



A Summary of Climate Change Risks for the East of England

To coincide with the publication of the UK Climate Change Risk Assessment (CCRA) 2012





Front cover - Essex and Suffolk Water have begun construction of the 'Abberton Reservoir Enhancement' to enlarge the capacity of the company's existing reservoir. This resource is required to provide Essex with the amount of water needed to ensure a continued future supply to customers over the next 25 years.

- 1 - Office for National Statistics, 2009. National statistics regional trends
- 2 - Office for National Statistics, 2009. National statistics regional trends
- 3 - East of England Catchment Abstraction Management Strategies (CAMS) – Environment Agency
- 4 - Environment Agency, 2009. Investing for the future. Flood and coastal risk management in England. A long-term investment strategy. Report Reference GEH00609BQDF-E-P.
- 5 - Environment Agency, 2009. Flooding in England, A National Assessment of Flood Risk. Report Reference GEH00609BQDS-E-P
- 6 - UK CCRA 2012



Introduction

The East of England is the second largest English Region and covers 15% of the total area of England.

It contains the counties of Bedfordshire, Cambridgeshire, Essex, Hertfordshire, Norfolk and Suffolk and the unitary authorities of Central Bedfordshire, Bedford Borough, Luton, Peterborough, Southend-on-Sea and Thurrock.

The major cities and towns in the region include Norwich, Cambridge, Peterborough, Stevenage, Ipswich, Colchester, Southend-on-Sea and Luton. These urban centres are complemented by extensive rural areas.

The East of England has a population of 5.8 million people, 11% of the English total, it is predicted the region will have 6.8 million residents by 2026 – 20% more than in 2006. ²

The region supports a diverse range of habitats, from agricultural landscapes, wetlands and ancient woodland to heathland, rivers and a long low-lying coast that supports a wide range of freshwater, brackish and saline habitats, all interspersed with rapidly growing urban populations. Among these habitats are more than 40 sites that are designated as being of international importance. The landscape is more man-made than most in the UK due to the reclamation of land from the sea to create the Fens. The Fens and the Broads have some of the best and largest tracts of agricultural land in the UK including 58% of the country's grade 1 and grade 2 land.

The UK Climate Change Risk Assessment has highlighted three areas that are particularly pertinent to the East of England, these are water scarcity, sea level rise and flood.

Water Scarcity

The East of England region is the driest region in the country. Annual rainfall (600mm average) is only 70 per cent of the national average and less than 20 per cent of the amount that falls in the Lake District.

The region already faces significant water challenges, most of the East of England is recorded as being over-abstracted or over-licensed at low flows. Where water is being over-abstracted, such as in large areas of Essex and Hertfordshire, unacceptable damage to the environment is already occurring at those low flows ³:

- 59 per cent of the 129 catchments are over-abstracted or over-licensed at times of low-flow
- Two water company supply zones are currently operating at risk in dry years and have resources below their target headroom

The region has several large reservoirs, two major water transfer schemes and a number of smaller river support schemes supplying rivers and groundwater aquifers.

These transfers are crucial to the maintenance of public water supplies and also provide support for agriculture and the water environment, especially during drought periods.

Water resource management is particularly important considering the high levels of planned growth and a particularly extensive area of important wetland and other water dependant habitats. Water resources are also under pressure from industries such as agriculture, with over 1000 agri-businesses reliant on water to irrigate, particularly for root crops.

Flooding

An estimated 250,000 properties are at risk of flooding in the East of England, around 8% of the total properties in the region. Properties include households and non-residential properties such as offices, factories, commercial properties and warehouses. This is based upon a 1 in 1000 (0.1%) probability of flooding in any one year. ⁴ Also of importance is the effect of sea level rise and flood risk poses to critical infrastructure and extensive low lying areas in the region.

Of the 250,000 properties at risk of flooding, approximately 55,200 properties are at significant risk (1.71% of total properties in region). These properties are located mainly along the coast, while around 4% of properties are at low flood risk. This is based on the National Flood Risk Assessment (NaFRA) data, 2008. Norfolk has the greatest number of properties at risk of flooding, with around 25% (63,284 properties) of the region's total properties at risk. Norfolk also has the greatest number of properties at significant risk of flooding (around 16,555). ⁵

Sea level Rise

The East is a low-lying area with one-fifth of the region below sea level. There is also some of the fastest eroding coastline in Europe in Norfolk and Suffolk. The specific geology of the coastal areas (clay and sandstone) makes them particularly vulnerable to erosion.

