts for around 1100 premature deaths a year in the UK. By the 2050s, this figure is projected to increase by between 580 and 5900, with the greatest risk in London and southern England.

M **The number of casualties due to flooding and the impact of floods on mental wellbeing are both projected to increase.**

The annual number of flood victims suffering anxiety, depression or other mental problems is projected to rise by between 4000 and 7000 by the 2050s, from present day figures of between 3500 and 4500.⁹ The 18 deaths on average a year currently attributed to the direct or indirect effects of flooding and storms are projected to increase by between 6 and 34 by the 2050s.

Confidence

M **The risk of health problems caused by marine and freshwater pathogens¹⁰ is projected to increase.**

Rising sea temperatures are already providing conditions conducive to an increase in viruses, bacteria and harmful algae in the seas around the UK. Some of these can have an adverse effect on human health (e.g. causing stomach complaints among bathers). As the seas continue to warm and as sudden and heavy rainfall events generate increased amounts of runoff into sewers, the incidence of pathogens within bathing and shellfish waters may increase.

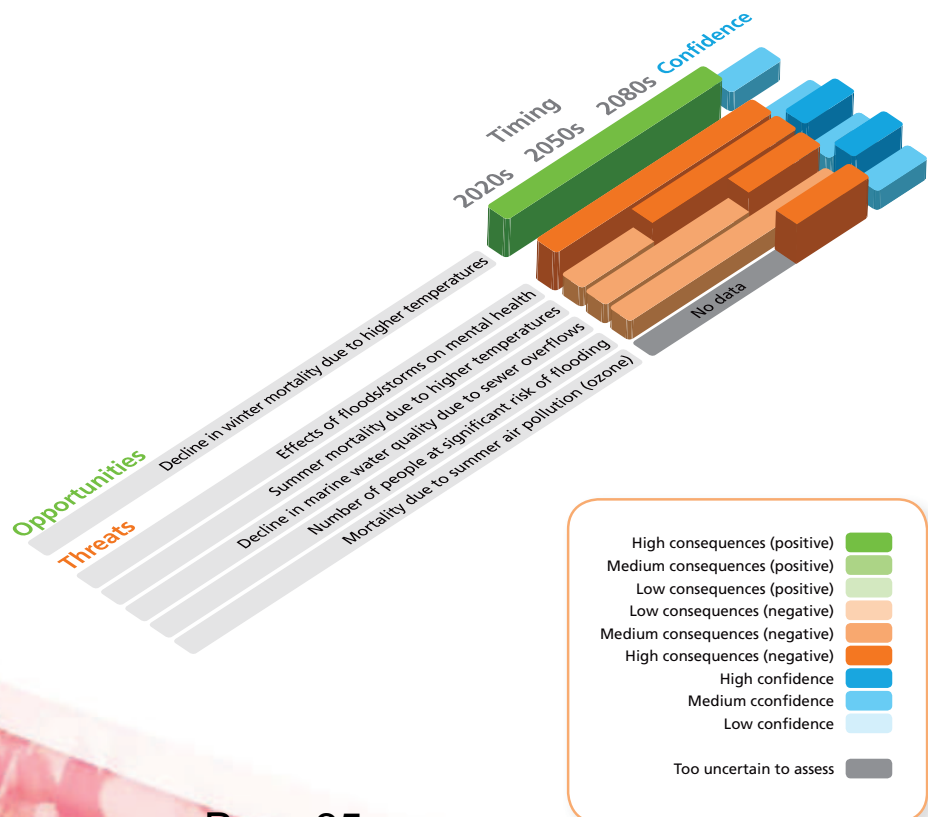
M **Health problems caused by air pollution may increase.**

Climate change could lead to a rise in concentrations of ground-level ozone. By the 2080s, it is projected that this may lead to respiratory-related deaths related to the short-term effects of ozone increasing by between 650 and 2900 from the current average of 10,000 a year, although the predicted impacts before the 2080s are highly uncertain. Similarly, hospital admissions are projected to rise by the 2080s by between 2300 and 10,000, from the current figure of around 33,000 a year.¹¹

⁹ The figures presented here apply to England and Wales only.

