Building future communities 2025

Getting ready for a changing climate

Road closed sign under deep water during extreme flood.

September 2025

Contents

Interactive elements

Use the contents page or navigation at the top of sections to easily click through to the information you require.

Take me to contents page.

Indicates what page you're on. Text navigation can also be clicked to move through the sections quickly.

Family crossing river whilst hiking in Lake District.
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1

Aviva introduction

Introduction: acting today to get ready for the climate of tomorrow

Every year the effects of climate change become ever more apparent in our daily lives. 2025 has been no exception, with the hottest, sunniest spring ever in the UK, followed by a familiar pattern of dangerously high temperatures, wildfires, hosepipe bans and flash floods.

It is also increasingly clear that, while we should double down on efforts to reduce climate change, there is equally an urgent imperative to be climate-ready, doing more to prepare our homes and businesses to deal with the increasing frequency and severity of the impacts we know are in store.

The analysis in this report makes clear that what we've experienced to date is only a foretaste of what is to come. It shows that by 2050, millions more homes and businesses, in communities all around the UK, could face the disruption and costs of dealing with floods, subsidence and extreme heat.

Encouragingly, however, the case studies covering some of the UK's most well-known landmarks offer inspiration for what can be done to prepare ourselves. There is excellent work already underway across all four nations, with owners, guardians, communities and councils working together to protect these iconic places and secure their legacy for generations to come.

Importantly, they show that adapting to a changing climate and becoming more resilient to the risks we all face, will take a range of responses. Some approaches, such as large-scale landscape restoration and expensive infrastructure projects will be the preserve of national and local government, expert organisations and large businesses like ours. Yet more simple solutions, such as adopting the right mindset and building closer relations with our neighbours and our local community, are within everyone's grasp.

This report sets out some of the actions Aviva is taking in more detail. It also spells out our recommendations for specific changes that could make a huge difference to how well prepared the nation can become. These include making widespread use of proven, low-cost flood resilience measures in new homes, strengthening planning rules to protect people from buying unprotected homes in flood zones, and enhancing the flow of public and private finance for natural flood management approaches to protect homes, businesses and infrastructure, as well as improving water quality and restoring habitats for nature and local communities.

The challenges ahead are real and demand collective action. We can no longer say we don't know what's coming. But we also know what needs to be done. The only question now is how quickly and effectively all of us act together, to make sure the UK is ready for a more resilient future.

Jason Storah,
CEO, Aviva UK & Ireland General Insurance

Flooded road in Essex.
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2

Executive summary

Executive summary

Climate change is already reshaping lives, homes, and communities across the UK. The last two years alone have seen record-breaking heat, devastating floods, and rising risks to public health and infrastructure. By 2050, millions more properties could be at risk from flooding and subsidence, with extreme heat threatening lives and livelihoods.

Key findings from our analysis show that by the middle of the century:

- The number of homes at risk from flooding in England could rise by 25% to 8 million properties.[1]
- 1.4 million more properties could be at risk of subsidence.
- Maximum summer temperatures could rise significantly, increasing risk for health and properties.
- Climate risks are converging which makes adaptation more complex.

While reducing emissions is critical, the UK must also act now to adapt homes, communities, and infrastructure for a climate-ready future.

This report uses case studies from well-known landmarks across the UK, combined with analysis of the latest climate change projections, to bring these future risks to life and inspire the action needed to face them.

Aviva's calls for change

Aviva is calling for urgent, coordinated action to reduce risks and build resilience. This report highlights six national priorities to embed climate resilience into planning, building standards, and finance. Together, these changes would provide the policy foundation for a safer, more climate-ready UK.

Future focus on climate change threats

For the first time, this report brings together the latest data to provide a broad picture of the risks the UK faces in 2050 and beyond, from a combination of climate impacts. Our future flood maps combine up-to-date climate projections from across the UK with property-level address data to give new insight into how homes and businesses may be affected in future. Further maps on future subsidence and heat risk demonstrate how climate change threats will reinforce each other and require coordinated solutions.

Exploring the impact on well-known landmarks

- **Hampton Court Palace, London:** Henry VIII's palace exposed to increased flooding of the Thames and extreme heat, affecting its historic gardens as well as the wider West London area.
- **Cardiff Bay, Cardiff:** Waterfront communities, including vulnerable neighbourhoods, are at risk of flooding in the future.
- **Liverpool waterfront:** A cornerstone of Liverpool's visitor economy and home of many businesses faces threats of increased coastal and river flooding.
- **Red House, London:** Historic Arts and Crafts landmark suffering from subsidence linked to London clay soils, with ongoing monitoring in place to protect its beautiful facades.
- **Charlecote Park, Warwickshire:** Shakespeare-linked heritage property is learning from experience how to continue to stay open to visitors during increasingly regular flood events.
- **Giant's Causeway, County Antrim:** Northern Ireland's iconic coastal landmark increasingly exposed to erosion and slope instability, with growing risk to visitor access.
- **Edinburgh Castle, Edinburgh:** The hilltop fortress unexpectedly flooded by surface water, with work underway to increase drainage and protect the property.

- **York City Centre:** Finding innovative ways to reduce future flooding in the ancient city by looking upstream to natural flood management solutions.

Aviva taking action

With 25 million customers, at Aviva we recognise that we have an important role to play in helping the UK get ready and take action against future climate risks. We have pledged more than £80 million towards nature-based solution projects which capture carbon, contribute towards flood resilience and help to restore natural habitats.

Aviva has supported over 400 eligible customers under the Flood Re Build Back Better scheme – which offers up to £10,000 to install property flood resilience measures where a customer has been flooded. This action is part of our Aviva Sustainability Ambition, which focuses on climate action, social action and being a sustainable business. Find out more about our sustainability ambition and action at www.aviva.com/sustainability.

Young girl assisting with gardening.
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Protective flood barriers, Bewdley Bridge, Worcestershire.
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3

Aviva's calls for change

Aviva's calls for change

In this report, we are making six calls for change – areas where we believe urgent action and attention is required on a national level to get climate-ready and protect properties and communities from the current and future impacts of climate change.

Alongside continued investment in flood defences to keep pace with escalating flood risk, we believe these action points; dealing with planning regulation, flood management and resilience measures against key climate change threats, will provide a strong policy foundation for delivering a more resilient future.

Calls for change

1. **Strengthen planning rules to prevent unprotected development in current and future flood zones**

   Over the last decade, 110,000 new homes were built in the highest risk flood zones, equivalent to 1 in 13 new homes built in total. If this trend were to continue, 115,000 of the Government planned 1.5m new homes would also be in the highest risk flood zones. This is evidence that the existing planning rules must be tightened to prevent unprotected development in these areas.

2. **Amend building regulations to require low-cost proven property flood resilience (PFR) measures**

   PFR measures are simple, low-cost, proven interventions (such as self-closing airbricks) installed in a home to help resist surface water flooding and significantly reduce the amount of time and cost of recovering from a flood. Where included in a new home PFR measures are either cost-neutral (e.g. wiring electrical points from above) or low-cost. The additional cost for PFR for a new home is around £1,000.

3. **Standardise the use of Sustainable Urban Drainage Systems (SuDS) in new developments**

   In England, developers have the automatic right to connect surface water arising from new homes to the public sewerage system, irrespective of whether there is capacity. Implementation of Schedule 3 of the Flood and Water Management Act (2010) would end this automatic right to connect and provide a framework for the approval and adoption of SuDS paving the way for their widespread use. As it stands SuDS are used inconsistently and the risk of surface water flooding is increasing significantly.

4. **Mainstream Natural Flood Management (NFM), by revising government funding rules and supporting private finance markets**

   NFM is primarily about slowing the flow of water using interventions like "leaky dams" to provide natural speed bumps for water across the catchment, absorb water, and prevent funnelling water that overwhelms infrastructure downstream. It is a cost effective, but under-utilised part of the UK's flood resilience strategy. The Government has proposed a new flood funding formula which would result in the total government budget spent on PFR, NFM and SuDS increasing from 1% (currently) to 18% of the total budget under the new formula. A common value framework is required for NFM to drive enhanced private investment into it. The Government can help potential investors deliver this enabling framework.

5. **Establish a Resilient Buildings Taskforce to make recommendations on how climate resilience can be placed at the heart of policy and promote cross learning with the insurance, lending, professional and other related sectors**

   With increasing subsidence, storm, flood and heat risk on the way, a Resilient Buildings Taskforce with appropriate representation from developers, social housing providers, surveyors, architects, insurers and lenders should advise government on how to adapt policy to improve the adaptation of existing and new homes to mitigate these risks.

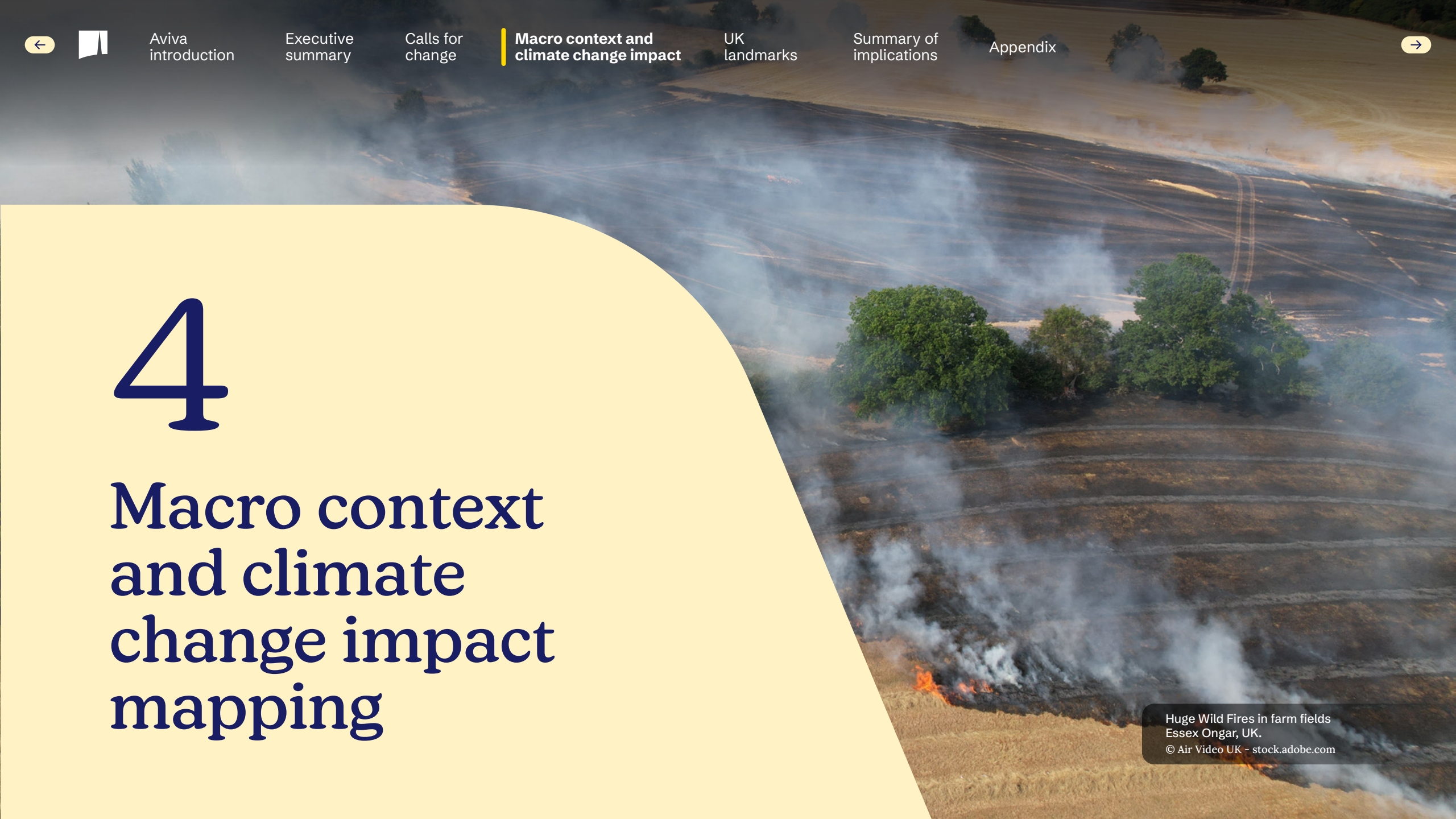
6. **Encourage investment and innovations to protect homes against heat risk, including by extending Part O Building Regulation requirements to cover refurbishments of existing homes**

   New cheaper innovations are required to help cool older homes when extreme heat occurs. Part O of the Building Regulations (which applies to new homes) sets out requirements to prevent excessive heat. The Climate Change Committee has recommended extending this requirement to the refurbishment of existing homes to drive the innovations that will help adapt older UK homes.