It is anticipated that the East of England could face dramatic increases in sea level of up to <0.54m by the end of the century assuming the high UKCP09 emissions scenario ⁶. Shoreline Management Plans (SMPs) are being developed by Coastal Groups, principally made up of local authorities and the Environment Agency. The plans are based not only on the latest available scientific knowledge, but also upon the current legislative and funding arrangements for coastal defence management. In the East of England these include: Lowestoft Ness to Felixstowe Landguard Point, North Norfolk Shoreline Management Plan, and the Essex and South Suffolk Shoreline Management Plan.



UK Climate Change Risk Assessment

The UK Climate Change Risk Assessment (CCRA) is an independent research project, funded by UK Government and Devolved Governments that analyses the main risks and opportunities to the UK, arising from climate change over the coming years. It provides the underpinning evidence to inform discussions on adaptation action needed in such areas as infrastructure, health, environment and business. It will be updated every five years taking account of new climate observations and improved understanding of future climate change and risks.

The CCRA methodology is novel in that it allows for comparison of over 100 risks (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 using a consistent method and set of climate projections to look at current and future risks and opportunities.

The CCRA methodology has been developed through a number of stages involving expert peer review.

The approach developed is a tractable, repeatable methodology that is not dependent on changes in long term plans between the 5 year cycles of the CCRA.

The assessment considered population growth, where relevant, but did not quantify the impacts of other societal changes on future risks, for example due to economic growth, or developments in new technologies, or the full range of planned and potential future Government policies or private sector adaptation investment plans.

Excluding these factors from the analysis provides a more 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 consider that 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 best directed or needed.



Key National Messages

Some key findings show why we must act now to prepare ourselves and our businesses for the future impact of climate change. The research reveals that without action we could see:-

- Increases in the frequency of flooding affecting 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 properties in England and Wales, due to flooding from rivers and the sea, rises from £1.2 billion to between £2.1 billion and £12 billion by the 2080s. Without action, a range of important infrastructure such as roads and railways may be affected by a significantly increased risk of flooding based on future population growth and if no adaptive action is taken.
- Summer overheating potentially contributing to heat-related health problems. Premature deaths due to hotter summers are projected to increase (e.g. by between 580 and 5900 by the 2050s). This is likely to place different burdens on the National Health Service (NHS), public health and social care services. Other health risks that may increase include problems caused by ground-level ozone and by marine and freshwater pathogens.
- Reductions in water availability, particularly during the summer, leading to more frequent water use restrictions and, in the longer term, water shortages. The gap between demand and availability will potentially widen, impacting homes, businesses, schools and hospitals. 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.

This pack was commissioned to coincide with the publication of the UK's first Climate Change Risk Assessment. While drawing on the CCRA where there is regional or local information (which at times is limited due to lack of data) this pack presents a local perspective of the CCRA risks and opportunities. The pack offers an illustration of what climate change means for people, businesses, community groups, local authorities, and other organisations across key sectors, at the local level, highlighting what is already happening and where there is a strong case for greater local action.

Detailed results from the CCRA are presented in:

- An extensive and comprehensive UK CCRA Evidence Report;
- A suite of technical reports on 11 key sectors.
- The UK CCRA: Government Report, which highlights actions already in place to manage the risk identified in the CCRA, and outlines UK Government plans for the future.

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



Key Risks and Implications

Some Key Regional Climate Implications



Business

- Sea level rise poses a risk to businesses in the East of England particularly in the tourism sector, with threats of infrastructure damage, loss of natural assets e.g. beaches and damage to built assets e.g. historical monuments.
- Central or high UKCP09 Emissions scenarios identify the East of England as being one of the regions likely to face a high loss of staff days due to heat.
- A reduction in water availability for abstraction poses a significant risk to businesses in the East of England, particularly agricultural/horticultural abstractions, affecting the long term viability of current business models.



