

Climate Ready Red Cross

Climate change risk in the UK
and the role of the British Red
Cross Crisis and Emergency
Response Service



**EMERGENCY
RESPONSE**
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Introduction

The British Red Cross exists to support those in crisis. The UK Crisis and Emergency Response (CER) service of the British Red Cross works to ensure that people are able to prepare for events as well as survive and recover when disaster strikes. Increasingly such disasters are weather and climate related. Since 2020, CER teams have responded to over 200 severe weather and environmental flooding incidents in the UK. We know that due to climate change we will continue to face extreme weather events increasing in intensity and frequency, such as floods, storms, and heatwaves.

More people will also increasingly be affected by climate impacts across the UK. That's why the British Red Cross Crisis and Emergency Response service are developing a climate change adaptation offer – to best support communities to adapt to our changing climate. Adaptation is the adjustment to and preparation for climate change and its impacts, both now and in the future.

In order to know how and where to adapt, we need to understand what risks climate change poses. This document presents a Climate Change Risk Assessment (CCRA) summarising what climate change means for the UK, the risks it could pose to communities across the nation, and the risks to our own CER service. This CCRA helps inform our Theory of Change and provides an evidence base for our work.

To identify and assess risks associated with climate change, workshops were held with British Red Cross staff and volunteers. Climate hazard screening workshops were held with eight

local area teams between May and July 2023. In addition, two sessions were held at the CER conference in Manchester 2023. These sessions identified impacts of weather and climate impacts to date, case studies, and perceptions of how impacts and risks may evolve in the future. We identified eight key climate change risks which pose the greatest risk to British Red Cross CER and the services we provide to vulnerable communities. AtkinsRéalis has supported us to quantify the identified risks using climate change projections and climate risk maps, and they have provided further details throughout this report about the impacts of risks and the people and places most vulnerable. AtkinsRéalis enhanced the risk assessment through the completion of a high level screening exercise of UK regional exposure to ten key climate hazards, followed by a more detailed definition of the eight risks of particular relevance to the British Red Cross, supported by mapping and quantitative climate modelling projections of climate variables.



Photo © Sam Atkins/BRC

Overview of climate hazards and the relevant services British Red Cross CER provides

Climate change poses a significant threat to individuals, communities, infrastructure, natural environment, and economies globally and in the UK. According to the Intergovernmental Panel on Climate Change (IPCC), the UN body for assessing the science related to climate change, Sixth Assessment Report (AR6), human-caused climate change is already affecting many weather and climate extremes in every region across the globe – with widespread losses and damages to both nature and people. Climate change is not a distant or future problem, it's happening now. That's because, our climate isn't just changing, it has already changed – even here in the UK.

Climate change sets an unprecedented challenge for the British Red Cross and our UK operations. We are already dealing with the impacts of climate change in the UK, from flooding, heatwaves and wildfires, placing an increased need for support from the British Red Cross to respond and help prepare communities. Observed changes indicating that the UK's climate is changing, include:

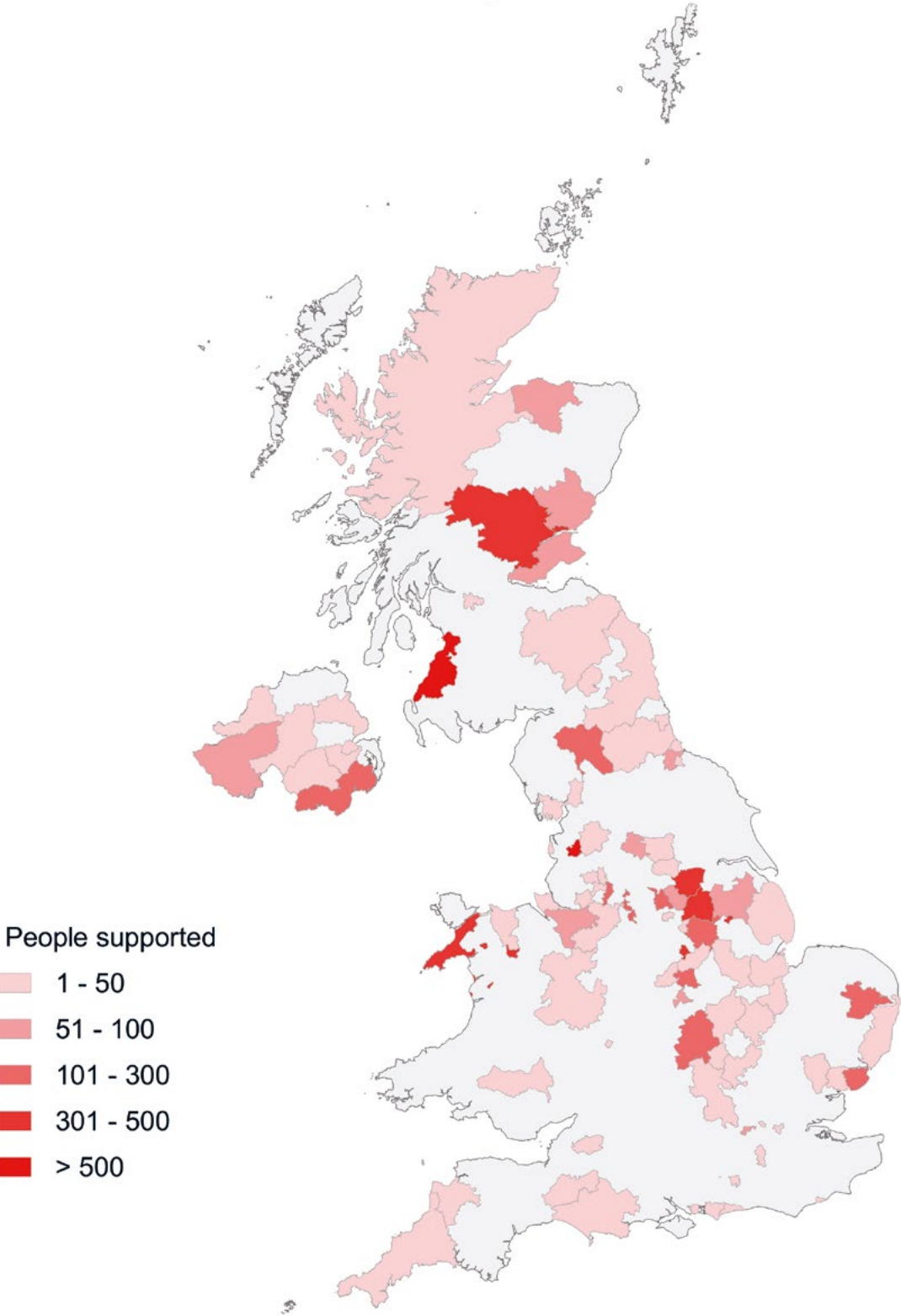
- The ten warmest years in the UK have all occurred since 2003¹, with the heatwave in July 2022 resulting in surface temperatures of 40°C in parts of England. 2023 was provisionally named the second warmest year on record in the UK.
- Extreme events, such as heatwaves, drought, and storms, have all recorded increases in intensity and frequency in the UK over the last decade.
- Wildfires are becoming more of a risk in the UK with four times more wildfires recorded in 2022 in England compared to the same period in 2021². Wildfires are already causing destruction to properties in the last decade in the UK, including Marlow in Buckinghamshire in 2018³.