Flood water and houses in Salisbury after heavy rain.

4

Macro context and climate change impact mapping



Huge Wild Fires in farm fields Essex Ongar, UK.

Changing climate, increasing risk: the macro context

This report focuses on three of the most immediate and visible threats from climate change in the UK: flooding, subsidence and extreme heat. These risks are growing in scale and impact, creating serious challenges for people, places and the public services we all depend on.

To help illustrate how these risks could evolve by 2050 and beyond, the report draws on a combination of national datasets, climate projections and map-based modelling. These tools highlight the areas of the UK that could face the greatest pressure, where impacts may intensify over time, and the communities that may be most affected. For the first time, this report brings together different data sets to provide a broad picture of the risks the UK faces in 2050 and beyond, from a combination of climate impacts.[2]

These scenarios are grounded in some of the most up-to-date data available. In 2024, the Environment Agency released new national flood data for England – the first update in over a decade – with Wales, Scotland and Northern Ireland also releasing similar revisions.[3] Our analysis combines these sources with leading climate projections from the Met Office and others to paint a picture of what the UK could face in the coming decades if progress on cutting emissions and adapting to change remains limited.

Yet this future is not inevitable. With the right choices, from improving infrastructure and planning more wisely, to restoring nature and redesigning how we manage land and water, we can reduce these risks, and we can adapt to the new normal.

This section sets the scene for what follows: a closer look at what's at stake, what we can do to prepare, and how resilience is being built across the UK.

Floods partially submerge a tourist signpost Bewdley Bridge Worcestireshire England UK.
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Flood

The number of homes at risk from flooding in England could rise by 27% to 8 million properties by 2050.

Flooding is one of the most significant environmental risks facing the UK. It includes river, coastal and surface water flooding.

Currently, 6.3 million properties are at risk in England alone, as well as key infrastructure like transport, utilities and businesses.[4] Climate change means we are experiencing more frequent and severe flooding, rising sea levels, and longer periods of drought that harden soils and reduce their capacity to absorb water. Surface water flood risk is being accelerated by increases in impermeable surfaces, reduction in permeable surfaces and insufficient improvements and maintenance of UK drainage capacity. The number of at-risk properties in England could rise to 8 million by the middle of the century, equivalent to 1 in every 4 homes.[5]

Separate analysis by Aviva suggests that, in Scotland and Wales, flood risk may also increase in the coming decades. In Scotland, 80% more properties could face river and coastal flood risk, and over double will face surface water flood risk by 2080.[6] In Wales, 88% more properties could face river and coastal flood risk, and 47% more will face surface water flood risk by 2120.[7]

These future scenarios reflect the timescales analysed by the governments of these two nations.

While the Government is taking steps to address flood risk, the UK's existing defence systems remain under growing pressure. In some areas, critical flood protection assets are in poor condition, with maintenance backlogs and ageing infrastructure raising serious concerns about future resilience. Without accelerated investment and more effective long-term planning, the scale and severity of flood damage are likely to increase, particularly as climate risks intensify and new areas become exposed.

This is particularly the case for surface water flooding, which is linked to localised rainfall and can't be defended against in the same way. Today, 83% of properties exposed to surface water risk are unprotected, far higher than the proportions for river or coastal flooding.[8] Bridging the gap between climate change impacts and resilience measures will require not just more funding, but a shift towards smarter, more preventative approaches that reduce risk at source.

Flooding can be devastating at a personal level. A single flood can destroy cherished belongings, damage walls, floors, and electrics, and render a home uninhabitable for weeks or even months. For people affected, the emotional toll can last much longer than the event itself, particularly when repeat flooding becomes a regular threat. Restoring a home after a flood also has a significant carbon impact equivalent to six and a half transatlantic flights in an average case, as explored in our previous Building Future Communities report.[9]

The risk to homes is increasing as houses continue to be built on recognised flood zones. Over the last decade, 110,000 new homes were built in the highest risk flood zones, equivalent to 1 in 13 new homes built in total. If this trend were to continue, 115,000 of the Government planned 1.5m new homes would also be in the highest risk flood zones.[10]

But flooding doesn't just affect individuals. A dramatic flood event or repeated smaller ones can disrupt entire communities. Roads and railways may be blocked, power and communications cut off, and emergency services stretched. Local businesses may be forced to close, some permanently. And when historic buildings, cultural landmarks, or green spaces are damaged or lost, the social and economic consequences can ripple far beyond the flood zone.

Addressing these challenges involves more than just reacting when a flood hits. A strategic, forward-looking approach to land use, planning, and infrastructure on a national level can help reduce future risk and limit exposure. This would include guiding new development away from high-risk areas, improving existing flood defences, and making greater use of nature-based solutions such as restoring wetlands and re-naturalising rivers. Expanding sustainable drainage systems can also help slow the flow of water, ease pressure on built infrastructure, and provide wider benefits for nature, climate resilience, and communities.

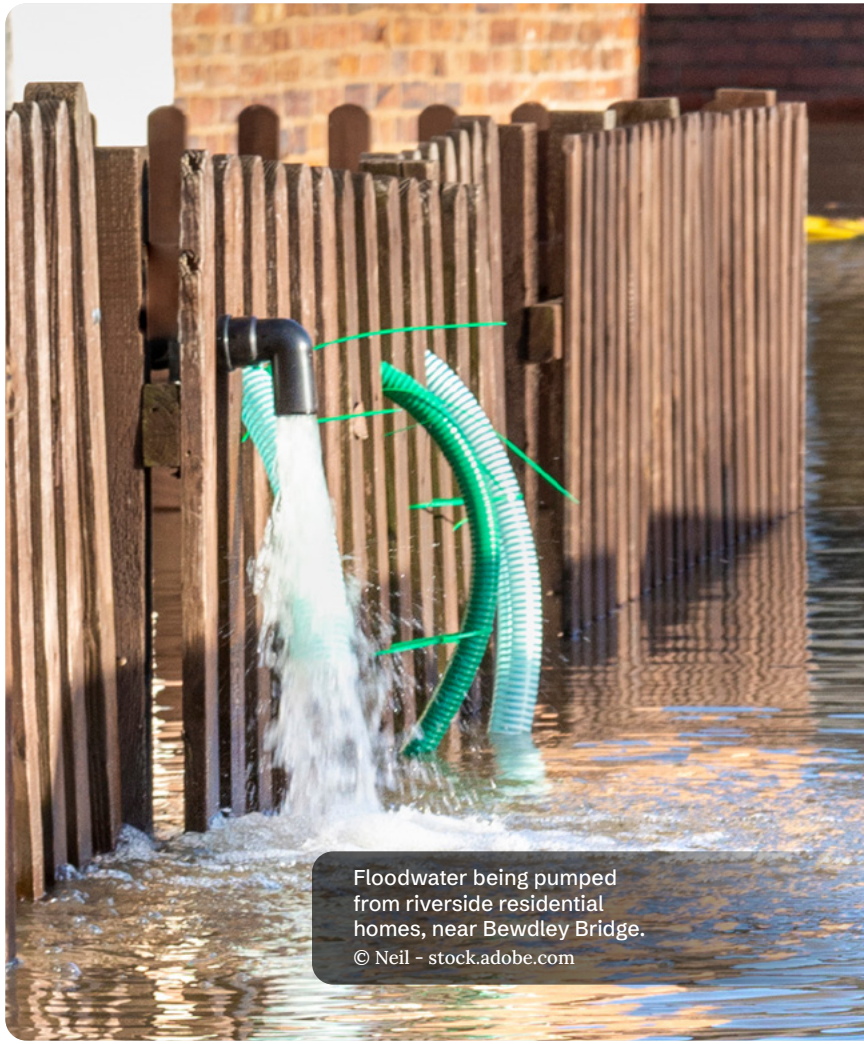
Property Flood Resilience (PFR)

PFR measures are a simple, low-cost, proven interventions installed in a home to help resist surface water flooding and significantly reduce the amount of time and cost of recovering from a flood. PFR includes self-closing air-bricks, non-return valves on toilets and sump pumps that collect and pump out flood water from basements.

Government studies have found PFR provides "significant cost-effective" opportunities to improve flood resilience.[11] 3.1 million current UK homes are exposed to flood depths where PFR is most effective (up to 0.6m) and could realistically benefit from PFR interventions.[12] PFR also significantly reduces the time and cost of recovering from a flood.[13] Adapting UK homes to include PFR is the clear direction of travel in flood resilience policy.

The DEFRA flood funding formula (which determines how the flood defence budget is allocated) is being revised so that Government can spend more on retrofitting PFR. The total spent on PFR, NFM and SuDS will move from 1% (currently) to 18% of the total budget under the new formula.[14] Under the Flood Re Build Back Better scheme (introduced in 2023), around 70% of insurers offer customers up to £10,000 to install PFR following a flood.[15]

Where included in a new home, PFR measures are either cost-neutral (e.g. wiring electrical points from above) or low-cost. The additional cost for PFR for a new home is around £1,000. PFR incorporated into new homes demonstrates a tenfold reduction over comparable retrofit costs, alongside an anticipated two thirds reduction on restoration costs whenever flooding occurs.[16]



Floodwater being pumped from riverside residential homes, near Bewdley Bridge.
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Future flood risk mapping

We have mapped out future flood risk across two separate maps: river and coastal flooding and surface water flooding. Both show how homes and businesses could be affected by flood risk in future. They use the climate change scenarios projected by each national government, cross-referenced with property-level address data to analyse the proportion of properties in each area that could face at least medium flood risk in the future scenario. By using property-level data, we aim to illustrate not only flood risk, but the potential impact it could have on home and business owners.

Understanding the future flood maps

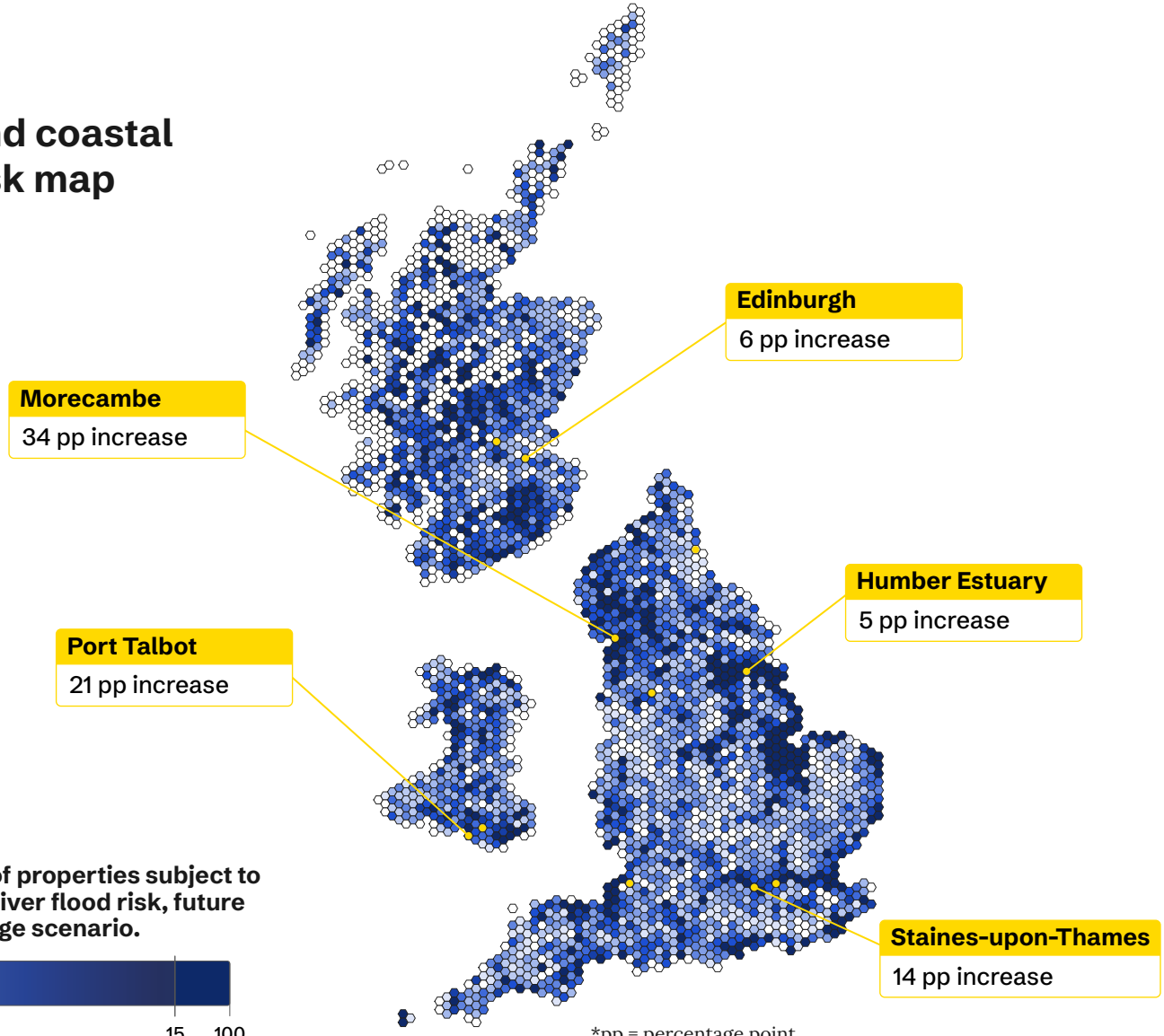
We have based these future flood maps on the most up-to-date climate change flood modelling undertaken in England, Scotland and Wales. Each nation has approached the challenge differently, using different time horizons and climate scenarios to base their calculations. Crucially, the future projection years are not the same for each, so the data and maps should be read in isolation, not in comparison with each other. For this reason, we have presented each nation separately here, rather than showing the mainland UK in one diagram.

