The UK Climate Impacts Programme (UKCIP) is based at the University of Oxford and funded by Defra to co-ordinate an assessment of how climate change will affect the UK. We help organisations assess how they might be affected so that they can develop adaptation strategies.
www.ukcip.org.uk

For further copies of this document, contact UKCIP at: Union House, 12-16 St Michael's Street, Oxford OX1 2DU, tel 01865 432076 or email enquiries@ukcip.org.uk.

Based at Westminster, the Local Government Association exists to promote better local government, working with our 500 authorities to put councils at the heart of the drive to improve public services and enable local people to shape a better future for their community.
www.lga.gov.uk

The Improvement and Development Agency (IDeA) was established by and for local government in April 1999. Our mission is to support self-sustaining improvement from within local government. This guide is one of our many practical solutions to improve local government performance on Sustainable Development.
www.idea.gov.uk/sustainability

www.cosla.gov.uk

www.wlga.gov.uk

www.defra.gov.uk

www.odpm.gov.uk

www.scotland.gov.uk

Further information about mitigating the impacts of climate change

Climate change: action to tackle global warming **www.defra.gov.uk/environment/climatechange/**

The Energy White Paper 'Our energy future – creating a low carbon economy' **www.dti.gov.uk/energy/**

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Climate change and local communities - How prepared are you?

An adaptation guide for local authorities in the UK

Foreword

Climate change is a real and immediate threat. Carbon dioxide levels have already reached their highest for almost half a million years and are rising faster than ever before. People everywhere will be affected by climate change, and here in the UK we will not be immune. Climate change scenarios for the UK published last year show that average temperatures across the country could increase by 2 to 3.5 °C over the coming century. So it is important that we all take steps to adapt our plans and business operations for the likely changes in climate.

Local government is no exception. This report from the UK Climate Impacts Programme (UKCIP) is designed to provide practical help and support for local communities to ensure that their infrastructure and key services are resilient to the impacts of climate change. All local authorities will have some responsibility for decisions and activities with long-term consequences - for example management of public buildings, planning for new development, and emergency preparedness. Areas with long planning horizons are a particular priority for adaptation. It is here that the impacts of climate change should be taken into account early in the planning process to avoid unnecessary costs and damages.

The Energy White Paper published this year puts the UK on a path to a 60 % cut in carbon dioxide emissions by 2050. Local authorities can play a key role in achieving this goal by reducing energy use in their own public buildings, supporting low-carbon and renewable energy sources, promoting more sustainable transport options, and raising awareness and providing practical advice on what the public can do. More than 60 local authorities have already signed the Nottingham Declaration on Climate Change, which commits signatories to prepare a plan with their local communities to address both the causes and effects of climate change. We hope that this number will continue to grow.

We recognise that local communities need the proper tools and knowledge to tackle climate change. The Government contributed funding towards the pilot phase of the Councils for Climate Protection (CCP) programme in England and Wales, with the aim of helping local communities produce emissions inventories and set themselves challenging, yet achievable, reduction targets. The Carbon Trust is planning a major new Local Authority Carbon Management Programme, based on the CCP approach. The programme is currently being developed and tested with a small number of councils with the intention of rolling it out to around 50 - 75 more councils across the UK later this year.

Climate change is a central part of sustainable development. In the future, we hope that action on climate change will integrate more and more with the ongoing development of Community Strategies or Community Plans, and that local authorities, using measures such as their well-being powers, will aspire to create communities that are sustainable in every sense of the word.

Elliot Morley MP
Minister of State for Environment and Agri-Environment
Department for Environment, Food and Rural Affairs

Phil Hope MP
Parliamentary Under Secretary of State
Office of the Deputy Prime Minister

This guide and accompanying web pages have been devised for UK local authorities by the UK Climate Impacts Programme (UKCIP) in partnership with the Local Government Association (LGA) and the Improvement & Development Agency for Local Government (IDeA). They have been developed in consultation with the Department of Environment, Food and Rural Affairs (Defra), Office of the Deputy Prime Minister (ODPM), the devolved administrations, the Convention of Scottish Local Authorities (COSLA), the Welsh Local Government Association (WLGA) and practitioners in local authorities.