Health and Wellbeing

- Being one of the warmer parts of the UK, increases in temperature may lead to increased levels of mortality and morbidity due to heat.
- Increased flooding may lead to increased number of deaths, injuries and people suffering from mental health effects as a result of flooding. A 0.01% (1:1000) tidal flood in the East of England could occur about 2.4 to 14 times more frequently by the 2080s compared with the present day frequency.
- Increased ozone levels by the end of the century may lead to increased levels of mortality and respiratory hospital admissions.



Buildings and Infrastructure

- Approximately 250,000 properties are at risk of flooding in the East of England, around 8% of the total properties in the region.
- The East of England is one of the most vulnerable regions for changes in water availability, affecting the public, businesses and industry.
- An increase in subsidence is a significant issue for the East of England, which may pose risks to sections of the transport network and buildings.
- The East of England faces threats associated with increased summer temperatures affecting conditions in buildings and the urban environment. This may lead to heat related damage and/or disruption to energy and transport networks.



Agriculture and Forestry

- The increase in risk of tidal flooding and storm surge is particularly relevant in the East of England where high quality agricultural land is located.
- The availability and reliability of water resources for agricultural/horticultural abstractions are under severe pressure in the East of England.
- Lowland beech woodland habitat may decline as it loses climate space in the East of England.
- There is the potential for increased yields for current crops (e.g. wheat and sugar beet, potatoes) and for new crops (including non-food crops for energy and pharmaceuticals) and tree species to enter production.



Natural Environment

- The East of England has world famous nature reserves and is rich in biodiversity, it is home to some of the rarest plants and animals in the UK and therefore coastal change and associated habitat loss is a significant threat.
- The region's coastal zones, wetlands and freshwater habitats are particularly vulnerable to changes in water availability and species range shifts.
- There may be better conditions for some flora and fauna, increased productivity could be seen in forests and woodlands due to increased temperatures where drought, pests, pathogens and other pressures are not limiting factors.



Key Risks and Implications

Key National Risks from the UK CCRA 2012

- Climate change represents a potentially significant issue for all UK business sectors.
- Main climate challenges to businesses include flooding and coastal erosion, increased competition for water, and disruption of transport and communication links.
- The degree to which individual organisations are affected depends upon their level of vulnerability and adaptive capacity.
- There are potentially significant commercial and competitive advantages to be gained for those businesses taking on the challenge.



Business

- Climate change could have significant implications for the health and wellbeing of the UK population.
- Implications affect public health, the continuity of health and social care services both within the NHS and beyond, the resilience of local emergency services, and the most socially vulnerable.
- There may be some welcome benefits, but these are likely to be outweighed by a range of negative effects.



Health and Wellbeing

- The built environment and infrastructure are already vulnerable to extreme weather such as flooding, storms, heatwaves, and droughts.
- Most of today's buildings were designed for the climate that existed when they were built and are not necessarily equipped to cope with current and future climates.
- Around 70% of buildings that will be in use in the 2050s already exist, but there may be opportunities for innovative building services and urban planning in the UK and overseas.
- The government has already prioritised the need to improve the long-term resilience of new and existing infrastructure networks in the energy, ICT, transport and water sectors.



Buildings and Infrastructure

- Agriculture and forestry are sensitive to climatic conditions; changes in climate have a profound impact on productivity and economic viability.
- Climate change may alter the impact that agriculture and forestry have on the natural environment and the value of the ecosystem services provided.
- Warmer temperatures and carbon fertilisation may present some opportunities to increase yields, in the short term.
- Low water availability in the summer, increased flooding and coastal erosion, increased prevalence of pests diseases, and frequent wildfires may limit opportunities in the longer term.



Agriculture and Forestry

- Climate change may exacerbate and/or alter the pressures placed on the natural environment, especially those caused by human activity.
- Heightened impacts may in turn affect the way humans are able to use the environment – for example growing crops or obtaining high quality drinking water.
- The natural environment is crucial to our ability to adapt, reducing flood risk, cooling cities and storing water.



Natural Environment



Business



Tourism in Great Yarmouth, Norfolk. (Sustainability East)

- Climate change represents a potentially significant issue for all UK business sectors.
- Main climate challenges to businesses include flooding and coastal erosion, increased competition for water, and disruption of transport and communication links.
- The degree to which individual organisations are affected depends upon their level of vulnerability and adaptive capacity.
- There are potentially significant commercial and competitive advantages to be gained for those businesses taking on the challenge.