For ease of understanding, we have used a single colour scale, with equal minimum and maximum values for surface water and river and coastal maps respectively. However, the intervals across this scale are different for each nation and each flood type. Therefore, the scales for each nation and flood type are not comparable.

Please note that Northern Ireland has been omitted due to lack of availability of up-to-date climate change flood projections.[17]

Flood sign in flooded road.
© Brian Jackson - stock.adobe.com

River and coastal flood risk map



Map insights

1 Coastal flooding is a significant and escalating threat:

Coastal flooding already places 2.4 million properties in England at risk, including over 367,000 in high-risk zones. Without action, this number could rise to 3.2 million by mid-century, driven by rising sea levels and more frequent storm surges. The maps show severe exposure along England's East coast around the Wash, impacting the Lincolnshire area, and some of the sharpest increases in risk along England's North-West coast, where the percentage of properties at risk of flooding could rise by as much as 34% (in Morecambe) by 2050.

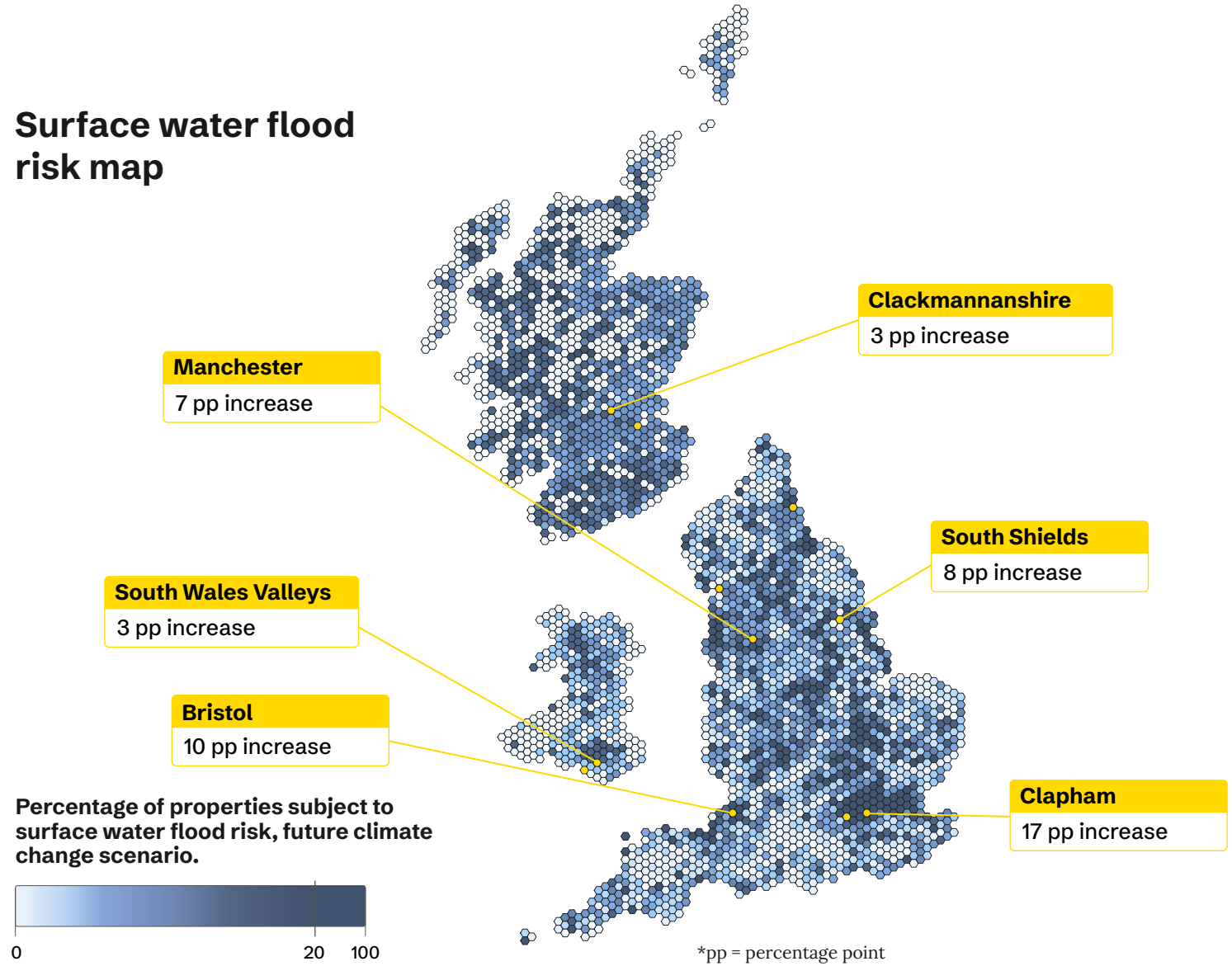
2 River flooding is easier to predict but is still a major risk:

Major rivers in the UK such as the Thames, Taff, Ouse and Clyde present well mapped, yet still significant sources of flood risk. By 2050 and beyond, many more properties will be at risk along these major rivers, especially where floodplains are developed or defences are outdated. The maps demonstrate pronounced risk along the River Thames and the Humber Estuary, where the percentage of properties at risk could rise by as much as 14% (in Staines-upon-Thames).

3 Cities in estuaries face compounded flood risk from river and sea:

Estuary cities such as London, Liverpool, Cardiff, and Bristol face a double threat as rising seas amplify tidal surges while river flows peak more frequently. The maps highlight how the Thames, Mersey, Severn, Humber, and Taff estuaries concentrate both hazards, leaving large urban populations especially vulnerable. This is particularly the case in Cardiff and Bristol, where projections suggest significant rises in risk levels under our future climate change scenario.

Surface water flood risk map



Map insights[18]

1 Surface water flooding threatens millions of properties:

According to the Environment Agency, 4.6 million properties in England are currently at risk of surface water flooding. Projections indicate that this could rise to 6.1 million properties between 2040 and 2060. This is a potential 66% increase in the most exposed category compared to current risk levels.

2 Urbanisation and inadequate drainage exacerbate risks:

As towns and cities expand, green spaces and permeable surfaces are often replaced by roads, driveways, pavements, and buildings composed of impermeable materials that prevent rainwater from soaking into the ground. The maps confirm that urban centres across the UK, particularly older, densely built-up areas such as London, Manchester and areas of the North East could be hotspots for surface water flooding in the future. And although potentially less significant, projected increases are sharp in fast-growing regions of the South-West of England, where the percentage of properties at risk of surface water flooding could rise by 10% (in Bristol).

3 Surface water flooding can occur anywhere:

Unlike river or coastal flooding, surface water flooding is less predictable, often with little warning, and in places unprotected by traditional flood defences. The maps highlight how contrasting landscapes and topographies can drive risk: from densely urbanised cities, where hard surfaces prevent rainwater from draining, to the steep-sided valleys of South Wales where heavy rainfall funnels rapidly into communities, and to upland and island settlements in Scotland.

Subsidence

1.4 million more properties could be at risk of subsidence by mid-century.

Subsidence is a huge risk to many UK properties, and it is made worse and more prevalent by climate change. Unlike floods or storms, the effects of subsidence are often subtle and slow-moving, but the damage it causes can be huge. Many cases of subsidence occur on clay-rich soils that expand when wet and shrink when dry. This natural "shrink-swell" cycle can shift the ground beneath homes, roads, and critical infrastructure, weakening foundations and causing costly structural damage. As climate change brings hotter, drier weather conditions, punctuated by severe rainfall, the risk of subsidence is increasing. This means not only a greater risk of buildings being weakened, but more properties becoming affected.

The danger is particularly acute in regions where soil composition, building design, and weather patterns intersect and reinforce one another, for example, in London. Over time, repeated cycles of ground movement can crack walls, jam doors, warp windows, and slope floors, leaving property owners with mounting repair bills. The nature of subsidence means that damage may build gradually and become more expensive to address the longer it goes unnoticed.

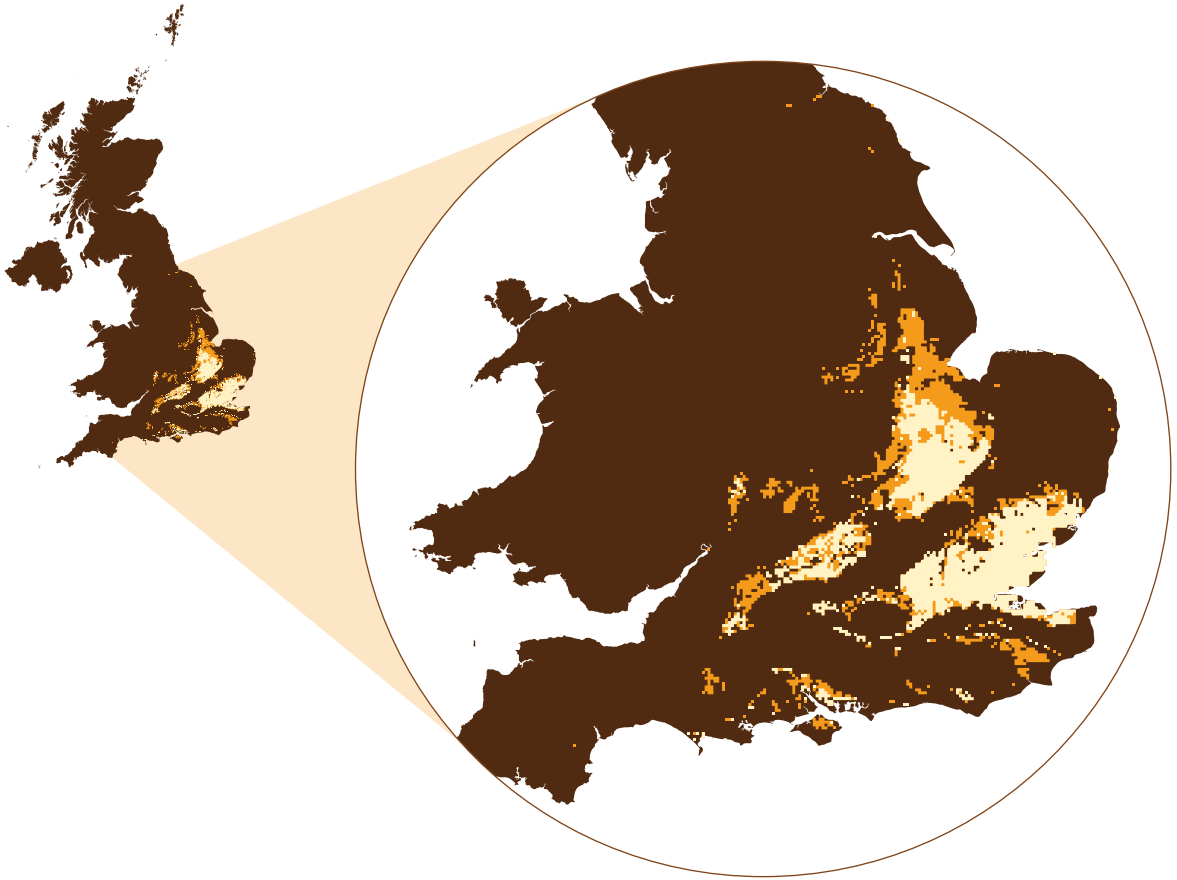
Another contributing factor to subsidence can be trees and vegetation. Plants draw moisture from soil, drying it out and increasing the impact of shrink-swell subsidence. Trees may also disrupt foundations if they grow very close. As such, trees near buildings often require careful management, and planting new trees close to buildings should be done with full understanding of their potential impact. Equally, new development, like extensions, should consider existing trees before going ahead.