These trends have resulted in impacts to communities across the UK – and when these events occurred, the British Red Cross has been there to help. Since 2020, we have provided support to over 15,000 people in the UK affected by severe weather and environmental flooding.



Photo © Peter Summers/BRC

Local Authorities where British Red Cross responded to an environmental incident between October 2014 and May 2024



Flooding

Historically, flooding has been the most catastrophic climate-related hazard in the UK, and British Red Cross has responded more frequently to flood emergencies than any other type of climate hazard. Flooding can be categorised into several different types based on its causes and characteristics.

Fluvial flooding

This type of flooding occurs when rivers overflow their banks due to an excessive amount of water flowing into them. River flooding can result from heavy and prolonged rainfall, snowmelt, or a combination of these factors. It often develops more gradually compared to other types of flooding, allowing for some advance warning.

Coastal flooding

Coastal areas are susceptible to flooding due to factors like storm surges and high tides. Coastal flooding can inundate low-lying coastal regions.

Pluvial flooding

Pluvial flooding, also known as surface water flooding, occurs when intense rainfall overwhelms the capacity of drainage systems and the ground to absorb water. It is common in urban areas and can result in localised flooding even in the absence of a nearby river or coastal source. The British Red Cross also responds to sewer flooding, often supporting water companies. Sewer flooding occurs due to leaks from the sewerage system (through pipes, drains or manholes) or floods up through toilets, sinks or showers inside a building⁴. Sewer flooding can be caused by heavy rainfall overwhelming the combined sewer and drainage system.

Groundwater flooding

Groundwater flooding happens when the water table rises to the surface or close to the surface, often after prolonged periods of heavy rainfall. This type of flooding can impact basements and low-lying areas and may be slow to recede.

Support British Red Cross provides

The British Red Cross responds to all types of floods, and we have observed increasing call outs to flood events, particularly surface water flooding. We’ve responded to over 500 flooding incidents since 2019, 127 of which were environmental flooding incidents in the past five years, with 25% of those being in 2023. Since 2020, over 300 of our emergency response volunteers have been deployed to provide support. We’ve been there in towns and communities and provided individual support to over 1,300 people impacted by environmental flooding.

British Red Cross helps communities to prepare for flooding before incidents occur, for example by providing guidance and information to communities, helping to erect temporary flood barriers (e.g. sandbags), and supporting rest centres for people to gather. British Red Cross supports emergency services providers when floods strike, so that emergency services can rescue people and animals trapped in floodwater and prevent flooding of critical infrastructure. Our teams also help to clean up the damage after flood waters have subsided.

⁴ Sewer Flooding – House of Commons Library parliament.uk

Northern Ireland flooding – August 2017

On 22 August 2017, a devastating flood overwhelmed communities in Northern Ireland. Over 63% of the average August rainfall fell within a 9-hour period resulting in 60 flooding incidents, more than 100 people being rescued by the emergency services, and the fire service receiving calls every 45 seconds at points. The clean-up costs reached £30 million as hundreds of roads, bridges, and homes were damaged in the flood water. It was reported as a ‘1 in 300-year flood’ meaning it was a rare event. These terms are becoming less commonly used as climate change continues to impact our weather systems globally meaning more extreme events like the flood in Northern Ireland.

Pearl and May, British Red Cross Emergency Response Volunteers, and Linda, an Emergency Response Officer, responded to the flood event in Eglinton Village and the surrounding area. Linda said, *“The flooding happened in the evening and was completely unexpected.”* This meant many people were unprepared and more vulnerable.

In events like this, Emergency Response Volunteers will wait for a call out to support emergency services and the Local Authority. This support can range from providing psychosocial support, helping set up and organise rest centres, and handing out blankets to people affected. May said, *“We got the call out and responded straight away but couldn’t get into the village [due to the flood water] so we had to get a tractor to distribute the blankets.”*

Over the next couple of days, British Red Cross volunteers, including Linda, Pearl and May, provided psychosocial support, asking people if they needed support, and distributing supplies. The response to flooding and other weather impacts can be extremely challenging for British Red Cross staff and volunteers both physically and emotionally, Pearl explained, *“Lots of people didn’t have content insurance, one person we supported had just finished paying off their sofa and it was destroyed by the flood. Their photos and sentimental items had to be thrown out due to them being contaminated by the water.”*

May acknowledged there was a lasting impact of the flood on people, *“Some people were not sleeping due to rain.”* This shows there are not only physical impacts on buildings and infrastructure but also emotional effects. The British Red Cross supported people for three months after the flood event illustrating the dedication to assisting people during and after emergencies.

Pearl, May, and Linda all highlighted the strength of the community and how the existing connections between community groups and representatives improved the response and recovery. The volunteers all agreed flood events were increasing. More preparedness is needed to ensure the number of people and severity at which people are impacted by weather and climate-related events is reduced. This is why climate change adaptation is vital to ensure the British Red Cross is future-ready and can continue to support those who need it the most.

Wind and storms

Storm events can include strong winds, lightning and hail (snow storms are mentioned later under Cold Snaps). Storms can often cause flooding through heavy rainfall and/or storm surges. Infrastructure disruptions are common during heavy storms, for example power outages and transport disruptions due to trees falling on power lines and roads. Lightning storms can cause fires, and storms can also lead to telephone and internet outages.