The East of England is home to 233,000 active businesses. During 2010, 23,000 new businesses started and 28,000 businesses ceased trading. ¹

Economic activity rates, expressed in terms of gross value added (GVA) per head, indicate that the areas of Hertfordshire, Peterborough, Cambridgeshire and Luton significantly outperform the other areas in the region². In the East, 2,682,000 (77.7%) people of working age were in employment, compared to 73.8% in England. ³

One of the many economies that exists across the diverse area is a prominent tourism industry supported by miles of coastline. Approximately 180,000 people are employed in hospitality, leisure and tourism in the East of England and the total annual spend by visitors to the region is estimated at over £5 billion. ⁴

The region has a strong knowledge economy and hosts five of the world's top ranked universities and provides 19.4% of the UK investment on research and development. ⁵

1 - Office of National Statistics, Business Demography report, 2010

2 - EoE Network Infrastructure Report 2010

3 - Business Population Estimates for the UK and Regions

4 - Insight East, Tourism statistics report, 2008

5 - The East of England Development Agency

6 - UK CCRA 2012



Threats

The main threats facing businesses are related to flooding, heat and water resources.

- Flooding presents a risk to businesses through damage to fixed assets and stock, loss of business continuity and increased insurance claims.
- Sea level rise poses a number of risks to businesses. The tourist industry faces threats from increased infrastructure damage, loss of natural assets such as beaches and damage to built assets such as attractions and historical monuments. It is anticipated that the East of England could face dramatic increases in sea level of up to <0.54m by the end of the century assuming the high UKCP09 emissions scenario. ⁶
- Warmer weather periods increase energy costs for summer cooling.
- Businesses face a loss of productivity due to overheating. Following the central or high UKCP09 emissions scenarios, the East of England along with the South East are likely to face the highest loss of staff days due to heat. ⁶
- A reduction in available water for abstraction poses a direct risk to businesses and affects the long term viability of current business models.

During testing economic times for business, we could think it forgivable if organisations sidelined thinking about climate risks. This would be a false economy addressing issues around weather and productivity will be essential to short term decisions and showing how business can demonstrate responsibility when faced with dwindling shared resources such as water will be paramount for longer-term business models. Lean, efficient business that understands how the weather will affect its profitability, that acknowledges how changing climate alongside population growth will impact on resource availability and price will be the business that has longevity.

Opportunities

- The main opportunities for businesses arise from the move to a low carbon economy and delivery of adaptation measures. These have the greatest potential to benefit the financial, utility, manufacturing and consultancy sectors.
- Targeted investment in flood risk management to reduce risks in key economic growth areas.
- Changes in domestic weather conditions increase market opportunities (e.g. agriculture may benefit from increased yields and tourism and leisure industries from better weather conditions).
- By fully internalising climate change risks into fund management, new products for investors seeking climate resilient opportunities could be developed.
- Winter heating costs are reduced.

New business models have to be flexible and fluid to prosper in the fast moving, modern world. While redesigning process and products, practical understanding of the risks and opportunities of a changing climate have to be factored into that change. At the same time new ways of communicating via social media will hold organisations to task for exploiting or wasting precious resource.

PepsiCo demonstrated that they have responsibility at the core of their strategy by questioning how their Copella Apple Juice plant in Boxford, Suffolk could source sustainable amounts of water into the future in their work with Sustainability East on 'Responsibility and Sustainable Growth'. ⁶



Health and Well-being



People enjoying a walk in Epping Forest, Essex. (Sustainability East)

- Climate change could have significant implications for the health and wellbeing of the UK population.
- Implications affect public health, the continuity of health and social care services both within the NHS and beyond, the resilience of local emergency services, and the most socially vulnerable.
- There may be some welcome benefits, but these are likely to be outweighed by a range of negative effects.

The East of England has a population of 5.8 million people. In 2008, the older population in the East accounted for 20.2 per cent; by 2033 this is projected to rise to 27.3 per cent.¹

The NHS is the regions' largest employer and invests over £8 billion each year, health is also a key determinant of economic success.²

Many of the most deprived wards in the region are located at coastal sites that are vulnerable to climate change impacts.