The impacts of subsidence extend beyond housing. Parks, gardens, archaeological sites, and historic landscapes are also at risk. Even small shifts in ground level can disrupt ecosystems, damage heritage features, or compromise drainage and accessibility in public spaces, which can have fundamental knock-on effects for tourism, local businesses and overall community well-being.

Tackling the rising risk of subsidence requires a forward-looking approach to planning and development. That means locating and designing buildings with ground conditions in mind, improving the standards of construction in high-risk zones, and investing in infrastructure that is resilient to an increasingly unstable subsurface. It also means better public awareness, monitoring, and maintenance, to prevent minor signs of movement from becoming major structural failures.

White building with a large crack running down the wall next to the window.

Subsidence risk, 2030 to 2050



Subsidence risk today (2030s)
Subsidence risk future (2050s)

Map insights[19]

1 South-East England is at the epicentre of subsidence risk:

The map clearly highlights South-East England, particularly areas surrounding London, Essex, Kent, Surrey, and the Thames Valley, as the region facing the most widespread and intense subsidence risk due to the prevalence of clay-rich soils. The concentration of risk in this area also reflects a dense pattern of development, meaning many homes, roads, and public spaces are potentially exposed.

2 Subsidence risk is projected to expand geographically by 2050:

While currently concentrated in the South-East, the map suggests that subsidence risk could sprawl outward over the coming decades. Areas of concern begin to emerge across the Midlands, East of England, and into southern parts of Wales, reflecting both the effects of changing weather patterns and the widening footprint of urban development on susceptible soils. The total number of properties located in subsidence risk zones in the UK could rise from 5 million to 6.45 million by mid-century.

3 Pockets of risk may emerge in unexpected locations in the next 20-30 years:

Importantly, the map shows that subsidence risk is not isolated to the South-East. Small but notable pockets of risk are visible outside the main risk zone. Some of them, including Peterborough and Southampton, already exist today. Others, including Stratford-upon-Avon and some areas of Middlesbrough, could emerge over the next 25 years. These may be tied to localised clay soil formations, increased development on marginal land, or shifts in regional climate patterns.

Heat

Maximum summer temperatures could rise significantly, increasing risk for health and properties.

Soaring summer temperatures in the UK, such as those in 2025, will climb even higher and increasingly become the norm due to climate change. This poses significant risk to health, properties, and day-to-day life as high temperatures disrupt public services like transport networks, food supply and water systems.

Extreme temperatures can create significant health risks, particularly for vulnerable populations including the elderly, young children, and people with pre-existing medical conditions. This puts more pressure on healthcare provision and creates an increasing need for local people to actively support vulnerable people as temperatures rise.

Combined with periods of drought, higher temperatures also create the conditions for devastating wildfires. National Resilience data paints a stark picture: as of 19th June 2025, fire and rescue services in England and Wales had responded to 564 wildfire incidents, a staggering 717% increase compared to the same period in 2024, which saw just 69 incidents. It is also more than double the number recorded in 2022 (277), which ultimately became the worst year on record for wildfires.[20]

Fires this year have included three simultaneous heathland blazes in London in August – a phenomenon giving rise to the new term "firewave".[21]

Moreover, higher temperatures can increase the probability of lightning strikes; studies suggest that lightning strikes, which are responsible for starting many wildfires, could increase in frequency by 12% for every 1°C of warming.[22] Aviva claims data shows that lightning-related claims have increased over the last five years, and also saw a significant increase in fire claims that started outside the home.[23]

As well as its immediate effects, extreme heat can also amplify the impacts of other climate risks like flood and subsidence. The dryer the land due to high and prolonged heat, the more damage a sudden downpour can cause, creating flash floods that overwhelm drainage systems and risk damaging properties. Drying soil also weakens ground stability and increases the risk of subsidence. The convergence of these hazards presents a compounded challenge for communities, homeowners and planners. Properties in high-risk areas could face a triple threat: overheating during heatwaves, gradual structural damage from subsidence, and acute flash flooding from intense rainfall.

Many buildings in the UK were never designed with high temperatures in mind, leaving their occupants overheating during hot summer spells. There are some simple fixes for this, including internal blinds, appropriate planting, and other solutions for milder heat issues.

But retrofitting more substantial cooling solutions like external shades can be complex and costly, particularly in sensitive older homes or blocks of flats.

Water trough in dry field with canary wharf skyline in background.
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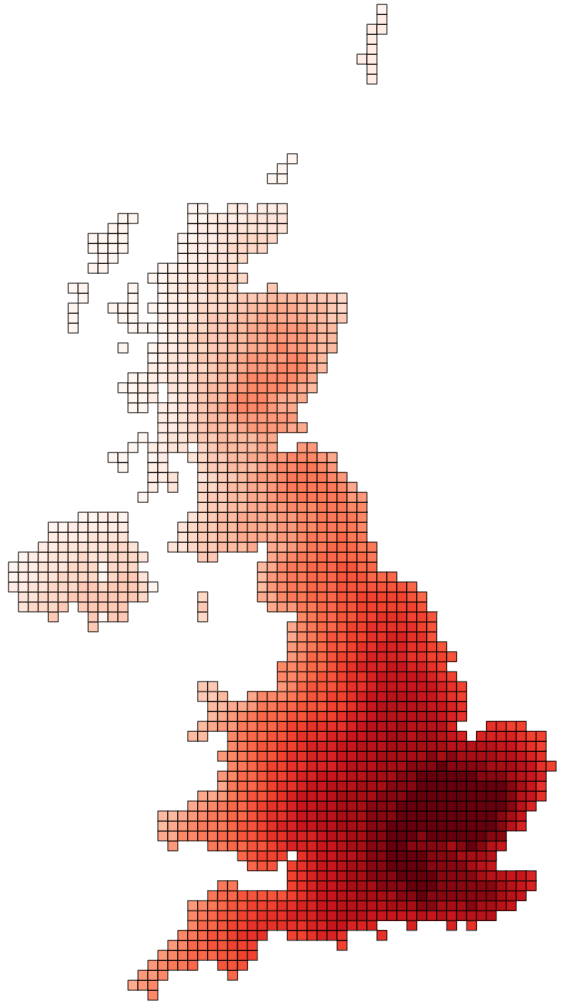
Heat risk map



Average maximum temperature change to 2045 (baseline 1981-2010 standard normal)

1.27 — 2.22

Map insights

1 Southern England faces the most severe warming

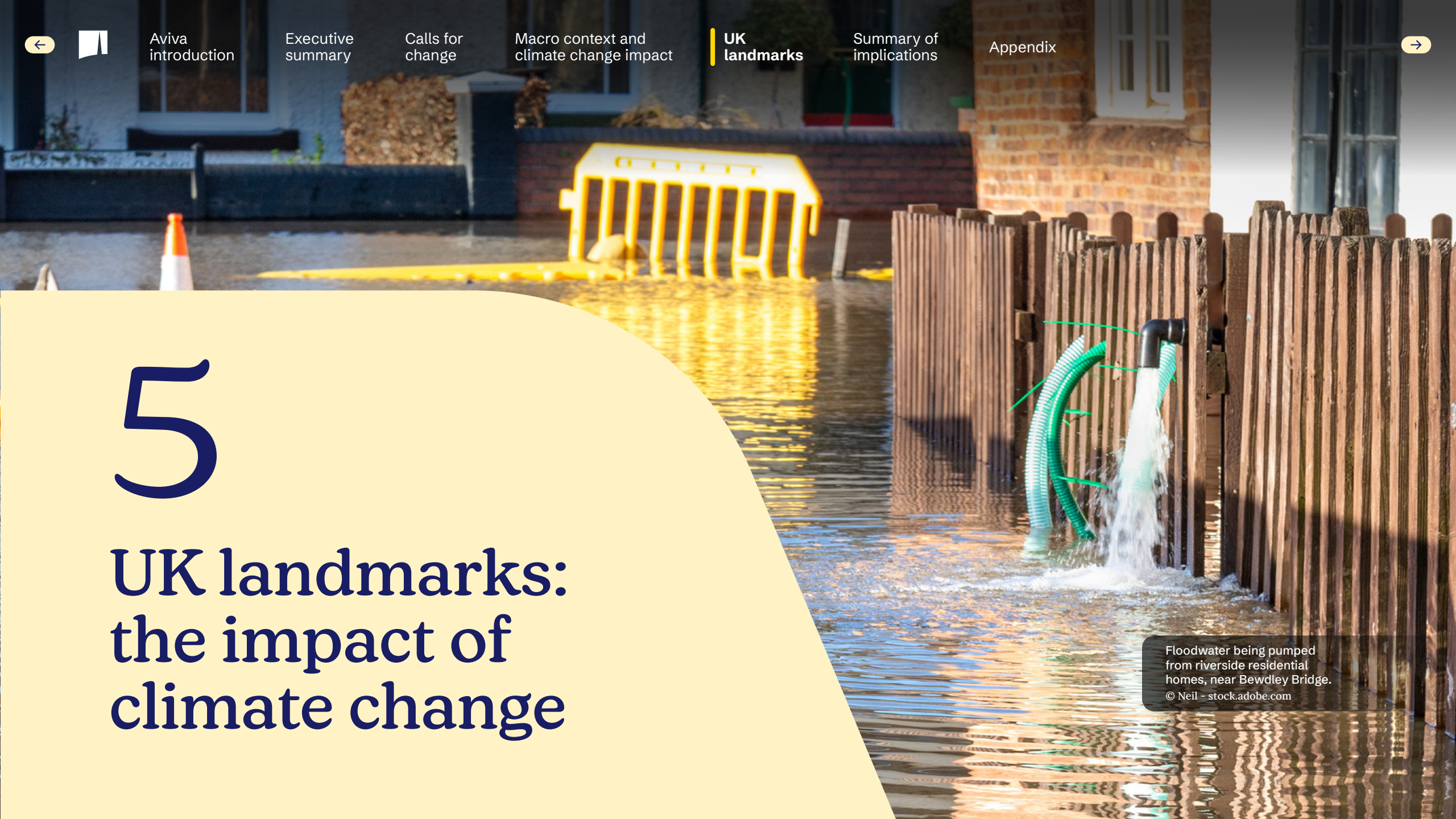
Temperature increases are expected to be most pronounced in the southern parts of the UK, with the darkest red shades of the map concentrated around London and the South East. Projections suggest a potential rise in maximum annual temperatures of up to 3.5°C in some areas, compared to the 1981–2010 standard normal.

2 The Urban Heat Island Effect is evident

Across the UK, urban areas stand out as particularly vulnerable due to the urban heat island effect. Built environments, with their dense networks of concrete, asphalt, and limited green space, absorb and retain heat more than surrounding rural areas. This effect is most acute in cities like London, Birmingham, and Manchester, and will require localised cooling strategies, such as appropriate greening and better building design.

3 Climate risks are converging which makes adaptation more complex

The areas projected to experience the greatest increases in temperature, particularly London, the South East, and parts of the Midlands, are also hotspots for subsidence and surface water flooding. This overlap reflects the reality that climate risks rarely occur in isolation.



Floodwater being pumped from riverside residential homes, near Bewdley Bridge.
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5

UK landmarks: the impact of climate change

The growing risk to UK landmarks: case studies of a changing climate

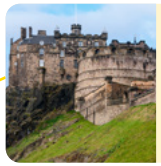
Subsidence
Surface water flood
Extreme heat
River / coastal flood

Giant's Causeway
County Antrim

Liverpool waterfront
Liverpool

Cardiff Bay
Cardiff

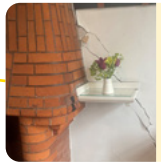
Hampton Court Palace
London



Edinburgh Castle
Edinburgh

York city centre
North Yorkshire

Charlecote Park
Warwickshire



Red House
London

Case study

Hampton Court Palace, London

A royal palace under water?

Hampton Court Palace, famed for being the home of Henry VIII and birthplace of real tennis, has stood as a defining landmark on the banks of the Thames for more than 500 years. Its iconic riverside setting is central to its character but also places it on the frontline of growing climate pressures that have the potential to disrupt events and increase demands on maintenance and conservation.