Support British Red Cross provides

British Red Cross teams are often called upon to support vulnerable individuals during power outages caused by storm events. Since 2020, we have supported over 3,000 individuals during power outages. British Red Cross helps communities to prepare for storms before incidents occur, for example by providing guidance and information to communities⁵. In addition, the British Red Cross supports electricity and gas companies to provide extra support to people on the Priority Services Register⁶. We support vulnerable customers who may be more adversely affected by a loss of power⁷.

Storm Babet – October 2023⁸

Storm Babet hit the UK on 18 October 2023, bringing high winds and extreme rainfall. Significant flooding across the country caused damage to homes, infrastructure, and the deaths of seven people. A red weather warning was issued for Angus in Scotland with the region experiencing its wettest day on record in a series from 1891 on 19 October⁹.

British Red Cross Emergency Response staff and volunteers were on the ground supporting people affected by the storm. Cyrus, a Scottish Emergency Response Officer was deployed in Brechin, one of the most affected places in the UK. He said, *“The flood defences failed around 4.30 in the morning, and a large amount of the community was flooded. Some people hadn’t heeded the Coast Guard and the rescue service’s warnings to evacuate from their properties.”*

The Tayside Team helped set up a rest centre with the Local Authority for people who had been evacuated from their homes and provided people with warm clothes and food. Cyrus said, *“A lot of them were very, very cold, a lot of them turned up to the rest centre. And our priority was to make sure that they were as warm as possible.”*

The 2023/24 storm season has been one of the stormiest seasons since they began naming storms in 2015. Between September 2023 and April 2024, the British Red Cross responded to over 60 incidents of severe weather and environmental flooding, supporting over 1,000 people across the UK.

⁵ Prepare for a storm or thunderstorm – British Red Cross | ⁶ www.theprs.co.uk | ⁷ <https://cadentgas.com/help-advice/supporting-our-customers/priority-services-register> | ⁸ Quotes taken from British Red Cross Stories Hub in January 2024 | ⁹ Second Red warning issued – Met Office

Heatwaves

We are already seeing warmer and drier summers. In July 2022, UK temperatures exceeded 40°C for the first time on record. Temperatures remained above 20°C overnight and the highest daily minimum record was also broken. Heatwaves can aggravate existing health conditions and reduce quality of sleep, severely affecting vulnerable people. Heatwaves can also cause infrastructure disruptions.

Support British Red Cross provides

British Red Cross staff and volunteers have been responding formally to heatwaves since 2022. We responded to incidents in 18 locations during the July 2022 heatwave. The support we provide includes providing affected people with cooling devices (e.g. temporary air-conditioning, fans, shade), and supporting people with accessing medical treatment. Given the extreme temperatures reached in 2022, we undertook research with the London School of Economics to understand the impacts on people¹⁰, available at www.lse.ac.uk/granthaminstitute/extreme-heat-preparedness-and-resilience-in-the-uk



Photo © BRC

July 2022 heatwave

An unprecedented extreme heatwave occurred across the UK from July 16-19 2022, due to hot air moving north from the nearby continent. On July 19th a maximum temperature of 40.3°C was recorded in Coningsby, Lincolnshire. The Met Office issued its first red warning for extreme heat and the government declared a national emergency.

The London Fire Service declared a major incident. It received 2,496 calls between the 19-20 July 2022, attended 59 grass fires and 106 total fires¹¹. 41 properties were damaged by fire in London, 14 in Norfolk and 5 in Lincolnshire¹².

Andy, an Emergency Response Volunteer based in England, responded to an incident on the hottest day of the year: “It was baking hot, and I was on duty. The phone rings. It is the Crisis Response Call Centre. Can you attend a house fire in Aldershot?” I quickly changed out of my shorts and light cotton T-shirt into British Red Cross heavy grey trousers and a red polo shirt. The car’s thermometer read 38 degrees.”

Andy continues, “My job was to provide emotional and practical support to the victims. The affected woman is in shock and has been sedated by a doctor. I provided her with clothing and a hygiene pack from the back of the van. I was wearing full PPE outdoors for much of it and have drunk 1.5 litres of water. I probably sweated about the same.”

Increased extreme weather events, including heatwaves, are exposing a new vulnerability in the UK and its workforce. Current workwear and equipment used when responding to emergencies are not suitable for the changing climate.

The heatwave impacted people, the road and rail network, and the natural environment. There were an estimated 2,985 people who died in the UK due to the heat in summer 2022¹³. Power cuts due to the heatwave were also reported, as demand for electricity surged and high-cost generation options were brought online to ensure electricity was available to London^{14,15}.

Adaptation action to address the impacts of extreme heat is urgently needed in the UK to help protect the vulnerable people and emergency response workers and increase the resilience of the natural and built environment and vital infrastructure.

¹⁰ www.lse.ac.uk/granthaminstitute/extreme-heat-preparedness-and-resilience-in-the-uk

¹¹ Major Incident Review Extreme Weather Period 2022 – london-fire.gov.uk | ¹² Heat Wave Response – Oral Statement – GOV.UK | ¹³ Heat mortality monitoring report: 2022 – GOV.UK | ¹⁴ Heat resilience and sustainable cooling – parliament.uk | ¹⁵ London paid a record price for electricity during its heatwave – The Verge

Drought

Droughts refer to prolonged periods of low or no rainfall and/or low water availability in rivers, lakes, and aquifers. Droughts can be compounded by high water consumption and poor water efficiency. Droughts are a risk for all parts of the UK, with particularly high risks in South and East England. Some of the most noticeable impacts from droughts include degradation of green spaces and gardens, which can affect people’s wellbeing, and limit recreational activities.

Support British Red Cross provides

In the event that water supplies are interrupted, British Red Cross has agreements in place with some water companies to support the dispatch of temporary water supplies (e.g. bottled water), and British Red Cross supports people with accessing medical treatment – prioritising the most vulnerable people who require constant access to water.

Water scarcity in Scotland – July-September 2018

In 2018, due to limited rainfall, large areas of Scotland experienced water scarcity between July and September. This caused over 500 private water supplies to dry up across Scotland.

Due to the decreased rainfall, critical reservoirs slowly began to run dry and even with some rain falling it was not at the scale needed to replenish the lost reserves. This prompted meetings with resilience partnerships across the country to decide the best course of action. The Emergency Response Operations Manager for Scotland stated, “Scottish Water did a huge piece of work around supplying bottled water to people. We [British Red Cross Emergency Response Volunteers] took a stock of bottled water in anticipation for being an agency to go out and distribute and deliver.”