Why take account of climate change?

Our climate is already changing and it will continue to change throughout this century. This will affect many of your council's services, assets and infrastructure. Recent extreme weather events, such as the flooding in the autumn and winter of 2000, have shown that climate can have a big impact on our society and that infrastructure and services need to be designed to meet the risk. Climate change makes this particularly important for policymakers, service planners, designers and engineers, because historic climate variability will no longer be a good guide to future climate. It is in the interests of local authorities to act now to find sustainable solutions that allow for climate change.

Ask yourself

- Do you know what impact climate change could have on your area?
- Do your current policies, strategies and plans include provision for the impacts of climate change?
- Can you identify and assess the risks from climate change to your services?
- Are developments with a lifetime of more than 20 years required to factor in climate change?
- Does your Emergency Planning service take into account climate change?
- Are you addressing climate change in your local Community Strategy or Community Plan?
- Have you briefed your elected members on any key risks arising from climate variability and long-term climate change?

If you answer NO to any of these questions, your assets and services could suffer from the negative effects of climate change and you may also miss out on any potential benefits.

This guidance aims to help you understand what climate change means for your local community, what action you should take to adapt to the impacts, and will help you obtain the information you need to ensure you are prepared. It is designed for all Chief Executives, council officers and elected members who need to understand the role local authorities can play in helping their communities adapt to climate change.

Decisions made today could affect how climate change impacts on our children and grandchildren.

Is climate changing?

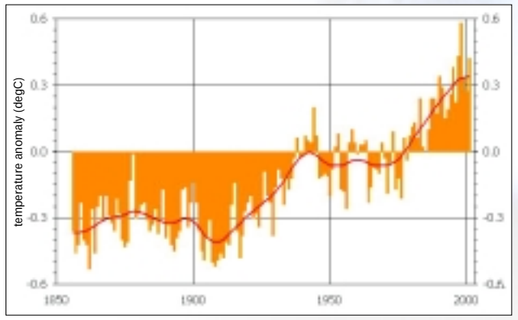

Figure 1: The observed increase in global-average surface air temperature. Anomalies are relative to 1961 – 1990 average. This data set is maintained by the Hadley Centre and Climatic Research Unit at UEA.

Records show that the average temperature of the globe has risen by about 0.6°C since the beginning of the 20th century, and there is now convincing evidence that the rise over the last 50 years is mainly due to human activities, such as the burning of fossil fuels. In the UK we have seen an increased frequency of summer heatwaves, while there are now fewer frosts and cold spells. Winters in the UK have become wetter, with more of the rain falling in heavy downpours, and summers drier. The sea level around our coastline has risen. We expect these sort of changes to increase in the future as the effects of climate change intensify.

Scenarios of future climate change for different levels of emissions have been developed for the Government by the Hadley Centre (part of the UK Met Office) and the Tyndall Centre. They estimate the range of likely climate conditions over the next 100 years, depending on the level of future greenhouse gas emissions (i.e. High, Medium High, Medium Low or Low). Maps illustrating two possible climate change scenarios (High and Low Emissions) for temperature and precipitation, including examples of the likely impacts, are provided on pages 8 and 9.

What is being done in the UK?

The UK has adopted a two-pronged approach to climate change.

Mitigation - Action to reduce greenhouse gas emissions. This is required to tackle climate change and limit the most severe impacts. Sources of further advice on mitigation are listed on the back of this document.

Ultimately, climate change is a global problem and can only be addressed by working together to reduce greenhouse gas emissions. Local authorities have a role in reducing their community's greenhouse gas emissions, but because of the inertia of the climate system, some climate change is inevitable.

Adaptation - Action to minimise the adverse impacts of climate change and to take advantage of opportunities it might present.

What should I do?

Climate change could affect the social, economic and environmental well-being of your community. Managers need to ensure the council services they deliver avoid the worst impacts, and take advantage of any opportunities, that result from climate change.

