



Campaign to Protect
Rural England

Climate change and the future of the character of the English Regions

A CPRE paper for *Tomorrow's England*
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Introduction Tomorrow's England is a joint project funded by Defra, aiming to help visualise the changes brought about by climate change in each English region by 2026 and 2050 – the initial launch in February 2008 focuses on South East England. CPRE's contribution to the project has been to outline some of the main characteristics of landscapes in each region of England, and how they might change as a result of climate change.

North West Region

The most important characteristics of the North West's countryside include:

- The uplands: the Cumbrian Fells in the Lake District, Howgill Fells, Forest of Bowland, and Southern Pennines;
- the Cheshire, Mersey and Lancashire coast with its long stretches of sand dunes and mudflats; and
- the plains of Lancashire and Staffordshire, home to some of England's richest pastoral farming.

Lake District The Lake District is a highly distinctive area of the North West and one of the most interesting parts of highland Britain. The vegetation has become established thanks to waterfalls carving the rock, and stream water seeping into the soil. As a result of climate change, lakes and streams could dry up quite dramatically.

The effects of climate change – increased intense rain resulting in run-off which the soil cannot absorb quickly enough, extreme events such as high winds and storms, and drought in summer with increased fire risk – will be likely to dramatically increase erosion in the North West uplands. Vegetation patterns in the Lake District will change because of the longer growing seasons and altered competition between grass, heather and bracken. Because of water shortage, more frequent moor fires and erosion, the characteristic purple heather dominated by calluna may dry up. The extensive upland blanket peat bog may also shrink dramatically. This in turn will exacerbate erosion and the instability of upland stream sides and lakes.

Aggressive species such as rhododendron are likely to displace oak woods, which may retreat due to lack of water, extreme heat and new pests. Fires are likely to become more frequent. Iconic sites which are threatened by climate change include Grasmere and Rydal Lakes, which may fill with silt because of erosion over Rydal Fell and Blearigg. The effect of desiccation of upland peat bog can be seen at Calbeck Fell and Common. Examples of woods under threat – juniper and birch – can be found on the east bank of Ullswater near Silver Point.

Coastal region The sand flats of the Furness peninsula may be greatly reduced by rising sea levels. Major coastal resorts such as Morecambe and Blackpool may require costly adaptation measures against storms and flooding. The yellow sand dunes of Morecambe Bay and the Sefton beaches, with their characteristic wildlife, may be lost. The Lune Estuary could be threatened by fluvial flooding. Mudflats where migratory birds flock in the Ribble, Wyre, Lune and Mersey estuaries could be lost as a result of 'coastal squeeze'. Arnside Coast Area of Outstanding Natural Beauty would be threatened.

Pastoral land The Lancashire and Staffordshire plains support some of England's richest mixed farming, including a thriving dairy farm industry. This creates a pastoral landscape of green fields, grazed by livestock, and irrigated by lowland streams and ponds. The effects of

climate change could give rise to a shift towards arable farming and many fewer livestock. Reduction in the vigour and productiveness of pasture could result in diversification of crops grown in polytunnels which would greatly affect the landscape.

North East Region

Some of the main characteristics of the North East countryside are:

- the large North Pennine area in the south west of the region, with the Cheviot Hills at its uppermost tip;
- the Northumberland coast including Lindisfarne and Holy Island, and its beaches such as Bamburgh; and
- the fertile pastoral land of the Tees Lowlands, mid-Northumberland plain and the Durham plateau.

North Pennines The North Pennines share many of the characteristics of the uplands in the North West, with alternating moorland and grass, some woodlands and extensive blanket peat bog. Climate change could lead to a process of peat bog desiccation, possible displacement of upland vegetation by tree species and increased vulnerability of vegetation to fire risk, all similar threats to those potentially facing the uplands of the North West. Kielder Head Moor, a distinctive landscape with its blanket bog moorland, is at risk from desiccation as a result of climate change.

Northumberland Coast This coast is very vulnerable. The dune systems, extensive beaches and mud flats of Lindisfarne, Goswick Sands, and Holy Island Sands, Fenham Flats, Druridge Bay and Budle Bay are all distinctive landscapes which are likely to be lost.

Pastoral land These lowlands are very fertile arable land, with no shortage of water. The land supports mixed farming similar to that in the North West. These lowlands are likely to benefit from a longer growing season between now and 2025 and beyond, and enjoy increased yields. As in the North West, the next decades are expected to result in an intensification of arable farming, with more crops requiring a lot of water, such as potatoes and tomatoes, as well as a reduction of livestock, and more use of polytunnels.