On this occasion, there was a period of heavy rainfall which helped resolve the issue before Emergency Response Volunteers were deployed. However, climate projections show that droughts in Scotland will become more regular as temperatures increase and rainfall decreases in summer months. The east of Scotland is predicted to be most at risk of droughts, with low flows in rivers increasing from every 40 years to every 9 years by 2050¹⁶.

Wildfire

Wildfires often arise due to warm, dry, and windy conditions. Areas of the UK have already experienced more frequent and destructive wildfires. For example, more than 24,316 fires were recorded between June to August in 2022 compared to 6,213 in the same period in 2021¹⁷. Fire and Rescue Services attended over 360,000 wildfire incidents in England over 12 years from 2009 to 2021, an average of 30,000 incident per year¹⁸.

Support British Red Cross provides

British Red Cross provides support to those affected and/or displaced by wildfires. Our role, in some areas of the UK, involves providing welfare support to the fire and rescue services during wildfire events and supporting the safe evacuation of people and animals to rest centres.



Photo © Francesca Jones/BRC

16 Archives – Climate XChange

17 Freedom of Information Request – PA media | 18 Forestry Commission Wildfire statistics for England: Report to 2020-21 – Summary – GOV.UK

Cold snaps

Cold snaps occur when temperatures drop below 0°C, sometimes occurring quickly over only a few days. These events often result in ice accumulating on roads and pavements and can include snow fall and snowstorms (generally accompanied with harsh winds). Extreme cold is life threatening, particularly for people living in fuel poverty and those who are homeless. Following a cold snap, if temperatures rise quickly above 0°C, freeze thaw incidents can occur which significantly impact water pipes and cause bursts and flooding.

Support British Red Cross provides

British Red Cross provided support during Beast from East in 2018 and also recently in Cumbria snowfall events in December 2023. British Red Cross helps communities to prepare for snowstorms, for example by providing guidance and information to communities (www.redcross.org.uk/get-help/prepare-for-emergencies/snow-and-winter), and providing safe rest centres for people to gather/sleep. British Red Cross supports emergency services providers when snowstorms occur, including providing transport for medical professionals.



Photo © David Taylor/BRC

Beast from the East – February-March 2018

The UK experienced very low temperatures and snowfall across the country from 26 February to 8 March 2018 due to easterly airflow across the UK bringing cold air across much of Europe¹⁹.

Nick Mort, a Senior Emergency Response Officer based in Scotland was on call in the lead up to and during the weather event, he said, “we started getting communications and alerts from the Met Office about 3 to 4 days out. As the weekend approached, confidence was building that this event was unusual, so we decided to set up a control centre in Inverness, identify volunteer availability to deploy and the vehicles we had available.”

The Met Office issued two Red Warnings for snow and almost all areas across the UK experienced some lying snow with greater accumulations in southwest England and south Wales. The lowest minimum temperature was recorded on 28 February in Faversham in Kent around -14°C.

Nick said, “The British Red Cross supported during the event by using our 4x4 vehicles to get critical hospital staff to work and also patient transfers as many hospitals had exhausted their 4x4 vehicle capabilities, we were their last option.”

As many as 2,000 deaths across the UK were attributed to the event. Local health and social services were under significant pressure, with several UK hospitals cancelling operations and outpatient services²⁰.

The event forced the closures of several businesses, schools, and universities²¹. Transport disruptions occurred including road closures, stranded cars, and cancellations to train, plane, and bus services. Estimated damages included 8,260 collisions across Britain in just three days, costing over £10m in insurance²². During the storm demand for electricity spiked and demand for gas was 37% higher than the previous year. National Grid Gas issued a gas deficit warning. However, the energy system was able to cope with the increased demand²³. Water networks were severely affected, with over 60,000 customers in England and Wales without water for over 12 hours due to pipe bursts as a result of rapid thawing after freezing during the event²⁴. The weather had a significant impact on agriculture. The event took place during lambing season and many lambs were lost to hypothermia and exposure to the severe conditions²⁵. It was reported the event cost the UK economy £1bn a day²⁶.

In total the British Red Cross responded to 33 incidents, deployed over 1,000 Emergency Response Volunteers, and supported over 6,000 people across the UK.

19 [Beast from the East February/March 2018 – metoffice.gov.uk](https://www.metoffice.gov.uk) | 20 <https://nic.org.uk/app/uploads/Technical-Annex-Good-practice-case-studies.pdf> | 21 www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/interesting/2018/snow-and-low-temperatures-february-to-march-2018---met-office.pdf | 22 www.theguardian.com/uk-news/2018/mar/01/beast-from-east-storm-emma-uk-worst-weather-years | 23 [www.nationalgrid.com/sites/default/files/documents/2018 Winter Review and Consultation.pdf](https://www.nationalgrid.com/sites/default/files/documents/2018%20Winter%20Review%20and%20Consultation.pdf) | 24 www.ofwat.gov.uk/publication/cold-water-companies-response-beast-east/ | 25 www.preventionweb.net/files/64781_impactofextremeweatheronscottishfar.pdf | 26 www.theguardian.com/uk-news/2018/mar/03/freezing-weather-storm-emma-cost-uk-economy-1-billion-pounds-a-day



Coastal erosion and sea level rise

Coastal erosion generally results in loss of coastal land, damaging properties, infrastructure, and ecosystems. Coastal erosion is often linked to storm surges and landslides. Sea level rise is increasing the risk of coastal erosion.

Support British Red Cross provides

British Red Cross has not often responded to coastal erosion events, but we are increasingly working with the Coast Guard and the Royal National Lifeboat Institution (RNLI) on preparedness exercises for people missing or injured due to coastal flooding. British Red Cross volunteers noted the risk of coastal erosion in particular in Northern Ireland and Wales, including damage to roads and cutting off access to some communities.

Landslides, land erosion, sinkholes, subsidence

Landslides and land erosion often follow heavy rainfall and saturation of soil and slopes. In contrast, sinkholes and subsidence generally occur after dry periods where land shrinks and collapses. All of these geophysical processes are compounded by climate change, posing a risk to people and properties.

Support British Red Cross provides

British Red Cross has not often responded to landslide or sinkhole events; however our response activities may relate to supporting rest centres to assist those affected and/or displaced.

Multi hazards and cascading risks

Climate hazards often occur simultaneously in the same or in different parts of the country. For example, in 2022 the southeast of England experienced drought, heatwaves, and wildfires at the same time, and these were shortly followed by storms.