To ensure a co-ordinated response it is sensible to make one person responsible. For example, Chief Executives may like to nominate a senior officer to co-ordinate their council's response and to circulate this document to business and service managers and elected members.

Action in key areas is needed now if future solutions are to take account of climate change. Failing to take action today and plan for the future could increase risk and incur higher costs as the climate changes, and remedial maintenance and renewal is required. Try to find 'no regret' solutions, which will deliver benefits whatever the extent of climate change, such as raising awareness of flood risks or planting trees that will thrive in current and future climate conditions.

Local authorities have a key role to play as community leaders to ensure that buildings and infrastructure are sustainable in a changing climate, that services can continue to be provided at reasonable costs and that communities are able to adapt to change. These are issues that can be taken forward with Local Strategic Partnerships (LSPs) or Community Planning Partnerships, as Community Strategies or Community Plans are revised, as well-being powers used, and as local sustainable development is considered in all types of planning. Those councils that have signed the Nottingham Declaration on Climate Change have already made a commitment to prepare a plan with their local communities to address both the causes and effects of climate change.

This guide is supported by a web page **(www.ukcip.org.uk/local_authorities/local_authorities.htm)** containing climate change information which is designed to help you make robust plans. It includes links to professional institutions, specialists, government bodies, case studies and best practice approaches developed by other local authorities.

"We commit our council to: work with key providers, including health authorities, businesses and development organisations to assess the potential effects of climate change on our communities and to identify ways in which we can adapt."

A clause from the Nottingham Declaration on Climate Change

Through adaptation you can avoid the worst impacts of climate change on your community.

How will climate change affect my council?

Your council's services depend, directly or indirectly, on climate and weather patterns. Climate and climate change is not an optional consideration but a key influence on many local authority responsibilities.

Ask yourself

- Do you expect your buildings and infrastructure to still be in place in 50 years' time?
- Are you planning new buildings and infrastructure that will still be in place in 50 years' time?
- Do any of your streets and buildings get uncomfortably hot during summer weather?
- Does your council area contain rivers, canals or a coastline?
- Do you have problems with river flooding or drainage overflows?
- Do you have natural ecosystems, parks and gardens to look after?
- Do you manage emergency services?
- Are your roads at risk from flooding, landslips, snowfall, or wind debris?
- Does your community face competition for water supply or water quality problems?

If you answer YES to any of these questions, there is a risk that climate change will make current problems worse, or create new problems. You can minimise these problems through prudent planning and proactive adaptation to climate change. The table 'Adapting to the effects of climate change' (overleaf) lists the main local authority responsibilities and shows some examples of the major impacts of climate change. Use this in conjunction with the web-based information at **www.ukcip.org.uk/local_authorities/local_authorities.htm** to start your plan for action.

When factoring in climate change remember that help is available - ensure your council makes use of it.

- UK Climate Impacts Programme (UKCIP), funded by Defra, is a rich source of expertise and knowledge on climate change.
- The new UKCIP climate change scenarios published in 2002 provide the best regional information to date on the expected changes in climate in the UK over the coming century. These together with other tools that assist decision-making are available from UKCIP.
- UKCIP supports stakeholders in Scotland, Northern Ireland, Wales and all the English Regions to produce scoping studies on the impacts of climate change in their area. Several climate change partnerships have developed further work programmes to support future planning. Many local authorities have had a substantial input and have played an influential role in developing this work.
- UKCIP supports a number of sectors. Current work includes investigations into the built environment, business and the marine environment. Reports published by UKCIP include reviews on the effects of climate change on health, biodiversity and gardening.

The UKCIP website has a local authorities' section that helps you identify the main effects of climate change on your services **(www.ukcip.org.uk/local_authorities/local_authorities.htm)**. It also suggests ways of identifying key risks you need to address now or in the very near future.

"The challenge is not only to reduce carbon emissions but also to develop a long-term strategy to adapt to the climate changes already underway."