A dual future climate challenge

By 2050, West London is projected to face wetter winters, heavier downpours, and rising river levels. These changes increase the risk of river flooding along the Thames, putting pressure on defences that were built for a different climate. Although the palace itself is protected by substantial river walls and embankments, it sits within a stretch of the Thames where flood risk is expected to rise. Home Park, 750 acres of ancient royal parkland, functions as a natural floodplain, but may face more frequent and severe inundation as rainfall intensifies. Across the Twickenham constituency of which Hampton Court Palace is a part, the number of properties at risk of river flooding and surface water flooding could increase by a third by 2050 (33% and 32% respectively).[24]

At the same time, London is projected to be the UK's epicentre of rising urban heat. Summers will become hotter and drier, with heat stress and drought placing strain on Hampton Court Palace's famous gardens and wider estate. These combined pressures mean the palace must contend with both the physical risks of flooding and the longer-term stresses of heat, drought, and water scarcity, threats that carry significant implications for a site whose gardens play a central role in welcoming hundreds of thousands of visitors each year.

The bigger picture for West London

The situation is part of a broader issue facing London. In the updated Thames Estuary 2100 plan, the Environment Agency recognised that flood defences upstream of the Thames Barrier, including in West London, will need major upgrades by 2050, 15 years earlier than originally planned.[25] London's Climate Resilience Review concluded that of the 126 kilometres of defences west of the Barrier, only around 7% are expected to remain high enough to provide protection beyond mid-century.[26]

To make matters more complicated, the Environment Agency owns just 12% of these defences, leaving most responsibility with private landowners. Unless these gaps are addressed, properties and landmarks along the Thames, Hampton Court Palace included, will become increasingly vulnerable.

Hampton Court Palace in Richmond.
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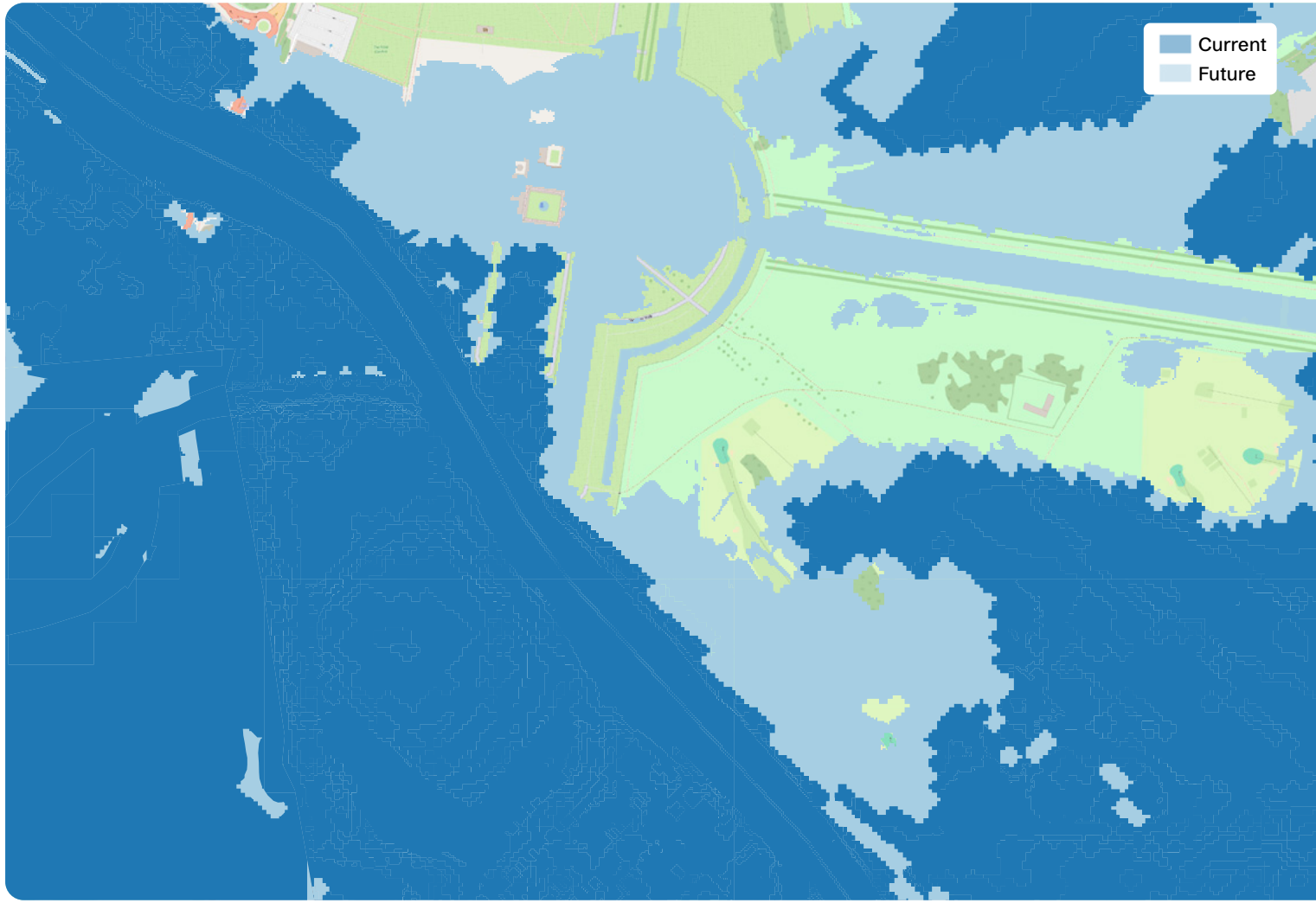
Climate-resilient gardens

Within its grounds, Hampton Court Palace is already adjusting to some of these changes. Garden teams are introducing more drought-resistant plants, a 'no dig' approach to soil management, and more perennial planting schemes. These are measures designed to keep the grounds thriving in hotter, drier summers and during periods of heavy rainfall. Yet gardens are only one part of the equation. Protecting the palace in the decades ahead will depend on the upkeep and renewal of wider flood defences across West London, requiring collective action between landowners, local communities, and government agencies.

Adapting heritage in a changing landscape

Hampton Court Palace embodies centuries of history, and its future will be shaped by how effectively today's flood and climate risks are managed. Only with sustained investment in defences and careful adaptation of its grounds and infrastructure, can one of Britain's most famous palaces continue to live alongside the natural forces that have shaped its landscapes for generations.



Case study

Cardiff Bay, Cardiff

Supporting vulnerable communities around the iconic seafront

Home to the Senedd, the first parliament in the world to declare a climate emergency, and a growing population, Cardiff Bay is a symbol of transformation. Once a working dockland, it was reimagined in the late 20th century as a dynamic civic and cultural destination, surrounded by residential neighbourhoods. But behind the progress lies a mounting climate challenge: rising sea levels and more extreme weather are placing growing pressure on the systems designed to protect the city.

An exposed waterfront

Cardiff's exposure was made clear during Storm Dennis in February 2020, one of the most severe weather events to hit the UK in recent history. In just 48 hours, Cardiff experienced more than a month's worth of rainfall, pushing the River Taff to its highest level in over 30 years, exceeding the previous peak set in 1979 by around 80 centimetres. While residential flooding was limited compared to other parts of South Wales, the storm served as a stark warning of Cardiff's vulnerability to climate-driven flood risk.

According to Natural Resources Wales, one in seven homes in Wales is already at risk of flooding, and that figure is projected to rise by more than a third by 2050. Sea levels around Cardiff could rise by 22 to 28 centimetres by 2050, which will likely test the security of the Cardiff Bay Barrage, which manages tidal flows and reduces the threat of storm surges. River and sea flooding projections suggest that the number of properties at risk in the Cardiff South and Penarth constituency could rise by up to 46% over the next century.[27]

Vulnerable neighbourhoods

In case of another major flood event, the stakes around Cardiff Bay are high. Some of the most at-risk areas, if defences were to fail, are also among Cardiff's most densely populated. These neighbourhoods are home to diverse and vibrant communities, including a high proportion of low-income households. In these settings, the impacts of flooding on health, housing stability and financial resilience are often deep and long-lasting. Proactive measures are crucial to protecting those in greatest need.

After the warning of Storm Dennis, the city updated its protocols around the Cardiff Bay Barrage, improving its future efficacy. But the protection it offers depends on continued maintenance, and many of the Barrage components are more than two decades old. With obsolescence a growing concern, the risk of rivers overtopping or drainage systems being overwhelmed could increase significantly.

A late afternoon in Cardiff Bay with a dark sky over the old Pierhead building.

Community collaboration

In this context, communities have been stepping up to improve resilience and prepare for future weather events. In nearby Pontcanna, residents have created a community flood plan, supported by the Welsh Government. Their plan includes:

- A register of residents who may need support in an emergency
- Appointed Flood Wardens to coordinate alerts and check on neighbours
- Agreed evacuation routes and emergency supply points
- Essential contacts for emergency services and utilities
- Regular flood drills and simulations to keep plans current and effective

The Welsh Government is encouraging efforts like this by providing templates, guidance and a mechanism to test plans using a digital flood simulation.

Initiatives like that of Pontcanna show that resilience isn't just built with concrete, it's built in communities. With both physical and social systems under pressure, Cardiff's flood preparedness will depend as much on neighbourly coordination as on national infrastructure investment.

Aerial view of Cardiff Bay lagoon.
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Case study

Liverpool waterfront, Liverpool

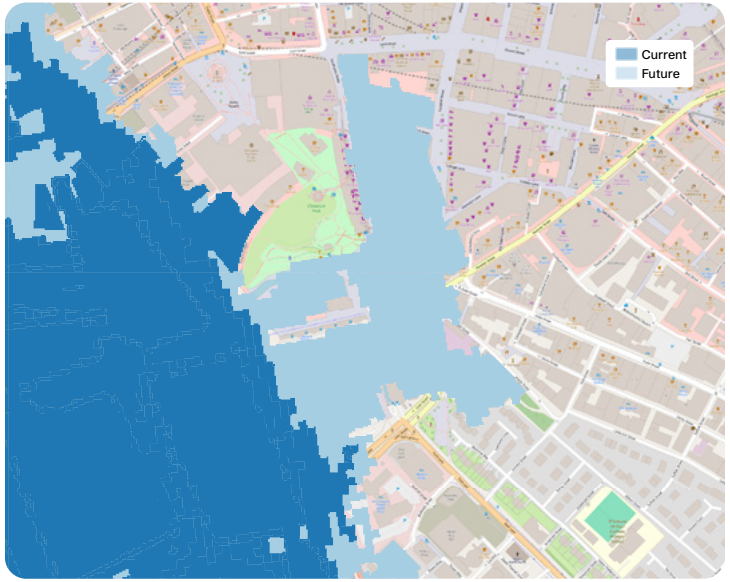
Climate threats to a vibrant tourist economy

Liverpool is one of the most visited cities in the UK, with tourists drawn by the city's industrial history, cultural significance and vibrant contemporary life. The city's visitor economy contributes around £6 billion a year to the UK economy, including by creating nearly 60,000 jobs.[28] The city's waterfront is one of the most popular destinations for visitors, home to the Tate Liverpool Museum and many businesses including restaurants, hotels, and creative industries. The city's waterfront attractions, however, are increasingly vulnerable to environmental risks.

Future flood risks on the Mersey estuary

Liverpool's location on the River Mersey estuary exposes it to multiple flood risks: tidal flooding from high tides and storm surges, surface water flooding during intense rainfall, and the potential for drains to be overwhelmed.[29] Historically, parts of the city experienced severe flooding in 2010 and 2020, and the winter of 2013/2014 saw a series of storm events impacting the coastline.[30] Throughout these events the waterfront itself was safeguarded by its various elevated quay structures and local flood defences, including sophisticated dock walls and sea barriers.

However, climate change projections suggest challenges lie ahead. By 2050, sea levels are projected to rise by up to 40cm, and by as much as 1 metre by 2100, and climate models suggest that storm surges in the Irish Sea may intensify, posing additional risk.[31] In addition, rainfall is expected to be more frequent and intense – up to 40% heavier by the 2080s. As a result, Liverpool's waterfront will fall within an increasingly high-risk tidal flood zone.



Liverpool waterfront.
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Preparing businesses and communities

These threats pose a particular challenge for Liverpool's businesses, whose reliance on the infrastructure and visitors of the dock could lead to them being disproportionately affected by any potential future damage or lack of access. Having clear plans for business continuity, property-level protection and tourism contingency plans will be crucial.

Local authorities across Liverpool are working to future-proof the city through climate-resilient planning. This includes requiring site-specific Flood Risk Assessments for building developments in higher risk flood zones, prioritising sustainable drainage systems, and integrating climate projections into urban planning. The Environment Agency and city partners plan to revise river maintenance standards and climate modelling for main rivers and watercourses.[32] The authorities have also suggested developing emergency response and evacuation plans for vulnerable zones.

Building awareness and shared preparedness will be key to safeguarding Liverpool's economic contribution and cultural heritage long into the future.