Hazards occurring in quick succession can compound existing issues, and not allow time for communities and emergency responders to recover and prepare for the next event. This puts further strain on British Red Cross' capacity to support vulnerable communities and presents challenges with prioritising where support is provided.

In addition, climate hazards occurring in a location can have much wider impacts due to cascading risks, for example when storms or floods disrupt power supply and this affects people and other infrastructure networks (e.g. rail, water) over a large area. We need to enhance our collective capacity through collaboration with partners and volunteers so that we can be agile and responsive when multiple hazards strike.



Climate vulnerability of communities

The climate crisis does not affect all people in the same way; some of the most disadvantaged and marginalised people are worst affected by our changing climate.

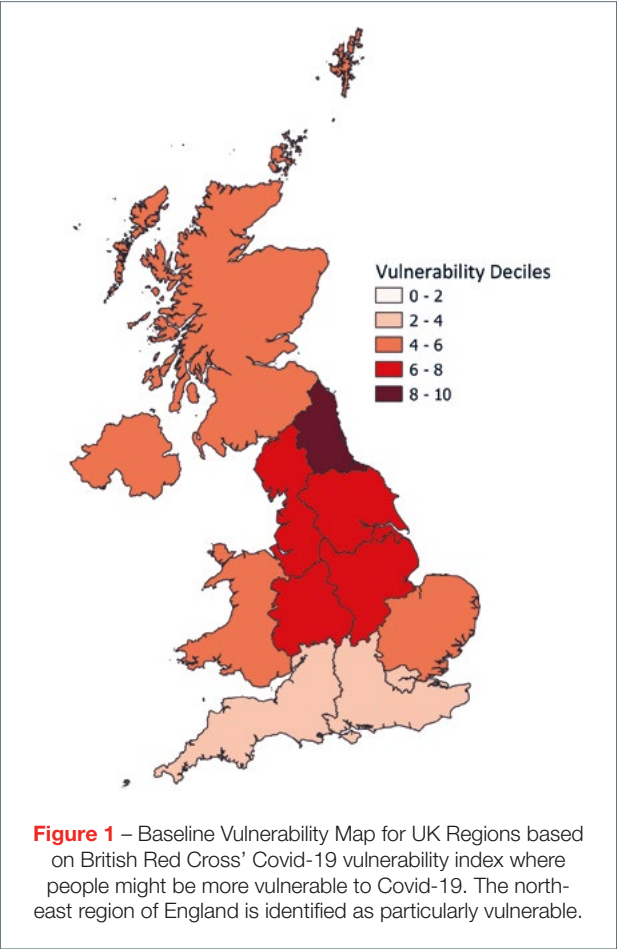
British Red Cross' Covid-19 Vulnerability Index <https://britishredcrosssociety.github.io/covid-19-vulnerability> identified areas in the UK where people might be more vulnerable to the effects of Covid-19²⁷. The index provides a useful proxy to consider vulnerability to climate impacts. The index is based on recent data providing baseline vulnerability indicators (however there are no plans to update the data in future):

Health/wellbeing vulnerability
Including age, disability, physical and mental health indicators.

Economic/financial vulnerability
Including indicators related to low income, benefits claims, and employment in vulnerable sectors.

Social vulnerability
Including indicators for geographical isolation, homelessness, limited digital access.

British Red Cross could consider weighting a region's vulnerability highly when prioritising action on climate risks and resilience, given we are generally supporting people and places with high vulnerability.



British Red Cross' Social Vulnerability Index <https://britishredcrosssociety.github.io/covid-19-vulnerability> is currently being developed, which will provide an updated understanding of vulnerability across the UK. This is based on 24 indicators which include age, education, health, socioeconomic status, housing and household characteristics, social networking, migration, and ethnicity – all leading indicators affecting social vulnerability.

- Climate Just** www.climatejust.org.uk
- Climate Just is a free webtool for public service providers designed to:
- Identify who is vulnerable to climate change and fuel poverty and why
 - Highlight neighbourhoods where climate disadvantage is highest
 - Explain the factors involved and help you decide what actions to take

British Red Cross supported work to update the underlying indicators in Climate Just with most recent census data, however currently the online version uses 2011 Census data – and is awaiting a refresh.

Everyone's Environment Programme www.thinknpc.org/influencing/everyones-environment

The Everyone's Environment Programme is a collaboration of over 60 social and environmental charities to accelerate action on the social impacts of the environmental crises. British Red Cross are joining the programme to be involved in research and activities exploring vulnerability to climate change, and support us to tailor our communications and programmes to support those in need.



Photo © Jonathan Cherry/BRC

27 British Red Cross COVID-19 Vulnerability Index – Google Docs

Climate change projections

This section outlines how climate change will impact on the UK’s climate in future and the risks it could pose to communities across the nation, and the risks to our own CER service. To understand how the climate may change in future, climate change projections are used. Climate change projections outline modelled simulations of the climate for future decades (usually up to 2100), based on assumed scenarios of concentrations of greenhouse gases such as carbon dioxide²⁸.

Explainer box: RCPs

Representative Concentration Pathways (RCPs) describe 21st century pathways of greenhouse gas emissions and are used within UK and international climate change assessments²⁹.

The RCPs represent the range of future potential scenarios of greenhouse gas emissions and are used to model and understand a broad range of potential climate outcomes in future^{33,30}.

Two RCPs are explored in this report as the UK Climate Change Committee (CCC) recommends that the UK should adapt for at least 2°C warming above pre-industrial levels and prepare for the possibility of 4°C warming above pre-industrial levels by 2100^{34,31}:

- **RCP4.5:** a **medium** greenhouse gas emissions scenario considered an ‘intermediate’ scenario. Global surface temperature is projected to be **2.4°C higher in 2081-2100** compared to the pre-industrial period (1850-1900).
- **RCP8.5:** a **high** greenhouse gas emissions scenario considered a ‘worst case’ scenario where greenhouse gas emissions continue to increase unmitigated. Global surface temperature is projected to be **4.3°C higher in 2081-2100** compared to the pre-industrial period (1850-1900).