¹⁰ Disease-carrying microbes.

¹¹ Results are based on the worst case assumption that there is no threshold for the effects of ozone.



Selection of impacts on...

Buildings & Infrastructure

Although it may lead to benefits such as lower heating demand in winter, the serious threats that climate change presents to UK buildings and infrastructure are likely to outweigh the positive effects. Large cities with high concentrations of vulnerable people may be most at risk. Interdependencies between different critical infrastructure networks mean that damage or disruption to one could impact others through a cascade effect.

Confidence

L Energy demands for heating are projected to decrease

Milder winters may lead to a reduction in energy demand for domestic heating, with the largest decreases in the south of the UK. The economic and social benefits of a reduction in winter heating demand are potentially very large, perhaps exceeding £1 billion per year by the 2050s.

H Energy demands for cooling are likely to increase.

Higher summer temperatures are projected to result in rising energy demand for cooling, again particularly in the south of the UK. Currently, cooling of buildings (including air conditioning, refrigeration and cooling of information and communications technology infrastructure) accounts for around 4% of total UK electricity use and demand for cooling is already increasing.

H Flood risks to buildings and key infrastructure are anticipated to increase.

Annual damage to UK properties due to flooding from rivers and the sea currently totals around £1.3 billion. £1.2 billion of this is accounted for by England and Wales – a figure projected to rise to between £2.1 billion and £12 billion by the 2080s.¹² Without action, a range of important infrastructure such as roads and railways could be affected by a significantly increased risk of flooding.

Confidence

H Overheating is projected to pose an increased risk to building occupants.

Summer overheating is projected to emerge as a significant risk, potentially contributing to heat-related health problems. In London, for instance, the number of days in an average year when temperatures rise above 26°C is projected to increase from the current figure of 18 to between 27 and 121 by the 2080s.

H The Urban Heat Island Effect could become more pronounced.

Large cities in the UK already experience higher night-time temperatures than the surrounding countryside due to their absorption of heat during the day. Increased urbanisation and increased energy use would cause this phenomenon to become even more noticeable over the course of the coming century, exacerbating potential health problems and impacts on biodiversity (e.g. in aquatic ecosystems) caused by overheating.

M Water resources are projected to become scarcer.

Reductions in water availability, particularly during the summer, may lead to more frequent water use restrictions and, in the longer term, water shortages. The gap between demand and availability could potentially widen, impacting homes, businesses, schools and hospitals, for instance. By the 2050s, between 27 million and 59 million people in the UK may be living in areas affected by water supply-demand deficits (based on existing population levels).



Confidence

L Sewers are projected to fill more frequently and spill into rivers and the sea.

Many sewers in the UK are part of combined systems (i.e. the sewers carry both sewage and surface water runoff). When they are full they can spill into rivers and the sea. Although heavily influenced by socio-economic factors such as population growth, significant increases in spill frequency may occur in future due to changes in rainfall patterns (e.g. more heavy winter downpours) and may impact biodiversity (e.g. in aquatic ecosystems).

M Damage to road and rail bridges is projected to increase.

Increased winter rainfall and higher river flows may lead to more damage to road and rail bridges. Old masonry arch bridges are most at risk from 'scouring', where their foundations can be washed away. Bridges can also be weakened during floods by the impact from floating debris (e.g. motor vehicles) and the washing-out of loose masonry and 'fill' material resulting from poor bridge maintenance.

Confidence

H Electricity network capacity losses are projected to increase.

Higher air temperatures may make it necessary to reduce the amount of electrical current passing through overhead power lines, in particular, as well as through underground cables and power transformers. Known as 'de-rating', this ensures that the equipment does not overheat. Although helping to prevent power outages, de-rating effectively decreases transmission capacity.