The East of England has 723km of predominantly low-lying coastline, which faces rising sea levels and wave heights and accelerated coastal erosion. Communities relying on the immediate coastal area for their residence, communications and economic and social activities are particularly at risk. Many are also vulnerable to climate change because of socio-economic issues such as high proportions of older residents and transient populations, low employment levels and high seasonality of work, physical isolation and poor transport links.³

At the end of Sept 2011, provisional data indicated that 2,830 households were in temporary accommodation.⁴ In figures published for 2010, the region had 294,000 (15.7%) workless households, which compared to 18.4% in England.⁵



Threats

Health and wellbeing threats are linked to temperature extremes, flooding and pollution.

- Increased temperatures may lead to increased levels of mortality and morbidity due to heat. Heat-related mortality can increase noticeably for exceptionally hot years such as was experienced in 2003 and 2006 –this could be the norm by the 2050's. Being in the warmer part of the UK, the East of England will be more affected.⁶
- Increased flooding may lead to increased number of deaths, injuries and people suffering from mental health effects as a result of flooding. A 0.01% (1:1000) tidal flood in the East of England could occur about 2.4 to 14 times more frequently by the 2080s compared with the present day frequency.⁶
- Increased ozone levels by the end of the century may lead to increased levels of mortality and respiratory hospital admissions.
- Increased temperatures combined with increased periods of time spent outdoors may lead to an increased risk of the number of skin cancer cases and deaths. The working population and vulnerable groups will be most at risk.
- Increased winter precipitation would lead to an increase in pollutants discharged from combined sewer outfalls, which may increase risk of human disease at the coast.
- Increased sea temperatures would lead to increased marine pathogens and harmful algae blooms which may impact negatively on human health.

Opportunities

- Increased temperatures may lead to decreased levels of mortality and morbidity due to cold.
- Increased temperatures combined with increased periods of time spent outdoors could lead to increased vitamin D levels and improved physical and mental health of people.

When we contemplate the future for the counties of the East of England, improving health and wellbeing will clearly be at the heart of all plans. However, this could be compromised by the risks associated with climate change. Ensuring that identified risks are assessed and that service delivery acknowledges the changing parameters will be crucial. This includes both primary and secondary effects of flooding, heat and pollution in cities, food safety implications, vector-borne diseases and exposure to the sun. How can we create places to live and work where we all enjoy improving health prospects and how can modern health services complement these communities?

The associations this region has with quality local food, the ability to access green space, the opportunities to walk and cycle can align with the opportunities that modern technology brings to monitor and inform our health. The ambition that we show when addressing the challenges that the first Climate Change Risk Assessment highlights will have strategic implications for the health and wellbeing of the East of England.

- 1 - Population insight: changing demographics in the East of England – Insight East
- 2 - East of England Implementation Plan – Feb 2010
- 3 - Joseph Rowntree Foundation – Impacts of Climate Change on Disadvantaged UK Coastal Communities
- 4 - DCLG Live Tables of Homelessness
- 5 - Workless households for regions across the UK, 2010, Office for National Statistics
- 6 - UK CCRA 2012



Buildings and Infrastructure



Train leaving Hertfordshire towards London (Sustainability East)

- The built environment and infrastructure are already vulnerable to extreme weather such as flooding, storms, heatwaves, and droughts.
- Most of today's buildings were designed for the climate that existed when they were built and are not necessarily equipped to cope with current and future climates.
- Around 70% of buildings that will be in use in the 2050s already exist, but there may be opportunities for innovative building services and urban planning in the UK and overseas.
- The Government has already prioritised the need to improve the long-term resilience of new and existing infrastructure networks in the energy, ICT, transport and water sectors.

The East of England contains major transport gateways including two of the international 'London' airports of Stansted and Luton as well as airports in Norwich, Cambridge and Southend. It is also home to seven major seaports. The seaport of Felixstowe is the largest and fastest growing container port in the UK accounting for 40 per cent of the UK's container traffic and is the fifth largest port in Europe¹. There is an extensive network of major road and rail routes including key routes out from London, including M25, A1, A1 (M), M1 and M11.