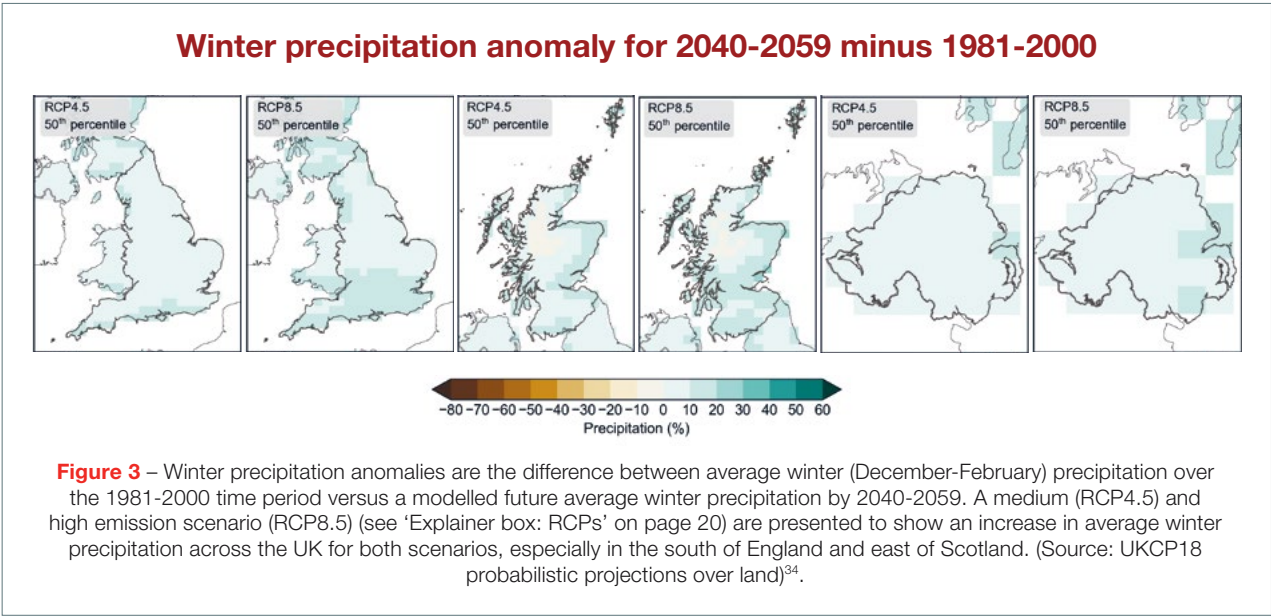
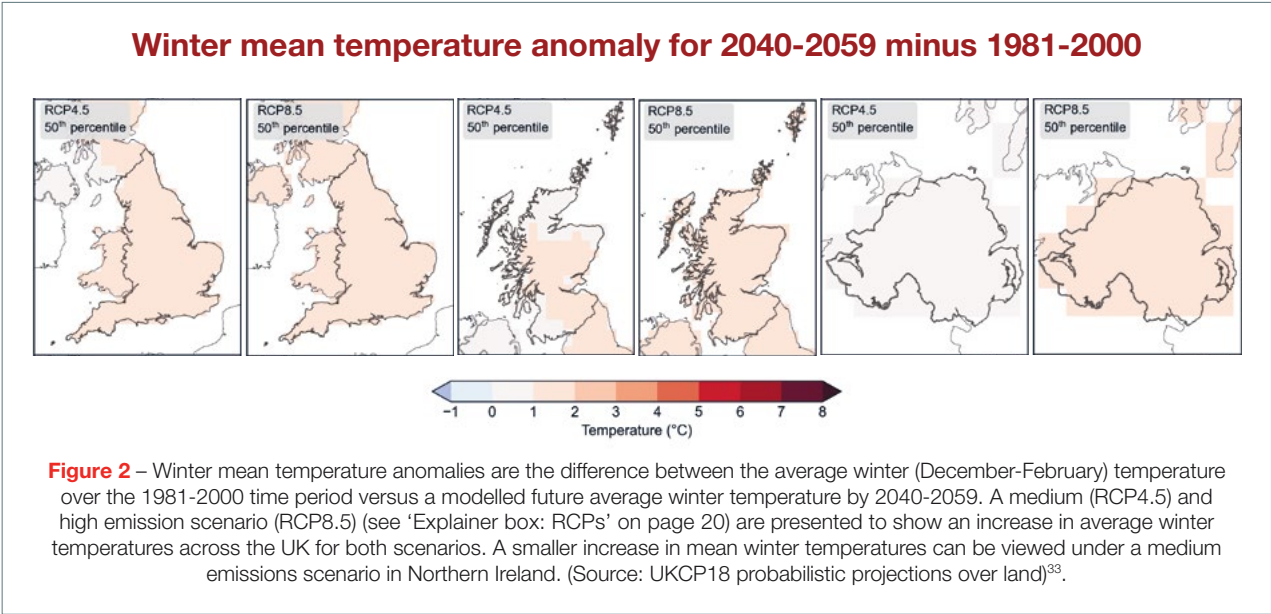
It should be noted that all climate model projections have inherent uncertainty. RCPs are defined as pathways therefore are not definitive, with alternative future scenarios potentially occurring in reality.

Projected changes

The Met Office publishes data on UK Climate Projections as part of the Met Office Hadley Centre Climate Programme. The latest published projections by the Met Office, the UK Climate Projections 2018 (UKCP18), provide data on how the UK’s climate could change under different climate scenarios. Below we outline key changes under the medium (RCP4.5) and high (RCP8.5) greenhouse gas emissions scenarios. These changes are likely to amplify climate hazards resulting in key impacts on British Red Cross’ services.

Winter

UK winters are predicted to become warmer and wetter. By 2050, the UK’s average winter could be around 0.1°C warmer (between 0.5°C cooler and 2.5°C warmer uncertainty range) and 5% wetter (10% drier to 20% wetter uncertainty range), compared to 1981-2000 depending on the region and global greenhouse gas emissions levels³². In recent years the UK has experienced more rain falling during winter storms and intense downpours, this is predicted to increase.



²⁸ Climate projections – Copernicus | ²⁹ Topic 2: Future changes, risks and impacts – IPCC | ³⁰ ukcp18-guidance---representative-concentration-pathways.pdf – metoffice.gov.uk | ³¹ CCC-Insights-Briefing-6-Undertaking-a-climate-change-risk-assessment.pdf – theccc.org.uk | ³² Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf – theccc.org.uk | ^{33,34} Climate change projections over land – Met Office

Summer

By 2050, UK summers are projected to be between 0°C and 3°C warmer, and up to 30% drier, depending on the region and global greenhouse gas emissions levels³⁵. Drier summers are also likely to increase the risk of wildfires in the UK³⁶. When summer storms do occur, climate projections reveal up to 20% increase in rainfall intensity³⁷.