In July 2022, the "Merseyside Totemy" public art installation was unveiled near Princes Dock. Created by artist Alicja Biala, the three totems (each 4.5m tall) illustrated how much land in Liverpool, Birkenhead, and Formby could be submerged by 2080 under high sea-level scenarios:

- 4% of Liverpool City Centre
- 45% of Birkenhead
- 82% of Formby

Each totem featured rusted steel segments and QR codes linked to interactive sea-level rise data, developed in partnership with Liverpool John Moores University.
The installation aimed to make climate science tangible and local for public audiences.[33]

Case study

Red House, London

Cracks appearing across London

Red House and its gardens in London's Bexleyheath are a national treasure: home to William Morris, founder of the Arts and Crafts movement, designed by the famous architect Philip Webb, and once described as the most beautiful place on earth. However, having stood strong for over 165 years, the ground is shifting beneath this iconic landmark.

Houses built on clay

Red House, like much of London, is built on soil containing large amounts of London Clay. This soil is highly susceptible to subsidence caused by shrink-swell movements as the ground becomes wet and dries out. This movement can cause foundations to shift, walls to crack and building instabilities to develop.

These kinds of issues have been carefully monitored and managed at Red House for at least two decades. Over the years, cracks have appeared both internally and externally, disturbing the beautiful facades of the building's exterior and threatening some of the stunning murals within. The building's shallow foundations are likely a contributing factor, as well as the softening of the soil caused by poor surface water drainage, which left the property vulnerable in conditions of rain or flood. It's also expected that seasonal movement caused by nearby tree roots has also had an impact on the building's stability.

This picture is concerning, but also highly common across London, with its vulnerable soil and historic buildings. Much of the London population lives in homes that are more than 100 years old, and many homeowners will be familiar with the challenges faced by Red House.

Future subsidence across the South-East

Climate change is causing greater periods of heat and drought, as well as more intense rainfall. This exacerbates the impact of shrink-swell subsidence, increasing risk for properties like Red House. In Bexleyheath, high temperatures in summer could rise by up to 3°C by 2050, with up to 53% less summer rainfall than we see today.[34] In conditions like this, heavy rainfall, when it does come, will likely have an exaggerated impact on subsidence and building stability. This change in heat and rainfall is projected to vastly expand the area of England at risk of subsidence in 2050, stretching out beyond just the South-East and putting an additional 1.4 million properties at risk.

A proactive monitoring approach

With the risks of climate change already clear and the impacts visible across the property, the National Trust team at Red House is taking a proactive and thoughtful approach. Over the past decades, steps have been taken to protect the property from the subsidence threats it faces, including both reactive responses to cracks and proactive measures to improve resilience.

Most recently, a "land drain" has been installed to deal with surface water. This type of drain allows water to seep easily through a layer of gravel before being collected and moved away through an underground pipe, reducing the risk of saturated soils causing instability. The National Trust plans to carry out more work later this year to further improve drainage. Trees have also been carefully managed, and any movement at the property remains under active monitoring.

For properties of this age and significance, it is crucial to balance ongoing structural needs with the historic and artistic value they represent. The process of maintenance is an ongoing dialogue between these equally vital priorities.

Red House internal.
©Hannah Silva

Case study

Charlecote Park, Warwickshire

Adapting to a challenging new normal in Shakespeare country

Charlecote Park in Warwickshire is a grand 16th-century estate, owned by the National Trust and open to the public. William Shakespeare is famously said to have poached deer from its grounds, an act believed to have inspired scenes in The Merry Wives of Windsor. Today, the estate is facing a different kind of drama: the escalating impacts of climate change.

Located on a natural floodplain, Charlecote Park has long managed a certain amount of seasonal flooding. But in recent years, the scale and frequency of flood events have increased sharply. Between 2023 and 2024, the park experienced five major floods, leading to 24 days of closure, including over peak periods like New Year's Day and Good Friday. At one point, only 9% of the site remained accessible, as fast-moving and concealed waters made many areas unsafe. In total, the damage exceeded £246,000. The toll has not just been financial but physical; after the most recent flood, staff and volunteers cleared over 70 trailer loads of debris, a reflection of the effort now routinely required to recover from a flood event.

Flooding on the horizon

These pressures are only expected to grow. By 2050, the local climate is projected to bring wetter winters, hotter and drier summers, and more intense storms. The combination of heavier rainfall and prolonged dry spells will test both infrastructure and natural systems, while more extreme weather events will leave less time to recover between impacts. This means that the estate's low-lying meadows, car parks, and main access routes could be submerged multiple times a year.

This will pose growing risks to visitor safety and disrupt day-to-day operations. If left unaddressed, Charlecote could face a future in which whole sections of the estate, including parts of its visitor offer, conservation work, and grazing land, are regularly out of action. For a site deeply rooted in heritage and reliant on public access, this would represent a profound operational and cultural shift. The risks posed require Charlecote to fundamentally rethink how the site operates and is cared for in the new normal.

Gardens grounds house and estate, Charlecote Park.
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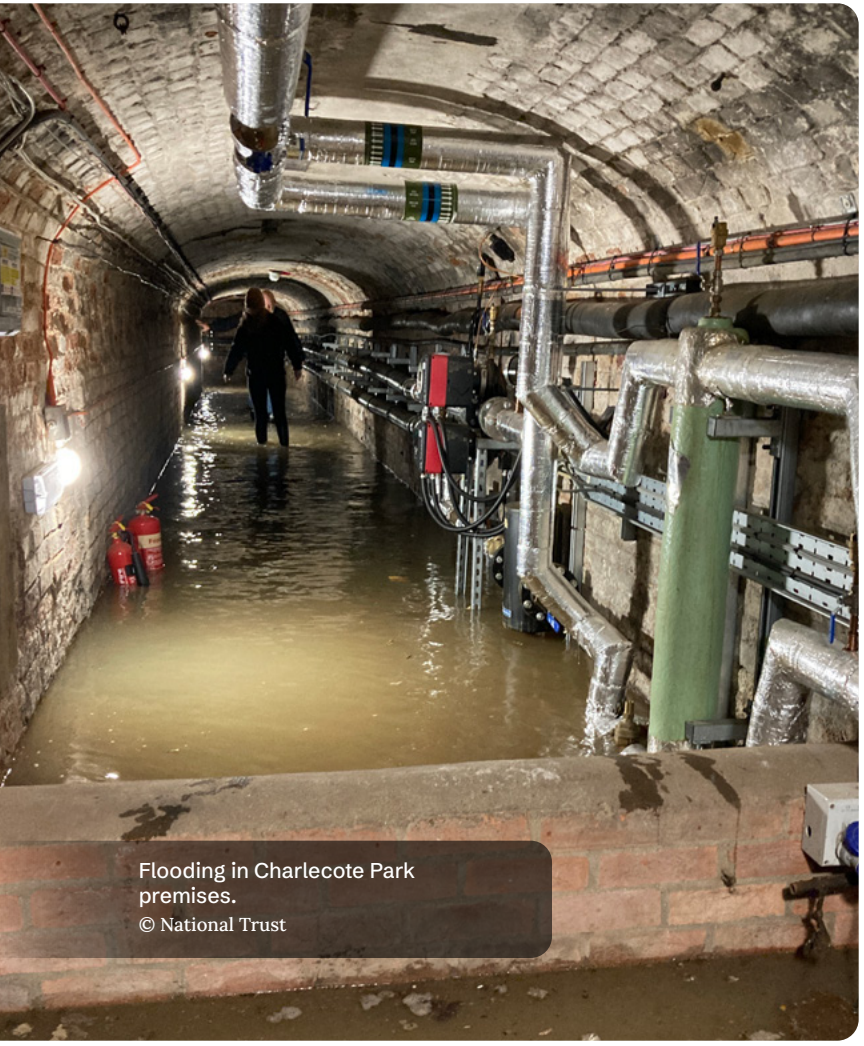

Flooding in Charlecote Park premises.
© National Trust

Adapting the business

The good news is that Charlecote Park is doing just that. The site is also being reorganised into separate visitor zones, so areas that remain dry can stay open even when others are affected, keeping disruption low and visitors safe. Climate risk now shapes everyday decisions, from how access routes are maintained to how grazing and conservation activities are planned. Visitor events are being rescheduled to avoid months most prone to flooding, while new income streams such as off-site partnerships and digital programming are helping reduce reliance on visitor numbers during wetter periods.

Flood resilience upgrades to the building are also underway, with practical improvements including rainwater harvesting to ease pressure on drainage and upgraded culverts and runoffs to manage heavy rainfall. A new lightning protection system is being installed too, as warmer temperatures will increase the likelihood of lightning strikes. Together, these actions reflect a shift from reactive recovery to proactive adaptation, building resilience into the fabric of how Charlecote Park operates.

While flood adaptation is underway at a property level, broader work is ongoing to reduce the severity of future flooding in the first place. Nature4Water, a catchment-wide programme led by Severn Trent, Warwickshire Wildlife Trust, and the Environment Agency, focuses on restoring natural water systems across the River Avon catchment.[35] By creating wetlands, improving soil health, and other nature-based solutions to hold and slow rainfall, the programme is helping reduce flood risk downstream, including at vulnerable sites like Charlecote Park.

Charlecote's experience shows that resilience is no longer about bouncing back; it's about adapting with foresight, flexibility, and care. And at the heart of that shift are the people, staff, volunteers, and communities, working each day to shape a new normal.

> "Our approach to resilient flood management is not just about adapting buildings, but adapting our business strategy. By taking a holistic view of every aspect of our work, we've been able to provide the best visitor experience in the context of a changing climate, as well as support the team to make good choices for the long-term preservation of this special place."
>
> **Rebecca Watson**
> General Manager, Charlecote Park

Case study

Giant's Causeway, County Antrim

Eroding a Northern Irish icon

Set against Northern Ireland's wild Atlantic Ocean, the Giant's Causeway has stood for 60 million years, drawing attention from scientists, storytellers, and visitors alike. Known for its striking basalt columns and rich geological history, the site has been shaped by natural forces. However, as the climate changes, so does the pace and severity of these forces, placing new pressure on the landscape, infrastructure, and long-term conservation of this globally recognised site.

Accelerating risk

The coastline is inherently dynamic, a reality brought sharply into focus in August 2025 when a rockfall in the "Loom" area prompted a temporary closure. While such events are often small and part of the site's natural erosion cycle, they highlight its vulnerability. Heavy rainfall events are the primary trigger for these slope failures, and scientific surveys have mapped persistent instability along sections of the cliff. These conditions, coupled with the high visitor numbers the site attracts each year, mean that managing safety while preserving access is a constant challenge.

By 2050, Northern Ireland's climate is projected to bring wetter winters, hotter and drier summers, and more frequent extreme weather events. Along the Antrim coast, sea levels could rise by 30 to 40 centimetres, pushing storm surges and high tides further inland and increasing the force of wave impacts on the base of the cliffs. Even a modest rise could accelerate erosion, undermine rock stability, and submerge sections of the lower path network, limiting access to some of the site's most iconic features. The basalt cliffs, while naturally resistant, are not immune to change. Increased winter rainfall may make slope failures more seasonal, while the combined pressures of the sea below and fluctuating temperatures on land could damage access routes and viewing areas.

Monitoring the situation

The National Trust currently uses hazard mapping and climate risk assessments to identify areas most vulnerable to landslides and shoreline retreat. Building on this, it is now planning to use more sophisticated and regular Light Detection and Ranging (LiDAR) monitoring at the Giant's Causeway to gain deeper insights into erosion rates and emerging weaknesses. This data-driven approach will shape decisions on how visitor routes are maintained, how cliff edges are monitored, and how the site can be adapted to safeguard public access for the future.

While the Causeway's ancient stones appear unchanged, the surrounding coastline is in constant motion. Adapting to that reality will require foresight, flexibility, and ongoing investment, ensuring that future generations can continue to stand on this remarkable landscape and experience both its geological wonder and its cultural significance.

For Northern Ireland, it's a powerful example of how even the most resilient natural icons must adapt in a changing world.

Giant's Causeway at sunset in Northern Ireland.
© Uwe - stock.adobe.com

Case study

Edinburgh Castle, Edinburgh

Flooding on the high ground

Edinburgh Castle is one of Scotland's most iconic landmarks, perched in a commanding position on Castle Rock, overlooking the city below. It may therefore be surprising that, in July 2021, this hilltop fortress was flooded. An intense and sudden downpour overwhelmed the Castle's historic drainage systems.[36] Rainwater cascaded across paved walkways and courtyards, funnelling into narrow channels that were never designed to cope with modern rainfall volumes.

The result was water ingress into the Palace block, impacting the decorative scheme and triggering emergency response protocols. This event was a sobering reminder that even high ground is not immune to flood risk.