The Environment Agency maintains over 4275km of flood defences and almost 1180km of sea and estuary defences along the region's coastline.²

Ensuring that water and wastewater services and assets are resilient to extreme weather events, particularly flood risk, is seen as a major adaptation challenge for Anglian Water. Extreme weather events could lead to supply interruptions, a deterioration of raw water sources or contamination of supplies. Two of the key challenges are preventing flooding to inland and coastal operational assets and maintaining supplies of water to a growing population in the East of England. Anglian Water has invested £40 million in improving resilience and supplies in Norwich and Peterborough and £5 million has been invested in flood protection of water treatment assets.



Essex and Suffolk Water have begun construction of the 'Abberton Reservoir Enhancement' (see front page picture), to enlarge the capacity of the company's existing reservoir. This resource is required to provide Essex with the amount of water needed to ensure a continued future supply to customers over the next 25 years.³

National Grid Electricity Transmission Plc is preparing a scheme to undertake flood mitigation work at all sites with a 1:100 year fluvial and tidal flood events. Until work to defend sites are complete there are emergency deployment plans to utilise a 1.2 km mobile flood defence system, which can be deployed at short notice. Coastal erosion risks to sub stations are being monitored by the Environment Agency as part of Shoreline Management Plans.⁴

Threats

- Increased frequency of flooding may affect a significant proportion of buildings and infrastructure.
- The East of England faces threats associated with increased summer temperatures affecting conditions in buildings and the urban environment. This may lead to heat related damage and/or disruption to energy and transport networks.⁵
- The 'Urban Heat Island' effect may become more common and more significant in large cities and may increase demand for cooling.
- Changes in water availability, particularly reductions in the summer, may lead to increased water shortages, affecting the supply for the public, businesses and industry. This is a significant issue for the East of England as one of the most vulnerable regions.⁵
- An increase in subsidence is a significant issue for the East of England, which may pose risks to sections of the transport network and buildings.

Opportunities

- Milder winters may reduce demand for heating, reducing costs for businesses and the public, and reducing carbon emissions.
- In the long-term, milder winters may reduce cold weather related damage, delays and disruption and associated costs for infrastructure providers, businesses and the public (although the natural variability in the weather will mean that extreme events will still occur).
- There may be further opportunities for innovative building services and urban planning in the UK and overseas, for example in the design of sustainable buildings and developments.
- UK based infrastructure operators, consultancies and investors may have opportunities to capitalise on global climate change adaptation activity.

As the regions population grows, the risks from flood, sea-level rise and aridity could become more acute. New developments and associated infrastructure clearly need to factor the identified risks from the CCRA into plans while progress has to continue to be made in adapting existing buildings, organisational structures and facilities to projected climate change.

The challenges of decarbonising the East of England will crucially add new elements to transport, energy and water infrastructure.

There are good examples of this work across the counties in the region. Continuing to find the most efficient, effective solutions will be reliant on strong collaboration and a consistent yet localised approach.

¹ - The East of England Development Agency
² - Responding to Changing Climates, Environment Agency, 2010
³ - Essex and Suffolk Water, www.eswater.co.uk/abberton, 2011
⁴ - National Grid Electricity Transmission Plc Adaptation Reporting Power report
⁵ - UK CCRA 2012



Agriculture and Forestry



Field of lettuce, Environment Agency

- Agriculture and forestry are sensitive to climatic conditions; changes in climate have a profound impact on productivity and economic viability.
- Climate change may alter the impact that agriculture and forestry have on the natural environment and the value of the ecosystem services provided.
- Warmer temperatures and carbon fertilisation may present some opportunities to increase yields, in the short term.
- Low water availability in the summer, increased flooding and coastal erosion, increased prevalence of pests diseases and frequent wildfires may limit opportunities in the longer term.

The region is low lying and contains notable geographic features such as the Fens and the Norfolk and Suffolk Broads.

Over 75% of land in the East of England is used for farming which highlights the importance of agricultural industries on the landscape and local rural economies. This is reflected in the high number of food processing and related supply chain businesses in the region.¹

The East of England is known for its cereal crops, with farmers growing more than a quarter of England's wheat and barley. Out of a total farmed area of 1.4 million hectares, almost a third of that land was used for wheat in 2007.¹

The East of England is a major region for horticulture cultivating everything from peas and beans to apples, strawberries, salad crops, flowers and shrubs.