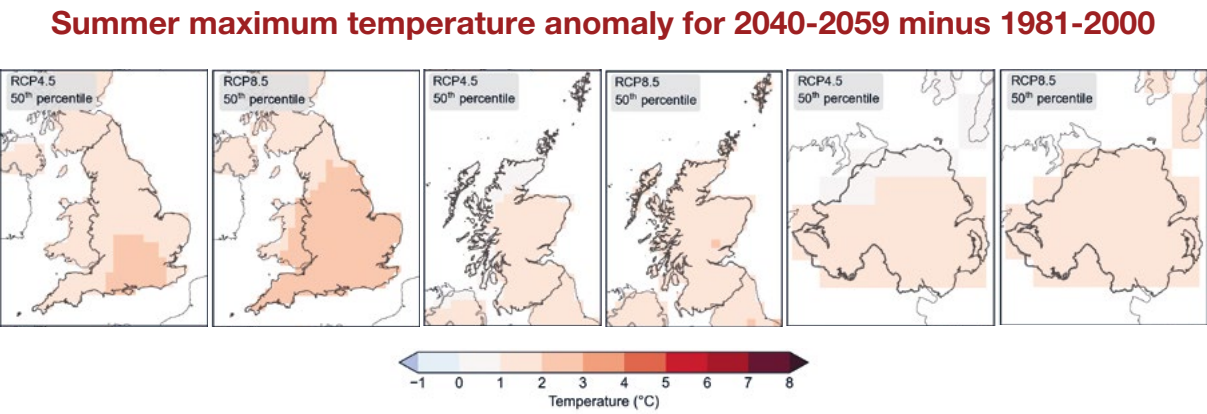


Figure 4 – Summer maximum temperature anomalies are the difference between the maximum summer (June-August) temperature averaged over the 1981-2000 time period versus a modelled future maximum summer temperature averaged over 2040-2059. A medium (RCP4.5) and high emission scenario (RCP8.5) (see ‘Explainer box: RCPs’ on page 20) are presented to show an increase in average summer temperatures across the UK for both scenarios, with particularly high increase in the south of England and parts of Wales. (Source: UKCP18 probabilistic projections over land)³⁸.

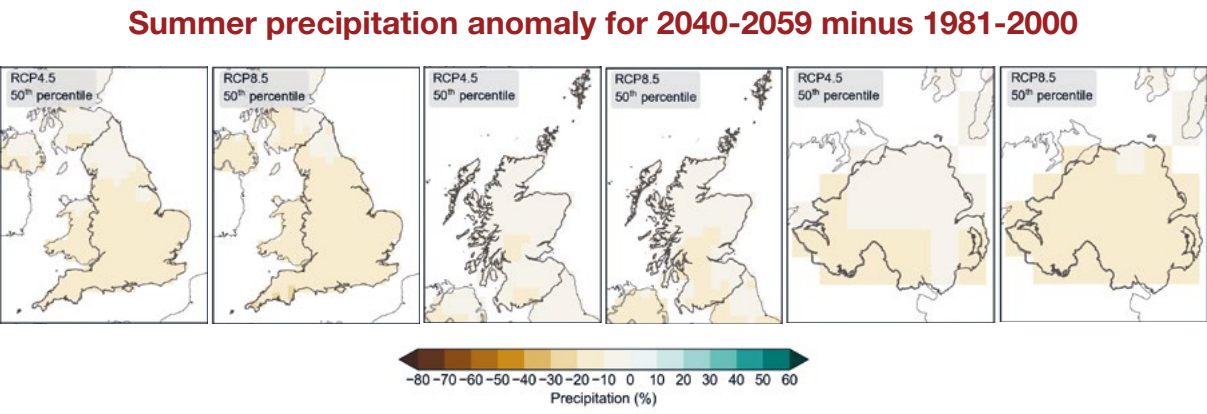


Figure 5 – Summer precipitation anomalies are the difference between average summer (June-August) precipitation averaged over the 1981-2000 time period versus a modelled future average summer precipitation by 2040-2059. A medium (RCP4.5) and high emission scenario (RCP8.5) (see ‘Explainer box: RCPs’ on page 20) are presented to show a decrease in average summer precipitation across the UK for both scenarios. (Source: UKCP18 probabilistic projections over land)³⁹.

Climate hazard screening across the UK

A high-level screening of climate hazards has been undertaken in order to compare across regions in the UK (methodology provided in Appendix). Scores for one hazard cannot be directly compared to another hazard, as scales and baselines are different for each hazard.

Explainer box: Climate hazard screening

A high-level climate hazard screening was completed to understand the key hazards impacting regions across the UK, both now and in the future. Regions were assessed in line with British Red Cross’ defined operational areas.

Ten key climate hazards were assessed based on a low (yellow), medium (amber) and high (red) scoring of exposure of each region to the climate hazard.

Score	Description
3	High exposure to climate hazard
2	Medium exposure to climate hazard
1	Low exposure to climate hazard

Scoring is high-level and is based on expert judgement of available evidence, such as regional level projections of temperature, precipitation, soil moisture, coastal erosion, subsidence, and expected damage from flooding. Three scenarios were assessed:

- **Baseline:** current level of exposure to each climate hazard for each region. Generally, the period 1981-2010 is used as the baseline period, however, this varies dependent on available data used to analyse exposure to different climate hazards.
- **2050s, RCP4.5:** future level of exposure to each climate hazard for each region in the 2050s, assuming a medium emissions scenario trajectory (+2.4°C increase in global temperatures by 2100) – see ‘Explainer Box: RCPs’ on page 20).
- **2050s, RCP8.5:** future level of exposure to each climate hazard for each region in the 2050s, assuming a high emissions scenario trajectory (+4.3°C increase in global temperatures by 2100 – see ‘Explainer Box: RCPs’ on page 20).

Some hazards could be weighted higher than others by considering the level of impacts, for example, impacts from flooding may be greater than other hazards based on British Red Cross’ incident response data. We encourage local areas to consider this information at a local scale, and in future, apply weighting to specific climate hazards to explore an overall risk rating across climate hazards at a local level. Hazards occurring simultaneously in the same or in different regions can pose greater risks, stretching response capacity and potentially creating cascading failures.