Surface water flooding futures

Surface water flooding is now recognised as one of the most pressing climate risks across the UK. Edinburgh Castle's vulnerability arises from a combination of impermeable surfaces, steep gradients and ageing drainage infrastructure. In heavy storms, water quickly builds up, with nowhere to go.

The castle's flood risk reflects broader patterns across the city where, in many areas, surface water is a significant contributor to flood risk. Across Scotland, surface water flooding accounts for around 23% of flood-related damages.[37] In densely populated areas of Edinburgh, flash flooding has repeatedly closed roads and affected local businesses, despite no nearby river.

This risk and the potential for damage will continue to increase. Peak rainfall intensities in Scotland are projected to increase by 10–20% by 2050, meaning short, high-volume events like the 2021 storm are likely to become more frequent and more severe.[38] In a city defined by its steep hills and paved historic areas, managing this runoff will become increasingly complex. Drainage systems built in the 19th century or earlier are often unfit for the pressures of a 21st-century climate.[39]

A co-ordinated response

In response, City of Edinburgh Council is pursuing a multi-pronged strategy. It has undertaken a flood risk assessment for the World Heritage Property to understand the areas at risk under current and 2050 climate conditions using hydrological modelling. In planning, it has mandated that all major developments incorporate sustainable drainage systems and account for the most extreme rainfall scenarios.[40] In its approach to development, it is expanding the city's "blue-green infrastructure" – the linking up of parks, trees, rain gardens and wetlands to promote stronger ecosystems and absorb water where it falls.[41]

On the other hand, Historic Environment Scotland (HES) published an initial assessment of climate change risk to the Properties in Care in 2018, which has informed ongoing monitoring, and is currently developing a new climate change risk assessment with partners, based on new and improved data. At the Castle, HES is working with climate adaptation partners to assess vulnerabilities and design targeted improvements.

This adaptation work forms part of a broader vision for a climate-resilient and future-ready Edinburgh. Central to this vision is the Climate Ready Edinburgh Plan 2024–2030, which unites public agencies, researchers, and local communities to deliver the actions set out in its Implementation Plan.[42] The Plan sits within the framework of the City of Edinburgh Council's 2030 Climate Strategy, supporting the city's ambitious goal of achieving net zero emissions by 2030.

A city so steeped in history, and vulnerable to even the most unexpected climate threats, is working together to create a more sustainable and resilient future.

Edinburgh Castle.
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Case study

York city centre

Building natural resilience upstream

York, a historic cathedral city of over 200,000 residents, sits at the confluence of the Rivers Ouse and Foss. Its compact medieval centre is a cultural and economic hub, but one that lies mostly within a floodplain. The city has long been vulnerable to both river and surface water flooding, with dense housing, key infrastructure, and numerous listed buildings at particular risk. These vulnerabilities mean the solutions to York's flood problems can not only come from the city itself but must be proactively sought in the natural environment upstream.

A history of flooding, a future of risk

York's most significant recent flood was Boxing Day 2015, when over 600 properties were inundated, businesses were closed, and transport networks disrupted. Six months later, a third of affected businesses were still shut.[43] In response, a major flood defence programme was launched, with around £100 million invested, including upgrades to the Foss Barrier and strengthened embankments. These measures provide vital protection to thousands of homes and businesses, buying the city time to adapt and plan for future challenges.

But climate projections show winters becoming wetter, with heavier downpours driving higher peak river flows and surface water pressures.[44] Without adaptation, the scale and frequency of flood events are expected to rise significantly over coming decades. Looking beyond the current programme, simply raising walls higher will not be enough. New approaches are already being developed along hard defences to create a more sustainable, long-term strategy.

While the river poses the greatest threat, York also faces surface water risk. By 2050, there is projected to be a rise in peak rainfall events of up to 15%, with higher temperatures also leaving the ground susceptible to flash floods.[45] Like many historic cities around the UK, drainage was not designed to cope with the climactic conditions of the 21st century. By mid-century, surface water flooding is expected to increase significantly, making sustainable drainage and adaptation in urban areas a growing priority for the council. The number of properties with surface water flood risk in the York Central constituency is projected to rise by 30% by 2050, an additional 2,375 properties.[46]

Natural adaptation upstream

Both York City Council and North Yorkshire Council are highly active in adaption. This includes upgrades to defences, pumping stations and drainage upgrades to more effectively deal with surface water. But the location and historic nature of York mean that changes need to happen more proactively, before water even makes it to the city.

For this reason, a major focus is on natural flood management solutions upstream of York, across the river Ouse and its tributaries. The Ousewem project, part of Defra's £200M Flood & Coastal Resilience Innovation Programme, is helping York and North Yorkshire to plan for the future.[47] Using advanced data modelling and on-the-ground trials, Ousewem is building a strategic approach to natural flood management, bringing scientific evidence and community input together to guide investment and long-term decision making.

These nature-based solutions include tree planting, leaky dams and scrapes: interventions that collect and slow surface water. These hold water back in the landscape, reducing flood risk downstream. Ousewem is working with its partners, including the University of York, to measure and evidence these benefits, so they can inform policy and future investment.

Back in York, this careful thinking and hard work is delivering a more flood-resilient city. The people that live there have always been engaged with the seasonal challenge of their river. Today, community groups come together to create flood plans, and educational experiences like the upcoming York Rivers Trail are helping ensure the next generation understands the risks and solutions to the city's relationship with the water.[48] This is an ancient city on the edge of the river looking firmly to the future.

"Hard defences alone are not enough – York's long-term flood resilience depends on upstream natural solutions that also benefit people and nature."

Mark Henderson,
Flood Risk Manager, City of York Council

Flooding on the River Ouse, York, England, UK.
© Christopher Keeley - stock.adobe.com

Flooded street from Storm Eunice.

6

Summary

What can you do

While some key actions for protecting our communities are the responsibility of government, developers, landlords and community leaders, there are many actions that we can all take to be part of creating a more climate-ready future.

You can visit the Aviva website for more information and advice to help you get ready for and deal with the impacts of all of the climate change threats covered in this report.

Understand your own property risk

You can access information and flood maps for your property's current and projected future flood risk using simple and freely-available government tools (England, Scotland, Wales and Northern Ireland each has its own tool). You can also think about how heavy rainfall and flooding currently affects your property: are there particular areas that flood, or where you see water collecting or flowing? Could these, in an extreme weather event, cause problems for your home?

Subsidence is far more prevalent on clay-based soils, so understanding what soil your property is built on is important. You can look out for signs that your property might be at risk, including cracking in the walls, doors or windows becoming misaligned, or large trees growing very close to the property.

Your experience of extreme heat in summer months may guide you as to whether it poses a health risk in your home, particularly considering any vulnerable people who may live there.

Understanding your risks is an important first step in taking action. Aviva has produced a series of tables which outline the risks from flooding, subsidence and heat by constituency. Further information on how to use the tables is provided here.

Make a plan

Flood and extreme heat are threats that appear quickly, so planning ahead is vital. The UK government provides resources on what to think about and gather together before a flood event happens, and provides a template for a personal plan, a community plan and a business plan. The NHS gives advice on how to cope in hot weather, with particular focus on vulnerable people.

Explore resilience measures at home

Depending on the risks your property faces, a range of resilience measures might be appropriate to install. Adapting your home or business can be hugely cost-effective, not only in helping avert disasters, but also because in many cases there are low-cost solutions. For flood, these include raising electrical sockets in higher-risk areas of the building, fitting non-return valves on toilets, installing flood gates and fitting airbrick covers or self-closing airbricks to avoid water getting in. A directory of practical property flood resilience (PFR) measures can be found on the Flood Mary site.

In the case of subsidence, it is important to be vigilant to warning signs if your property is in a high-risk location. In addition, managing trees and plumbing to ensure the stability of the soil under your property is key.

Trees and large shrubs should be planted at a safe distance from the property, should be pruned regularly, and should ideally be species with lower water demand. You should also think about surface water drainage, ensuring there is no water pooling near your home's foundations and keeping drains clear and operational. If you're considering renovations or extensions, consider a structural survey to evaluate soil types and groundwater conditions and design your works accordingly.

If your property and those who live there suffer during times of extreme heat, there are various resilience measures that can be installed, including internal and external sources of shade that keep the heat out without the need for electric-powered cooling. These include

blackout blinds, external window shades, use of planting and installation of solar-reflective films. Many of these solutions are suitable for both homeowners and renters, depending on tenancy contracts. A full list of heat resilience measures is available from the Red Cross.

Making your outside spaces more climate-resilient

Our gardens and driveways can help to improve your property's resilience to extreme weather but it's also important that they don't increase the risk of a flood or subsidence.

Making room for cars or opting for low maintenance gardens are common choices, but these changes can often increase the risk of flooding caused by heavy downpours. Urban areas can be most at risk and a lack of green space can leave rainwater with nowhere to go when the drains are overwhelmed. If you are thinking of making changes to your outside space, consider more flood resilient alternatives, including using permeable materials, such as gravel, installing drains or planting borders to allow rainwater to reach the ground.

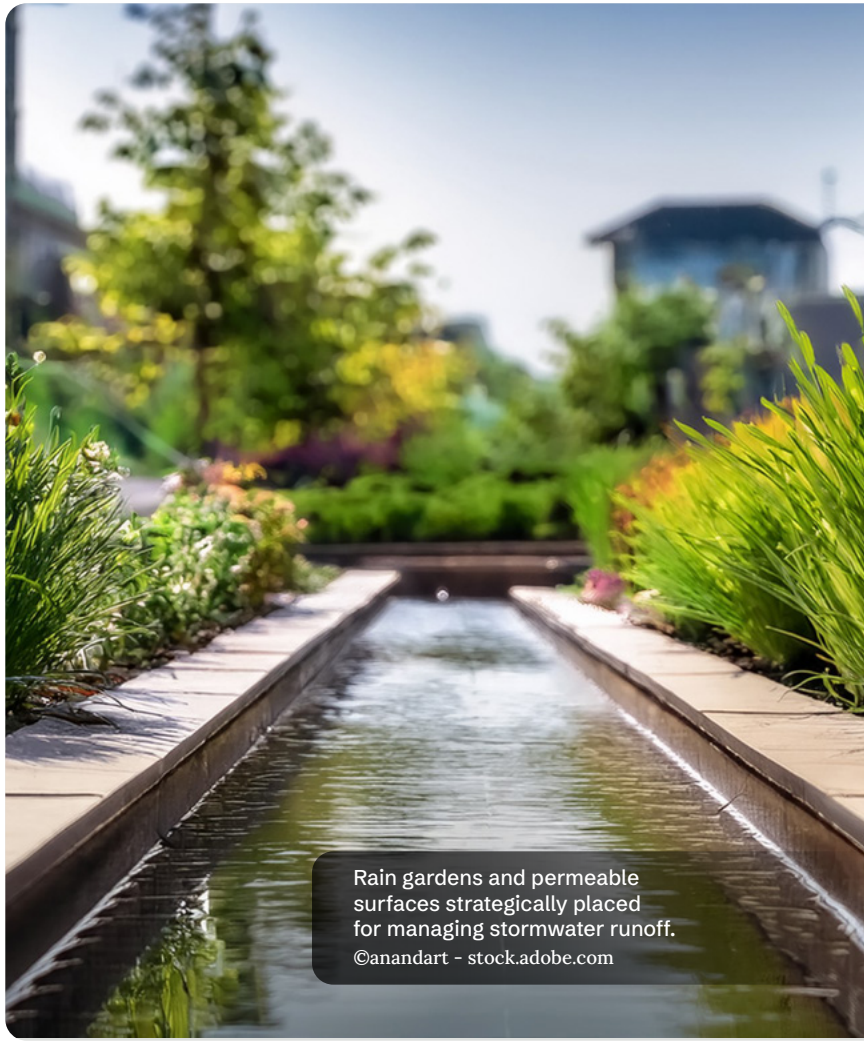
Planting can provide many benefits, but it is important you choose the right plants in the right place. Some tree varieties are more likely to cause problems to properties due to their long, fine root structures. This can cause subsidence in a property, with the best solution, weighing up complex factors including environmental, financial, legal and emotional impacts, often being to remove the tree or planting. The alternative is usually high-impact and disruptive engineering projects that also have the potential to increase property insurance premiums.

Therefore, try to make sure you don't plant trees or large shrubs too close to properties, including garages or outbuildings. A suitable distance will depend on the type of subsoil, variety of tree and depth of foundations, so if in any doubt, check with an expert.

Get involved in community resilience programmes

Many communities around the UK have local resilience programmes and groups that are taking direct action to adapt and prepare for climate-related events like flood and heatwaves. In this report there are many examples of good work being done by these kinds of groups, including putting in place nature-based solutions to flooding, installing local flood protection, and building the relationships and processes needed to help vulnerable people when these events occur.