The Kent Environment Strategy (March 2003) has been published as a first step towards addressing this challenge. Kent County Council.

Adapting to the effects of climate change

Climate change could affect the maintenance of your assets and infrastructure and delivery of key services. If you start planning now for some of these future changes, you could avoid unnecessary costs and damages in the future. Areas with long-term planning horizons or long life-times, such as major new developments, are a particular priority for adaptation. Decisions taken today will affect the resilience of infrastructure over coming decades as the impacts of climate change begin to be felt more often and more intensely. The information on pages 6 and 7 will help you set your own adaptation priorities and time-scales for response.

Although there is some uncertainty about the extent and speed of changes, we are more confident about the direction that the changes will take. Even allowing for uncertainties, the potential risks are such that we should take responsive action now on a sensible, no-regrets basis - particularly because of the long time lags in the climate system. For decisions involving large investments, it is recommended that a more detailed risk assessment is carried out: contact UKCIP for further information.

Local Authority Service	Potential Impacts of Climate Change	Examples of Possible Adaptation Responses[1]
Planning		
Forward Planning and Development Control	Higher risk of flooding/erosion of susceptible developments in floodplains or coastal margins	Ensure planning takes account of future trends in flooding and coastal erosion. Consider range of options for flood and coastal management, including promoting appropriate and sustainable defences (with the Environment Agency where appropriate) and locating new development away from areas of highest risk
		Incorporate landscape features to absorb water within developments
	Hotter drier summers could further increase pressure on water resources	Consider potential water supply/demand issues when siting new development
	Improved summer climate provides greater potential for outdoor living	Consider how Strategic and Local Plans can accommodate changes in recreational needs.
Emergency Planning	Increased risk of flooding and severe weather	Ensure emergency procedures and equipment are updated to meet increased risk
Housing and Buildings		
Housing	Increased risk of subsidence as soils shrink in hotter drier summers	Plan for preventative and remedial maintenance of existing stock
	Higher risk to houses in floodplains or coastal margins	Consider restricting development in the floodplain and coastal margins for new housing, and instigating a range of flood-proofing measures or sustainable defence measures for existing properties
	Temperature increases affect living space environment	Use thermal properties of materials to improve cooling and retrofit energy efficient systems
Management of public buildings	Temperature increases affect thermal comfort	Retrofit or upgrade energy efficient heating and ventilation
	Wetter winters causing damp, condensation and mould problems	Upgrade weatherproofing systems and manage internal environment
	Higher risk to buildings currently located in floodplain or coastal areas	Consider flood-proofing measures or relocate
Building Control	Drier summers increase risk of foundation subsidence	Consider changes to procedures and inspections to ensure foundations are resilient
	Wetter winters and severe weather increase damp problems	Consider updating procedures to include measures for wetter conditions

[1] These are included as examples of possible ways to prepare your community for climate change.
Please consult **www.ukcip.org.uk/local_authorities/local_authorities.htm** for a more detailed description of the range of options and how to decide what is best for your community. For decisions involving substantial investments, we recommend you undertake a more complete risk assessment.

Climate Change and Local Communities - How Prepared are You?