Yorkshire and Humber Region

The regional characteristics of the Yorkshire and Humber countryside and regions that abut it are the uplands of the North York Moors and Yorkshire Dales, the beaches and sand shingles of the Humber Estuary and North Lincolnshire coast, the pastoral Vales of Mowbray and York, the coalfields of Nottinghamshire, Derbyshire and Yorkshire, and the open landscapes of the Humber Head Levels (Selby and Scunthorpe).

Yorkshire Dales The Yorkshire Dales in the western part of the region, and particularly the western flank of the Dales, may see relatively little change because of receiving the prevailing westerly rains. But the North York Moors and Cleveland Hills could be under far greater pressure from water shortage and ensuing degradation of moorland as described for the North West and North East regions. A distinctive landscape at risk from climate change is Fleet Moss near Dodd Fell in the Yorkshire Dales.

Coastal area The rich coastal plains of Holderness are already eroding rapidly and this could increase further, threatening the towns of Withernsea and Hornsea. The huge and majestic sand and shingle bar of Spurn Head (including Kilnsea Clays and Trinity Sands) and the

coastal marshes of the North Lincolnshire coast (Gibraltar Point, Tetney High Sands and Tetney Haven bird reserve) will be vulnerable to sea level rise.

The Humber Estuary is likely to be hugely vulnerable to flooding. The largest remaining raised peat bogs in England at Hatfield and Thorne Moors in the Humber Head Levels may dry up because of low river flows.

Pastoral land The Vales of Mowbray and York, which are very fertile and support pastoral agriculture, could be more intensively farmed, with a decline in pasture as rainfall patterns change. As in the North West and North East, this is likely to bring about a move away from pastoral agriculture and an intensification of arable crops likely to be restricted by water shortage. The result could be a loss of variety in landscapes and fewer livestock.

East Midlands Region

The East Midlands region has Nottingham as its industrial centre, upland Lincolnshire in the south west of the region, and the coasts and fenland reclaimed from the sea. The region has only one Area of Outstanding Natural Beauty – the Lincolnshire Wolds; they are threatened by the reduction in groundwater through changes in rainfall patterns and the agricultural response of increased irrigation.

Coast The Lincolnshire coast provides an example of a ‘sinking’ or ‘drowned’ coastline: sand dunes, shingle beaches and wetlands may disappear. Lower down the region’s coast, the more inland Wash area is made up of ‘peat fen’, a distinctive, highly productive landscape which has been reclaimed from the sea over the centuries. The River Welland flows into the Wash and now flows above the level of the Fens as peat soils shrink. Fen landscapes will be increasingly threatened by terrestrial flooding and sea level incursion (as experienced in 1953).

Uplands The Dark Peak area in the northwest corner of the region is likely to suffer from desiccation, and this could seriously threaten the large deposits of blanket peat bogs there. The woodland character of the ‘High Dukeries’, the Leicestershire and Nottingham High Wolds, is likely to change. Native species such as oaks and bluebells may suffer, and are likely to become rarer. The pattern of streams in this pastoral landscape may decline with changing rainfall patterns; this trend may be aggravated by increasing abstraction from housing and industrial development.

East of England Region

The East of England is characterised by wide expanses of open farmed countryside and sweeping views, and a remote and beautiful coastline, with unspoilt villages, historical sites and internationally renowned nature reserves.

Coast The North Norfolk coast provides a good climate change case history; it is one of the most scenic areas in Britain, characterised by saltmarshes, mud flats, and both sand and shingle beaches. Much of this is likely to have disappeared by 2050. The Morston and Stiffkey Marshes, with their many different wetland birds, and Blakeney Point, famous for its seals, are likely to be lost, as will be the fishing village of Brancaster, noted for its Roman fort at Branodonum. Resorts such as Cromer would be under severe pressure from sea level rise.

The Broads, formed by medieval peat extraction and some of the richest wetland landscapes in England, are seriously threatened by sea level rise and extreme events such as storms.

They are vital to local tourism, but may be in danger of conversion to a brackish or salt-water landscape and a significant decline in landscape diversity.

The Suffolk coast heathlands, the Sandlings, are likely to suffer from greater fire risk and coastal incursion from the sea. The Dengie Peninsula, and its unique Roman field system, at the south east tip of the region, is also under threat from sea level rise, extreme events and erosion.