¹² This projection includes population growth.



High consequences (positive)	Green
Medium consequences (positive)	Light Green
Low consequences (positive)	Yellow-Green
Low consequences (negative)	Yellow
Medium consequences (negative)	Orange
High consequences (negative)	Dark Orange
High confidence	Dark Blue
Medium confidence	Light Blue
Low confidence	Very Light Blue
Too uncertain to assess	Grey

Selection of impacts on...

The Natural Environment

Human activity places a range of pressures on the natural environment. These are likely to be exacerbated and/or altered by climate change and may also heighten many of its impacts. In turn, these impacts could affect the way humans are able to use the environment, for example to grow crops or obtain high-quality drinking water. These conclusions are supported by the findings of the UK National Ecosystem Assessment.

Confidence

H Some species of animals and plants are likely to be lost to the UK as their 'climate space' moves.

Warmer temperatures and changing rainfall patterns could mean that some current native species would need to move to find areas climatically suited to them, or adapt to the new conditions. If they are unable to move or adapt, or if their 'climate space' disappears altogether, species may disappear from the UK (e.g. the bittern). But other species may be able to inhabit a wider area within the UK as conditions change (e.g. the stone-curlew), depending on the availability and accessibility of suitable habitat.

M The arrival of invasive non-native species may pose a threat to native species.

Climate change may enable the survival of species accidentally or deliberately brought into the UK from other parts of the world. A number of these could harm native species and indigenous ecosystems. The slipper limpet, the Pacific oyster and the zebra mussel, for example, could all damage or destroy important shellfish fisheries if they become more widespread.

L Some species of animals and plants may be better able to adapt than others.

'Generalist species' that can cope with a wide range of climatic conditions will potentially respond better to the challenges of climate change than 'specialist species' that are fundamentally suited to particular types of environmental conditions.

M The freshwater environment is projected to come under growing pressure.

Higher temperatures and changing rainfall patterns may combine with the effects of population growth and changing farming practices to reduce the amount and quality of water available for the natural environment. For example, reduced summer flows may reduce the dilution of pollutants in rivers and other bodies of water.

Confidence

M Drier conditions are projected to lead to a decline in habitats which only develop in a cool, wet climate.

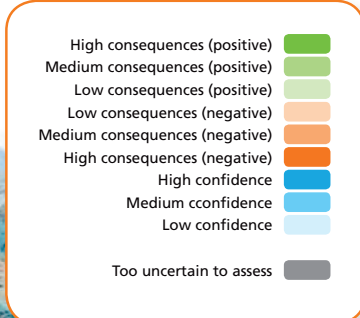
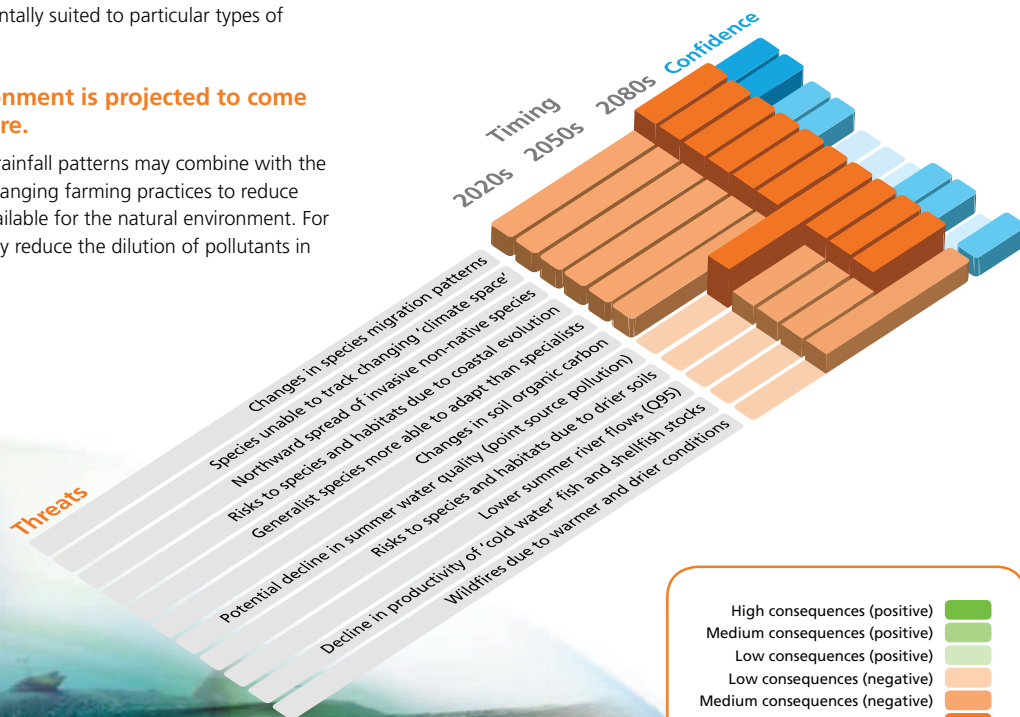
For example, peat-forming conditions, in particular, may be adversely affected by changes in seasonal and year-round conditions, with more than half of UK peatland potentially vulnerable. Because peat locks-in carbon from the atmosphere, any loss of this habitat would be detrimental to efforts to mitigate climate change.