Local Authority Service	Potential Impacts of Climate Change	Examples of Possible Adaptation Responses[1]
Housing and Buildings		
Building Design Services/Architecture	Climate change influences future design (in response to above)	Rethink built environment design and revise practice to suit
		Make use of thermal properties of materials to improve cooling
		Reduce solar heating using recessed windows, roof overhangs and shades
Transport and Highways		
Transport Planning	Increased risk of flood disruption due to wetter winters and severe weather	Plan to flood-proof or re-site infrastructure and plan routes to minimise disruption
	Increased temperature causing service disruption and heat stress to travelling public	Avoid exposed places and provide shade or cooled waiting areas
Highway Maintenance	Increased rainfall intensity affecting embankments and bridge piers and washing more debris into gullies	Increase monitoring and maintenance of embankments and bridge piers, and increase gully emptying activity
	Drier summers increase risk of road subsidence and higher temperatures increase risk of surface damage	Re-examine road structural design. Implement remedial work for existing roads
	Higher risk to roads located in floodplain or coastal areas	Aim to flood-proof or re-site strategically important roads
	Increase in rate of growth and length of growing season of road verges	Use slower growing plants in landscape schemes. Revise mowing/weed control schedule
	Warmer winters with reduced risk of frost	Reduced need for road salting
Health and Social		
Health and Social Services	Higher risk of skin cancer/ sun burn due to hotter summers and increased outdoor recreation	Consider ways to increase awareness of dangers of exposure. Provide more shade in public recreational areas
	Heat stress to the old, poor and vulnerable communities and people likely to increase	Ensure adequate shade and cooling available
Environmental Health	Higher temperatures likely to increase cases of food poisoning	Consider ways to increase awareness of food hygiene practices and revise best practice
	Higher levels of dust in the air due to drier summers	May need to hose down streets in urban areas
Environmental Services and Awareness		
Greenspace Management	Increase in rate of growth leading to year-round grass maintenance	Adapt maintenance schedules and resources to meet change
	Loss of trees and shrubs due to drier summers and wetter winters	Plant trees and shrubs that will tolerate future conditions
	Climate change influence on natural environment	Plan for wildlife corridors to allow natural migration
Watercourse Management	Wetter winters and increased rainfall intensity causing local flooding	Increase ditch clearing and gully emptying activities to obviate blockages
Waste Services	Rubbish will decay more rapidly in higher summer temperatures	More frequent waste collections particularly in summer
	Higher summer temperatures and higher, more intense, winter rainfall may affect landfill design and operation	Monitor condition of existing landfill sites. Check design and operation of future sites with regard to climate change
Community Awareness	Climate change will impact communities	Proactively raise awareness, and provide advice and information
Business support	Climate change provides changing markets, eg tourism and agriculture, and demand for new products	Encourage business to adapt to new markets

Climate Change and Local Communities - How Prepared are You?

When do I need to take action?

Climate change is a gradual process that happens over decades. Why do I need to act now? Can't I just wait until predictions are more precise and changes are clearly beginning to bite? The answer is both yes and no. Work to adapt to climate change needs to start now, but it will be a long-term process that needs to be tackled in a staged, prioritised way. Some of the most immediate adaptation priorities fall on those areas responsible for planning and developing major infrastructure, such as new buildings or roads. Costs of adapting to climate change can be minimised if adaptation is built in when:

- infrastructure is upgraded anyway
- plans come up naturally for review
- assessments are undertaken as part of a wider sustainability review
- **before** councils are forced to act by a sudden event or mounting maintenance costs.

Act now

When there are current problems If you are currently experiencing problems with flooding, overheating of buildings, weather-related maintenance costs, or need to upgrade infrastructure, make sure that your new standards take future climate conditions into account. Communities already experience regular damage from severe weather and climate patterns - floods, droughts, storms, pest invasions, water shortages. Climate change will change the frequency and intensity of such events. You may be able to save damage costs in the future by adapting to climate change now. Acting now can also provide 'no regret' solutions that can deliver benefits under present day climate as well as future climate scenarios.

"Adapting to climate change by ensuring that new and existing buildings, waste disposal methods, transport plans and other municipal developments take account of the predicted changes in local climate. This means, for example, that new and refurbished buildings need to be able to provide comfort for occupants at higher temperatures and withstand more heavy rainfall, flash floods and high winds."

From the forthcoming Climate Change Strategy as quoted in De Monfort University's case study for Leicester City Council.

Plan for the future

When you install fixed infrastructure or start developments with a lifetime of more than 20 years For a small additional cost now, you may be able to avoid major problems and costs in later years as the climate continues to change. You need to assess the plausible range of future scenarios to determine the best degree of future-proofing for fixed long-term installations.

Where you have responsibility for contingency planning Climate change could increase the frequency of extreme weather events, such as urban flash-flooding, storm surges, droughts and heat-waves.