Almost a third of England's potato crop is grown in the East of England and farmers in East Anglia harvest well over half the country's entire sugar beet crop - mainly in Norfolk, Suffolk and Cambridgeshire.¹

Britain's pig and poultry farms are centred largely on the East. The East of England has the second largest number of pigs in England, 1.1 million animals on around 1900 farms.¹



Approximately 50,000 people work directly within the agricultural and horticultural sector but many more jobs depend on it, including workers in engineering, livestock feed manufacture, transport, the veterinary profession and agricultural research and development.¹

Water availability for abstraction is an important risk for agriculture/horticulture within the region.

Woodland is the second largest land use after agriculture, comprising 7.3% of the land area (139,000 ha).²

Between 1980-1998 the woodland land cover in the region increased from 5.8 to 7.2% (26,000 ha).

The woodland areas are generally small, with 38% of the region's woodland occurring in blocks less than 10 ha in size, and 19% being less than 2 ha. However, the East contains many forests and woodlands of significance including Thetford Forest – Britain's largest lowland pine forest. The Forestry Commission manages over 25,000 hectares of forest in the region.³

Threats

- Areas of high quality agricultural land are projected to flood frequently under UKCP09 projections⁴. The increase in risk of tidal flooding and storm surge is particularly relevant in the East of England where high quality agricultural land is located.
- The availability and reliability of water resources for agricultural abstraction are under severe pressure in the East of England⁴. Pressures include higher summer soil moisture deficits and increasing demand for irrigation to maintain crop yields and quality.
- There is the potential for the increased potency in existing, or introduced livestock diseases.
- More intense rainfall means a greater potential for soil erosion.
- Reduced timber yield and quality due to drier conditions and an increase in the frequency of drought.
- There is the potential for an increase in forestry pests and diseases.
- Future projections of climate suitability for beech trees suggest that lowland beech woodland habitat may decline as it loses climate space in the East of England.⁴
- It is estimated that the risk of wildfires in the UK could increase by between 10% and 50% by the 2080s.⁴

Opportunities

- Increased yields for current crops (e.g. wheat and sugar beet, potatoes) due to warmer conditions and/or CO₂ effects.
- Increased grass yields benefiting livestock production.
- New crops and tree species may be able to enter production, due to warmer conditions.
- Opportunities to grow a wider range of non-food crops for energy and pharmaceuticals.
- Increased yields of rain-fed potatoes due to greater CO₂ and climate effects.

The agriculture and forestry sectors have always faced the implications of climate and short-term vulnerability to weather, it's clearly evident that these parameters determine results when you are growing potatoes or wheat or managing woodland. There is a lot to draw from the experience in these sectors for the implications of the UKCCRA. In this region we have a wealth of knowledge because of the scale of the agriculture and forestry sectors.

Continuing investment in research and innovation and the scientific application of new methods will contribute to the availability of high quality jobs in rural areas and help to ensure that forthcoming risks are mollified. From these methods we must attempt to gather the common lessons that can apply to other sectors when facing impacts from weather and climate.

1 - The National Farmers' Union (NFU), www.nfuonline.com, 2011

2 - East of England Plan: The Revision to the Regional Spatial Strategy for the East of England

3 - Forestry Commission, Visit England, 2011

4 - UK CCRA 2012



Natural Environment



Cliffs in Hunstanton, Norfolk (Environment Agency)

- Climate change may exacerbate and/or alter the pressures placed on the natural environment, especially those caused by human activity.
- Heightened impacts may in turn affect the way humans are able to use the environment – for example growing crops or obtaining high quality drinking water.
- The natural environment is crucial to our ability to adapt, reducing flood risk, cooling cities and storing water.

The East of England has world famous nature reserves and is rich in biodiversity, landscape and built heritage. For example, The Norfolk and Suffolk Broads is Britain's largest protected wetland and third largest inland waterway. It is home to some of the rarest animals and plants in the UK and provides crucial economic input to the area welcoming over 7 million visitors per year¹. The major risks are related to water management with flooding being the greatest potential risk.

The coastal areas of the East of England are important from an economic and a biodiversity perspective. Farming and tourism are important economic activities and the importance of biodiversity along the coast is recognised

both nationally and internationally. Coastal erosion and loss of coastal habitat is a well recognised risk for the East of England. Happisburgh in Norfolk and the Naze in Essex are well known areas of coastal erosion.