M Drier soils may lead to a decline in soil quality.

To date, overall soil quality in the UK has been declining mainly as a result of land-use changes. If the climate becomes drier, the processes that maintain soil quality may be altered. This could negatively affect some important habitats and species, as well as having an impact on water quality and the ability of the soil to store carbon.

M The risk of wildfires is projected to increase.

By the 2080s, higher temperatures, lower summer rainfall and drier soils could lead to a 30% to 50% increase in the risk of wildfires. As well as affecting habitats, wildfires can result in the local extinction of rare species.



A Summary of Potential Opportunities and Threats for the UK

The diagram below provides a representative selection of potential opportunities and threats for the UK that could arise as a result of climate change, as identified by the CCRA and based on projections for the Medium emissions scenario (central estimate).



To Find Out More

Detailed results from the CCRA are presented in:

- An extensive and comprehensive Evidence Report.
- A suite of technical reports on 11 key sectors: Agriculture; Biodiversity & Ecosystem Services; Built Environment; Business, Industry & Services; Energy; Floods & Coastal Erosion; Forestry; Health; Marine & Fisheries; Transport; and Water.
- A suite of 11 summaries outlining the main findings from these technical reports.
- Three detailed reports focusing on the Devolved Administrations of Scotland, Wales and Northern Ireland.
- Three summaries to accompany the reports for Scotland, Wales and Northern Ireland.

The results presented in this summary are in general rounded figures and, therefore, may appear slightly different from those presented in the above reports.

To read these publications, please visit www.defra.gov.uk/environment/climate/government/

About the CCRA

The CCRA has drawn together evidence and carried out analysis which will help the UK understand the relative risks posed by climate change, including both threats and opportunities.

It has reviewed the evidence for over 700 potential impacts of climate change in a UK context. Detailed analysis was undertaken for over 100 of these impacts, on the basis of their likelihood, the scale of their potential consequences and the urgency with which action may be needed to address them.

Acknowledgements

This work was funded by Defra, the Scottish Government, the Welsh Government and the Department of the Environment Northern Ireland.

© Crown copyright 2012

You may use and re-use the information featured in this publication (not including logos) free of charge in any format or medium, under the terms of the Open Government Licence: www.nationalarchives.gov.uk/doc/open-government-licence/open-government-licence.htm

Any email enquiries regarding the use and re-use of this information resource should be sent to: psi@nationalarchives.gsi.gov.uk. Alternatively write to: The Information Policy Team, The National Archives, Kew, Richmond, Surrey TW9 4DU.



This page is intentionally left blank