When you put long-term policies in place Local authorities have a vital role in delivering a better quality of life, particularly through the development of sustainable communities. Climate change could threaten the economic, social, and environmental well-being of your community.

If you wish to benefit from climate change Not all effects of climate change will be negative. Warmer summers and winters could reduce heating costs and lead to a more outdoor lifestyle. A changing climate could also increase domestic tourism if traditional overseas destinations become too hot for comfort. Farmers may be able to grow new crops and explore new markets. Your community could benefit if you proactively plan for these changes.

Keep a "watching brief"

When you do not know enough Adapting to climate change is not always a simple decision to change operating standards and design parameters. Climate and weather patterns have pervasive positive and negative effects on industries such as agriculture and tourism; on social wellbeing and health; and on ecosystems. To minimise the risk to council services you, and your staff, should keep up to date about the impacts of climate change. You can achieve this by ensuring your staff attend training seminars and ask them to work with their professional bodies to embed climate change knowledge in service standards and procedures. You can also participate in your UKCIP - supported regional climate change impact and adaptation partnership.

"We do not have to wear hair shirts in order to tackle climate change. Many of the things we need to do will also provide job opportunities and improved living conditions, particularly for the less well-off and the vulnerable."

Councillor Derek Boden, Bury Metropolitan Borough Council

All these approaches can be captured by planning ahead. If you have not started to adapt it is not too late. Help is available if you go to:
www.ukcip.org.uk/local_authorities/local_authorities.htm

It contains information and links to help you develop detailed plans and actions to deliver all your responsibilities and services that could be affected by climate change. The links to other sites provide further guidance in specialised areas, best practice examples from other local authorities, case studies and leading edge research support.

What are the impacts of climate change on the UK?

Scenarios of future climate change for different levels of emissions have been developed by the Hadley Centre (part of the UK Met Office) and the Tyndall Centre and published by UKCIP. They estimate the range of likely climate conditions, depending on the level of greenhouse gas emissions over the next 100 years. Although there is some uncertainty about the extent and speed of changes, we are more confident about the direction of changes. Human-caused climate change will influence the long-term trend in temperatures and rainfall, but we will still be subject to year-to-year and decadal variability. Figures 2 and 3 illustrate climate changes in terms of temperature and precipitation for two possible Low and High emissions.

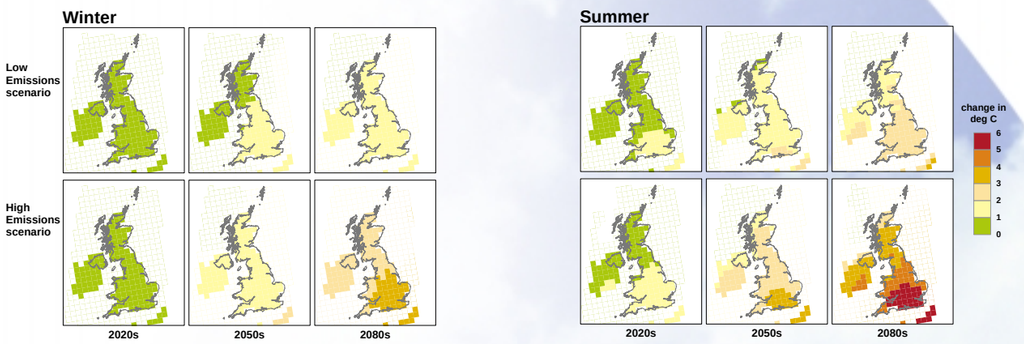

Figure 2: Change in average winter and summer temperature for the 2020s, 2050s and 2080s for the Low and High Emissions scenarios.

The UK can expect the following key climate changes to take place in this century.

The UK climate will become warmer especially in the summer. By the 2020s annual temperatures may increase up to 1°C and by the 2080s by up to 4.5°C under the High Emissions scenario. By the end of the 21st century, two out of every three Augusts may be as hot as the unusually hot August of 1995. Very cold winters will be increasingly rare.