Fens Very serious water shortage is likely to bring about dramatic changes in the East of England's pastoral landscapes. Significant reduction in rainfall could lower water tables and, as a result, streams would dry up and tree cover would be reduced. Beech and ash may be badly affected, and many are expected to die while pines may flourish. The last remnant of wild fenland at Wicken Fen, Holme Fen, Woodwalton Fen and Chippenham Fen in Cambridgeshire could be under threat from both desiccation and more extreme flooding events.

The risks described for the East Midlands are similar to those in the East of England. Major development projects for coastal fenland landscapes will be made more difficult through lower river flows in summer and heightened risk of flooding, from rivers or the sea, in winter.

Agriculture The huge expanses of arable land producing wheat and water-intensive crops such as potatoes, peas and broccoli, which depend on irrigation, will have to be replaced by crops requiring less water, such as maize and sunflower. Competition for water is expected to be intense, and will be compounded by increasing housing development.

West Midlands Region

The land-locked region of the West Midlands has extensive tracts of open moorland and hills, notably the Shropshire Hills and Herefordshire Black Mountains, and rich pastoral land on the Herefordshire and Worcestershire lowlands.

Hills The hill tops of the Shropshire Hills are often crowned with open moorland containing heathland, acid grassland and bracken. There is an abundance of headwater streams, brooks and rivers where ferns grow. The steeper slopes often contain woodland, especially ash and oak. The hill slopes typically contain patchworks of pasture fields giving way to arable land in the dales, and ancient hedgerows. The Long Wynd in the Shropshire Hills is an area of upland heath and a Site of Special Scientific Interest.

The Shropshire Hills are likely to change in a similar way to the North West uplands. The 'Operation Purple' project to recover heather moorland could be threatened by increased fire risk and changed rainfall patterns. The heathland is likely to dry out as the level of streams and rivers drops dramatically. There is likely to be a gradual decline of oak and ash woodlands. Pastoral land with cattle and sheep grazing will become less common because of greater water scarcity and reduced grassland productivity. The large numbers of veteran trees such as oaks and chestnuts in the West Midlands' many historic parks, for example, Croome Park, are unlikely to survive the higher temperatures and reduced water associated with climate change.

Pastoral land The West Midlands has been home to a great deal of traditional mixed farming, particularly in the Worcestershire and Herefordshire lowlands. The lowlands, dominated by wide river valleys – the Severn, the Wye and the Lugg – are enclosed by hilly and frequently ancient wooded landscapes. Pasture is prominent but increasingly confined to steeper slopes by the reduction in rainfall and the dominance of cereal production. Hedgerows are a major landscape feature. Arable cultivation is on the increase, with crops such as maize, wheat and

potatoes. Orchards are a particular feature, especially away from the floodplain. There is likely to be a substantial increase in polytunnel farming to protect crops from climate extremes.

As a result of reduced groundwater and regular rainfall, farming in Herefordshire could become increasingly dominated by arable crops. Wheat and other cereals, as well as potatoes, may give way to maize and new crops such as sunflower. Hops, orchards, dairy farming, beef cattle and sheep are likely to decline more than in the North West and South West.

South East Region

The countryside of the South East is characterised by pastoral lowland and extensive arable farming on higher ground and on downland, together with the heavily wooded landscape of the Weald and a concentration of ancient woodland. Arable farming extends over the South East plateaux, and most of it is highly intensive. The South East is England's most wooded region, with 15% of the region's land covered by woodland, and contains by far the greatest proportion of ancient (mostly oak) and semi-natural woodlands. On lime-rich soils, beech is often interspersed with yew trees. One third of the region is covered by Areas of Outstanding Natural Beauty such as the Chilterns, Surrey Hills, High Weald, Chichester harbour and the Isle of Wight, the New Forest National Park and the proposed South Downs National Park. The South East coast has a number of extensive marshes, notably the North Kent Marshes and Romney Marsh. The South East has the highest proportion of historic parks and gardens in the UK.

Coast The highest sea level rises are predicted in the SE (UKCIP). Sea level rise and storms will put the North Kent Marshes and Romney Marsh under water. The long shingle beach at Dungeness, Chichester Harbour, and New Town Harbour on the Isle of Wight will be under threat from sea level rise. Coastal erosion could destroy famous features such as Hurst Castle Spit, Selsey Bill and East Head.

Woodlands The water shortage in the South East associated with climate change is likely to be exacerbated by housing development and will have major impacts on wooded landscapes, and particularly ancient woodland. The shallow-rooted Chiltern beeches may also be vulnerable to pests and diseases. Milder winters are expected to favour alien broad-leaved species such as sweet chestnut. Bluebells will decline in the woods of the Chilterns and on the Weald.