The region contains 122,324 ha of SSSI, covering 7% of the total land area in the region². In 2009, around 75% of the region's SSSI area met the PSA target and were assessed as being in 'favourable' or 'unfavourable, but recovering' condition.

A number of adverse factors prevent the SSSIs in the East of England being in target condition. Many of the shallow marginal water habitats are in an 'unfavourable' condition due to complex coastal and freshwater issues such as coastal squeeze. This is where rising sea levels have squeezed saltmarsh and mudflats against hard flood defences and other developments. Much of the 'unfavourable declining' fen, swamp and marsh habitats as well as standing open water and canal habitats are affected by water abstraction and pollution from agriculture.³

The Environment Agency suggests that mean monthly river flows between July and November could decrease by 30-80% if temperature rises associated with medium to high climate change scenario assumptions up to 2050 are realised.



Threats

- Coastal change including habitat loss is a significant threat. High emissions projections indicate that the greatest proportion of habitat loss would be for saline lagoon, 20% of this resource would be losses from the East of England alone⁴. The High emissions scenario projects coastal floodplain, grazing marsh and saline lagoon as losing <50 ha each in the East of England, this represents the greatest loss for a region. More specifically, fen, purple moor grass, rush pasture and reed bed habitat lose <20 ha within the region⁴. The UKCCRA report recognises that the eastern coastal estuaries are vitally important for UK biodiversity and the analysis suggests that these areas may be the most affected by coastal change.
- Some of the largest deficits and greatest reductions in flow of water are projected to be in the East of England. Average regional reductions in flow are 38% (-16 to -54%) for the Low emissions scenario and 56% (-38 to -70%) for High emissions scenario⁴. Coastal zones, uplands, semi-natural grasslands, wetlands and freshwater habitats are particularly vulnerable to changes in water availability and species range shifts.
- Biodiversity and ecosystem services are likely to face increasing pressure due to changes in soils and invasion of non-native species, pests and diseases.
- Phenological mismatch⁵ may lead to disruption of food species and put species and ecosystem services at risk.

Opportunities

- There may be better conditions for some flora and fauna, although this will tend to favour generalist species that are more adaptable, rather than specialist species that are more specific in their habitat requirements.
- Increased productivity could be seen in forests and woodlands due to increased temperatures where drought, pests, pathogens and other pressures are not limiting factors.

Respecting the value of the regions natural environment, biodiversity and landscape is key to experiences critical to our health, economic development and well-being. Reductions in river flow, changing climate suitability for certain species, threats from sea level rise to coastal habitats and increasing aridity present challenges to the exceptional resource in the East of England.

Cutting edge research, management and protection are continuing to be applied across the areas natural environment assets as exemplified by the case study on the Norfolk Broads, however, the scale of the risk is large and more detailed understanding of the threats and how to deal with them in the most proportionate, effective way are essential.

1 - The Broads Authority (<http://www.broads-authority.gov.uk/education/about-the-broads.html>)

2 - Natural England, 2009. Investing in the East of England natural assets: State, value and vision.

3 - Environment Agency – SoE Report 2010 for the East of England

4 - UK CCRA 2012

5 - N.B. Phenology is the study of recurring plant and animal life cycle stages, especially their timing and relationship with weather and climate.

Where next?

Sustainability East facilitates a thriving network of stakeholders working on the climate change adaptation agenda. In a partnership with Anglia Ruskin University's Global Sustainability Institute (GSI), the network aims to develop a robust adaptation pathway and construct a strong narrative on adaptation for the East of England. This work will strategically link to national level work taken forward by Defra and the Environment Agency in the form of the National Adaptation Programme (NAP).

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Sustainability East is an independent, not for profit social enterprise based in Cambridge. We are the focal point for collaborative activity on climate change and sustainability in the East of England.

At Sustainability East we focus on creating responses that are proportionate to the rate and scale of the change ahead. We encourage a consistent approach and challenge assumptions in order to help organisations make informed and considered decisions.

SUSTAINABILITY  **EAST**
incorporating Climate East

This information pack was commissioned by the Department for Environment, Food and Rural Affairs (Defra) to coincide with the publication of the UK CCRA 2012. The content of this pack represents the initial interpretation of the East of England Climate Change Partnership drawing on the CCRA and other local evidence.