Did you know? The extremely hot summer of 1995 was about 3°C degrees warmer than average with only a third of the average rainfall. This resulted in additional costs of water supply of about £280m. Conversely, the mild winter led to net energy savings of about £350m. A Department of Health study in 1999 indicated that by the 2050s cold-related winter deaths could decline by around 25% (20,000 per year) compared to the 1990s, heat-related summer deaths could increase to around 2,800 per year (up from 800) and cases of food poisoning may rise by about 10,000 per year (around 10% higher than cases notified in 1998).

Winters are expected to be wetter throughout the UK. In parts of the south east winter rain could increase 15 – 20% by the 2050s under the High Emissions scenario. It is likely that winter rainfall will also be more intense, further increasing the risk of flooding. In most parts of Scotland snowfall could decrease by 40 – 60% by the 2050s and by as much as 60 – 90% by the 2080s.

Did you know? In the floods of autumn 2000 virtually all regions of England and Wales were affected, and some 10,000 properties flooded. Insured losses caused by these floods and related storms were about £700m. In Scotland, some 77,000 properties may be at risk of flooding from rivers. Research by the Scottish Executive indicates associated damage could increase by 68% by 2050 and by 115% by 2080. Currently 1.8 million residential properties in England and Wales are potentially at risk from flooding. A recent report suggests that if no allowance is made for climate change, damage from river flooding could increase by half and coastal flooding by four times, equating to an extra £1.1 billion in annual damages by 2075.

Summers may become drier everywhere. In parts of the south and east of the UK, summer rainfall may decrease by 30% by the 2050s under the High Emissions scenario. In summer, soil moisture could be reduced by 20% or more over large parts of England by the 2050s and by 40% or more by the 2080s.

Did you know? Over the past 30 years, subsidence claims following summer droughts have been increasing steadily, accounting for a staggering £3.3 billion of insurance claims over the 1990s. Many impacts of climate change can be minimised by comparatively small expenditure by building in adequate protection into plans at an early stage. According to a recent study climate-proofing new buildings in southern England against subsidence may only cost £32 million, compared to a possible annual cost of £200 - 400 million from damage claims if no action is taken.

Sea levels will continue to rise relative to most of the UK's shoreline particularly in south east England. Extreme high water levels, due to a combination of storm surges, high tides and increasing mean sea level, are predicted to become more frequent with a higher risk of coastal flooding and erosion.

Did you know? At Immingham, a port on the east coast of England, a water level of 1.5 m would be expected once every 120 years. Under the Medium-High Emissions scenario for the 2080s, this level could occur once every seven years; a seventeen-fold increase in frequency. Similarly, under the same scenario a water level that occurs, on average, once every 50 years at present might occur as often as once every three years by the end of the century.

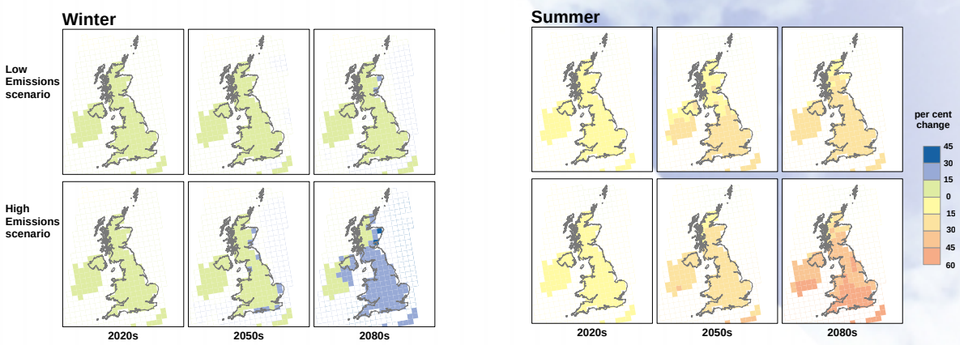

Figure 3: Change in average winter and summer precipitation for the 2020s, 2050s and 2080s for the Low and High Emissions scenarios.