The Downs The chalk grasslands in the North and South Downs, with their outstandingly rich plant habitats, may suffer from lowering water tables and reduced summer rainfall. Ancient woodlands will lose their core oak component. Salisbury Plain could become drier, with similar consequences to those in the Downs. The Surrey Hills and Hampshire Downs are expected to change in a similar way, with the possibility of alien species replacing native flora.

Farming Mixed farming will become ever rarer in the South East. Arable crops such as wheat, barley and oil seed rape could be replaced by soya, maize, sunflowers, vineyards and other new commodity crops. Increasing pests and diseases could harm forestry and orchards. Huge advance by the sea could fundamentally change the lower coastal valleys of the Cuckmere, Adur and Arun rivers.

South West Region

The South West is the most rural of the regions; it is characterised by upland moors such as Exmoor, Dartmoor and Bodmin; in the west, it has a variety of hills, forests and heaths and in the east, marshy levels and fertile plains. Its climate has been mild and wet, giving warm winters, cooler summers, and high rainfall in exposed upland areas.

Farming Many of the distinctive features of the South West are due to farming and woodland management, but parts of the agricultural industry in the South West are currently in a depressed state, particularly dairy farming, with its strong pastoral character of grassland and hedges. Soil erosion will continue to become more pronounced as climate change alters rain patterns, reduces the amount of water in the soil, and also leads to cropping changes.

For example, the trend of shifting from spring-sown crops to winter-sown crops reduces soil cover over winter months and increases soil erosion. The ongoing increased cultivation of maize is likely to increase further the risk of soil erosion and nutrient run-off into watercourses and the siltation of rivers. Oak and ash woodland may succumb to water deficit, heat and pests and be replaced by drought-resistant, sometimes alien species.

As drought lowers the throughput of rivers, with increased tourism putting pressure on the water supply, the highly characteristic and traditional apple and pear orchards are likely to be replaced by olives, cherries and almonds, which need far less water. The pastoral lushness and variety of mixed farms bound by hedgerows will be lost as hedgerows' shrub species increasingly have to compete for water and decreasing grass yields reduce livestock. Instead, there is likely to be an intensification of arable crops such as linseed and oil seed rape, meaning less distinctiveness of the lowland southwest landscape.

Upland moors The effects of climate change on Dartmoor and Exmoor will bear much resemblance to those evoked for the uplands of the North West and North East. There is likely to be a decline of heather moorland and bogs, as a result of drought, fires, and scrub. It may be difficult to sustain grazing due to increased scrub, compounded by ground erosion.

Coasts Rising sea levels is expected to increase the rates of coastal erosion, and many beaches may be significantly threatened, for example, Slapton, Saunton and Chesil beaches, together with the coastal wetlands at Fleet, Ley and Braunton Burrows.

Woods The well known Ebworth beech woods in the Cotswolds may be threatened by climate change.

Conclusion

In CPRE's view, lowland farming is likely to become more profitable in Western Europe because of the world's increased population, and world water scarcity made worse by climate change. This may put pressure on 'marginal land' which has hitherto retained greater character and biodiversity. There could be increasing pressure to produce commodity crops requiring less water, and for genetically modified crops to reduce the need for water, fertilisers and pesticides. These trends are likely to increase demand for water and intensify competition for it. There is likely to be a reduction in groundwater and stream flows and an increase in alien pest species.

Considering the changes which may become visible by 2026 and 2050, the continuity of England's countryside over time could be lost; for example, in East Anglia long established wheat production areas or in Herefordshire or Devon traditional pastoral landscapes. There

may be a loss of pastoral land except in the North East. There may also be a decline in the link between animals and land as cattle are fed maize increasingly in farm buildings.

We expect to see four sets of landscape changes due to climate change:

1. very dramatic changes, particularly on the east coast, with loss of beaches and entire villages;
2. major changes to uplands such as the Lake District, where the pattern and variety of upland and moorland vegetation and the appearance of the lakes will be altered;
3. erosion of the finer grain and regional diversity of the landscape (the 'patchwork quilt' effect) in pastoral areas, with reduction in livestock and in mixed farming as orchards disappear, giving way to more intensive arable and drought-tolerant crops and polytunnels; and
4. general degradation of the tree stock in lowland farmland and ancient woodlands, together with increased secondary woodland on uplands, replacing heather and bog landscapes.

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