These groups are often organised at a local or regional level, and there is no national database. However, searching for climate resilience or flood preparedness groups in your area, or otherwise contacting your regional Local Resilience Forum (LRF), are good places to start.



Rain gardens and permeable surfaces strategically placed for managing stormwater runoff.
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What Aviva is doing to support resilience

In this report we have highlighted the importance of resilience against growing climate change impacts, and some of the excellent work already being done across the country to ensure cities and landmarks are climate-ready. However, over the coming years and decades, these impacts will affect all of us. With over 25 million customers, at Aviva we recognise that we have an important role to play in helping the UK get ready and take action against future climate risks.

Aviva was one of the first insurers to sign up to the Flood Re Build Back Better scheme,[49] and we have supported over 400 customers through the programme since it was launched in 2023. The scheme provides up to £10,000 to help eligible customers who have had a flood claim restore their property to a more resilient state than before the flood, including by installing property flood resilience measures such as flood doors, barriers, non-return valves, and garden adaptations to increase resilience. We are also exploring and developing innovative new approaches to property resilience to support our customers to upgrade their homes.

We are also investing in prevention measures to help avoid flood events in the first place. Working with partners across the UK, we have pledged more than £80 million towards nature-based solutions projects which capture carbon, contribute towards flood resilience and help to restore natural habitats. These programmes help communities directly and also act as case studies to encourage wider action: our flood risk projects in Norfolk demonstrated a 17:1 return on investment in risk reduction, and a blueprint for others to replicate.[50]

We're collaborating with property flood resilience data experts Resilient Planit to support customers in flood risk areas to prepare for future flooding. Soon, customers will be able to sign up to a free app - Resilico Connect - which provides access to flood alerts, guidance on creating a flood plan, and actionable steps to protect their property. How customers engage with the app will provide valuable insights into their needs and behaviours around flood preparedness and resilience, helping us better support them in the future.

This kind of action is particularly necessary given that Flood Re, the UK national flood reinsurance initiative, will end in 2039. Flood Re was always intended as a temporary measure to allow for adaptation and resilience measures to be put in place. Without action to do so, there is risk that the ending of Flood Re will lead to uninsurable properties and unaffordable flood insurance.

In dealing with subsidence, we are committed to seeking the most effective, convenient and low-carbon ways to manage risk and claims. With this in mind, we have funded a three-year programme with the University of Birmingham to understand the impacts and viability of Electro-Kinetic Stabilisation; an exciting new technology that can potentially help stabilise soil with minimal impact on the environment and the lives of our customers.

This action is part of our Aviva Sustainability Ambition, which focuses on climate action, social action and being a sustainable business. In 2021, we announced our ambition to become Net Zero by 2040, the first major insurance company in the world to do so, and we are committed to playing our part in the collective effort to enable the global transition and promote resilience.

Find out more about our sustainability ambition and action at www.aviva.com/sustainability.

Aviva case studies

Slowing the flow in the River Soar catchment

Aviva is working with Trent Rivers Trust and WWF UK on upstream land to reduce flooding across the catchment of the River Soar, a major tributary to the River Trent in Leicestershire. Interventions include those aimed at slowing the flow of water, lowering embankments to increase access for local people to the river and creating habitats for local wildlife. Together, these interventions are having a significant economic impact, with the potential to save up to £20 million per major flood event in the catchment.[51]

Ensuring a Wild Ingleborough

Aviva has worked with WWF UK on a project called Wild Ingleborough which aims to promote biodiversity at this Yorkshire landmark through a range of restoration activity. This includes connecting woodlands through tree planting, restoring ancient blanket bogs, and ensuring a home for the incredible wildlife of the region. The work will also help protect against flooding, improve water and soil quality, and enable more carbon to be absorbed into the land.[52]

7 Appendix

Scorched grass at Rammey Marsh, Enfield, London, after wildfires.

Methodology

Various data points throughout the report, including maps and related data points contained in the macro context section, derive from Aviva's own calculations and mapping analysis. The methodology used in these calculations is detailed below.

Data sources and details

UK property data set

Topic	Source	Details
UK property data set	Addressbase	Uses Ordnance Survey data
Constituency boundaries	Office for National Statistics	Uses Ordnance Survey data

Climate risk data sources

Topic	Source	Details	Climate change scenario
England Flood	EA	2050s Epoch (2040–2069)	UKCP 18 RCP 8.5
Scotland Flood	SEPA	Rivers: 2080 (2070–2099) Coastal 2080 or 2100 Surface Water and Small Watercourses 2070	River and Coastal Flooding UKCP09 High Emissions Scenario Surface Water and Small Watercourses UKCP18 RCP8.5 Coastal flooding (Outer Hebrides and Loch Etive) UKCP18 RCP8.5
Wales Flood	NRW	2120	UKCP18 RCP 8.5 Peak river flows and extreme rainfall UKCP09 High emissions
UK Heat	UK Climate Resilience Programme	2031-2060	UKCP18 Regional RCP8.5
England, Scotland and Wales Subsidence	BGS	2050s (2045-2055)	UKCP09 Medium emissions projections

Flooding

- Both river/coastal and surface water flooding analysis use current and future projected flood data from all UK nations except Northern Ireland (see table). Medium and above risk level used in current and future scenarios. Please note each nation has a different future scenario timescale so the data sets are not comparable.
- Scenarios mapped and cross-referenced with UK property address data.
- Each nation divided into 10km hexagons and number of properties with flood risk recorded for each.
- Map created to show shading for percentage of properties in each hexagon that suffer flood risk in each scenario. For river/coastal flooding, scale created with minimum 0% of properties and maximum 15+% of properties suffering flood risk. For surface water flooding, scale created with minimum 0% of properties and maximum 20+% of properties suffering flood risk.
- For each nation, the scale used is slightly different in order to allow all maps to be shown together. For this reason, and because of different future scenario timelines, the maps of each nation are not comparable.
- Political constituencies mapped across the same data set to produce constituency-level data tables.
- Northern Ireland has been omitted due to lack of availability of up-to-date climate change flood projections.

Subsidence

- Uses current and future projected subsidence risk across England, Scotland and Wales (see table, Northern Ireland is not included in the data set). Medium and above risk level used in current and future scenarios.
- UKCP09 data set used in order to rationalise 2050 timeline with EA flood data and align with the general scope of this report. The outputs do not, therefore, contain the advanced modelling of UKCP18, but the two projections are “broadly consistent… both show increased chance of milder, wetter winters and hotter, drier summers” (BGS).
- Map created to show extent of subsidence risk across present and future scenarios.
- Scenarios mapped and cross-referenced with UK property address data.
- Political constituencies mapped across the same data set to produce constituency-level data tables.

Heat

- Uses “Maximum temperature” indicator and “°C Change” (see table). Data collected in 12x12 kilometre squares.
- Map created to show average maximum temperature in each square across the UK, in relation to the 1981–2010 standard normal.
- Data cross-referenced with UK property address data.
- Political constituencies mapped across the same data set to produce constituency-level data tables.

References

1 https://www.gov.uk/government/publications/national-assessment-of-flood-and-coastal-erosion-risk-in-england-2024/national-assessment-of-flood-and-coastal-erosion-risk-in-england-2024

2 For a summary of data sets used, see Methodology

3 https://www.gov.uk/government/publications/national-assessment-of-flood-and-coastal-erosion-risk-in-england-2024/national-assessment-of-flood-and-coastal-erosion-risk-in-england-2024

4 Environment Agency publishes major update to national flood and coastal erosion risk assessment - GOV.UK

5 https://www.gov.uk/government/publications/national-assessment-of-flood-and-coastal-erosion-risk-in-england-2024/national-assessment-of-flood-and-coastal-erosion-risk-in-england-2024

6 Aviva analysis based on SEPA data. See Methodology section for details.

7 Aviva analysis based on NRW data. See Methodology section for details.

8 JBA, commissioned by Flood Re

9 https://static.aviva.io/content/dam/aviva-public/gb/pdfs/personal/aviva-edit/surveys-and-reports/building-future-communities/aviva-building-future-communities-report.pdf

10 Aviva research

11 JBA Consulting; Establishing the Cost Effectiveness of Property Flood Protection: FD2657

12 JBA, commissioned by Flood Re

13 Property Flood Resilience - Environment Agency - Citizen Space

14 Reforming our approach to floods funding June 2025.pdf

15 In Focus: How important is it for insurance to move beyond indemnity and into risk mitigation? | Insurance Times

16 Aviva/IPFRA analysis

17 For full explanation of the methodology, please see Methodology section

18 Environment Agency publishes major update to national flood and coastal erosion risk assessment - GOV.UK

19 Aviva analysis based on BGS data. See Methodology section for details.

20 Wildfire numbers this year surge past 500, as Fire Chiefs urge public caution - NFCC

21 https://www.bbc.co.uk/news/articles/c9vd79x97zlo

22 Projected increase in lightning strikes in the United States due to global warming | Science

23 https://www.aviva.com/newsroom/news-releases/2025/06/dont-be-left-high-and-dry-this-summer/

24 Aviva analysis based on Environment Agency data. See Methodology for full details

25 Thames Estuary 2100: Time to Plan and Time to Act - GOV.UK

26 https://www.london.gov.uk/sites/default/files/2024-07/The_London_Climate_Resillience_Review_July_2024_FA.pdf

27 Aviva analysis based on NRW data. See Methodology for details.

28 https://marketingliverpool.co.uk/2024/08/28/tourism-generates-over-6bn-for-liverpool-city-region-economy/

29 https://modgov.sefton.gov.uk/documents/s103507/Enc.%202%20for%20FRMP%20Liverpool%20and%20Sefton.pdf

30 https://www.theccc.org.uk/2020/04/21/how-much-more-climate-change-is-inevitable-for-the-uk/

31 https://www.theccc.org.uk/2020/04/21/how-much-more-climate-change-is-inevitable-for-the-uk/

32 https://www.gov.uk/government/collections/flood-risk-management-plans-2021-to-2027

33 https://www.totemy.org/en/10/index.html

34 https://uk-cri.org/

35 Nature4Water | Warwickshire Wildlife Trust

36 https://journals.ametsoc.org/view/journals/bams/104/10/BAMS-D-22-0196.1.xml

37 https://www.gov.scot/publications/implementation-flood-risk-management-scotland-act-2009-report-scottish-parliament-2019/pages/8/?utm_source=chatgpt.com

38 https://www.sepa.org.uk/media/jjwpxuso/climate-change-allowances-guidance_v6.pdf

39 https://www.edinburgh.gov.uk/downloads/file/32775/surface-water-management-and-flood-risk-guidance-march-2022

40 https://www.edinburgh.gov.uk/downloads/download/15361/surface-water-management

41 https://www.edinburgh.gov.uk/downloads/download/15361/surface-water-management

42 Climate Ready Edinburgh preparing for climate change – The City of Edinburgh Council

43 https://www.gov.uk/flood-and-coastal-erosion-risk-management-research-reports/evidence-on-the-costs-of-floods-in-england-and-wales

44 Appendix A - Draft Climate Change Strategy for Adoption.pdf

45 https://www.ukclimateresilience.org/wp-content/uploads/2021/11/Future_Drainage_Webinar_241121.pdf

46 Aviva analysis based on Environment Agency data. See Methodology for details.

47 https://www.ousewem.co.uk/

48 https://www.ousewem.co.uk/homepage/14/york-rivers-trail

49 https://www.insurancetimes.co.uk/news/flood-re-reveals-build-back-better-scheme/1440908.article

50 https://www.aviva.com/newsroom/news-releases/2025/06/analysis-shows-natural-flood-management-helping-to-reduce-flood-risk-in-norfolk/#references

51 https://green-alliance.org.uk/publication/adapt-to-thrive-preparing-the-uk-for-climate-change/

52 https://www.wwf.org.uk/wild-ingleborough

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Nextmap © Intermap

Marine Scotland

O'Hara Murray, R., Campbell, L. 2021. East Coast of Lewis and Harris Climatology 1.02. https://doi.org/10.7489/12042-1

Met Office

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Met Office Hadley Centre

Hadley Centre for Climate Prediction and Research (2017): UKCP09: Land and marine past climate and future scenario projections data for the UK. Centre for Environmental Data Analysis, 2012. Met Office Hadley Centre (2018): UKCP18 Time-mean Sea Level Projections. Centre for Environmental Data Analysis, 2021.

OceanWise

Ordnance Survey

Scottish Environment Protection Agency

Scottish Government

Transport Scotland

UK Hydrographic Office

Surface Water & Small Watercourses

Aberdeenshire LiDAR

Airbus

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