³⁵ Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf – theccc.org.uk | ³⁶ UKCP18-Overview-report.pdf – Met Office | ³⁷ Climate change in the UK – Met Office | ^{38,39} Climate change projections over land – Met Office

Exposure to climate hazards screening score

Table 2
High level screening of exposure to climate hazards across the British Red Cross’ operational areas. A low (1), medium (2) and high (3) exposure score is outlined for each climate hazard and region for a baseline period, and two future scenarios – a medium (RCP4.5) and high emissions (RCP8.5) scenario – in the 2050s (see Explainer box: Climate hazard screening on page 23). Generally, regions tend to be most highly exposed to heatwaves, flooding (surface, river and coastal) and storms across the UK. At a more localised level, these scoring may vary, and findings should be treated as high-level.

Region	Time period	Heat-waves	Cold snaps	Drought	Increased rain/humidity	Surface flood	River flood	Coastal flood & erosion	Storms	Wildfire	Landslides and sinkholes
South and Channel Islands (SCI)	Baseline	3	1	2	2	2	3	3	2	2	2
	2050s RCP4.5	3	1	2	2	2	3	3	2	2	2
	2050s RCP8.5	3	1	2	2	3	3	3	2	3	3
London	Baseline	3	1	3	2	2	1	1	1	1	1
	2050s RCP4.5	3	1	3	2	2	1	2	1	2	1
	2050s RCP8.5	3	1	3	2	3	2	2	1	3	2
Scotland	Baseline	1	2	1	2	2	3	2	3	1	2
	2050s RCP4.5	1	2	1	2	2	3	3	3	1	2
	2050s RCP8.5	2	1	1	2	2	3	3	3	2	3
Wales	Baseline	2	1	2	2	2	3	2	3	1	2
	2050s RCP4.5	2	1	2	2	2	3	3	3	2	2
	2050s RCP8.5	3	1	2	2	3	3	3	3	1	3
Northern Ireland	Baseline	1	1	2	2	2	2	2	2	2	2
	2050s RCP4.5	2	1	2	2	2	2	3	2	2	2
	2050s RCP8.5	2	1	2	2	2	2	3	2	2	3
Central England	Baseline	2	1	3	2	2	2	1	1	1	1
	2050s RCP4.5	3	1	3	2	2	2	2	1	1	1
	2050s RCP8.5	3	1	3	2	3	2	2	1	2	2
North England	Baseline	2	2	2	2	2	2	2	2	1	2
	2050s RCP4.5	2	2	2	2	2	2	3	2	1	2
	2050s RCP8.5	3	1	2	2	2	2	3	2	2	3
South East England	Baseline	3	1	3	1	2	2	2	2	2	1
	2050s RCP4.5	3	1	3	1	2	2	3	2	2	1
	2050s RCP8.5	3	1	3	1	3	3	3	2	3	2

Key climate change risks impacting British Red Cross CER

Eight key climate change risks have been identified due to their potential impact on British Red Cross CER and our service users now and in the future. These risks were identified via consultation with our local emergency response teams across the UK, as well as desk based review of information on UK climate change risks and the national risk register. The eight risks are summarised in the table below, followed by more detail on each risk and what this means for British Red Cross CER and the people we support.

Each risk is scored in line with the UK’s third Climate Change Risk Assessment (CCRA3) published in January 2022, with the following scoring criteria used:

Urgency score	Description (as defined by the UK CCRA3) ⁴⁰
Urgent – more action needed	New, stronger or different [Government] action, whether policies, implementation activities, capacity building or enabling environment for adaptation – over and above those already planned – are beneficial in the next five years to reduce climate risks or take advantage of opportunities.
Further investigation needed	On the basis of available information, it is not known if more action is needed or not. More evidence is urgently needed to fill significant gaps or reduce the uncertainty in the current level of understanding in order to assess the need for additional action.
Watching brief	The evidence in these areas should be kept under review, with continuous monitoring of risk levels and adaptation activity (or the potential for opportunities and adaptation) so that further action can be taken if necessary.

The above urgency scoring outlines the level of action required by British Red Cross to respond to climate risks impacting British Red Cross and action required by the UK Government and external partners to ensure ongoing action and monitoring of key risks. The UK CCRA3 urgency scoring approach is used by British Red Cross as “it is transparent and can be understood and considered with ease and speed by policymakers with responsibility for large and diverse policy areas.”⁴¹

41 CCRA3-Chapter-2-FINAL.pdf – ukclimaterisk.org

Summary of key climate risks impacting British Red Cross

Key climate risks impacting British Red Cross	British Red Cross urgency scoring
1. Risks to people and properties from river and surface water flooding	Urgent – more action needed
2. Risk to people from high temperatures	Urgent – more action needed
3. Risk to people and properties from moisture, mould, and heavy rain	Further investigation needed
4. Risks to people from poor water quality and household water supply interruptions	Further investigation needed
5. Risk to people, properties, agricultural land, and forests from wildfires	Further investigation needed
6. Risk to mental health from climate shocks and stresses	Further investigation needed
7. Risk to energy, transport, and telecommunication networks due to climate hazards and cascading failures	Watching brief
8. Risk to communities from coastal flooding and erosion	Watching brief



Photo © Peter Summers/BRC

Risk 1: Risks to people and properties from river and surface flooding

British Red Cross urgency score: Urgent – more action needed

Current and future risk
As temperatures increase due to climate change, warmer and wetter winters are likely to become more common, and summer storm intensity is also increasing, leading to an increased risk of flooding⁴². Maximum 1-day rainfall provides an indication of heavy rainfall in a day and consequently the likelihood of a surface and/or river flood event (Table 2). Across the UK Max 1-day rainfall is projected to increase by 7.4% to 12.8% by the 2050s, depending on the region and the level of global greenhouse gas emissions.

Table 3
Maximum 1-day rainfall totals in capital cities across the UK. This provides an understanding of extreme rainfall which can lead to flood events. The figures presented in this table present the difference in maximum 1-day rainfall which is averaged over a 30 year period. The greatest annual average maximum 1-day rainfall in the 2050s under a high emissions scenario (see ‘Explainer box: RCPs’ on page 20) is projected by climate models to be in Belfast, followed by Cardiff. Heavy rainfall events are projected to increase across all capital cities.

City	Average Annual Max 1-day rainfall (mm) in 2050s and % change from baseline (1981-2010)
	High emissions scenario – RCP8.5
Belfast	32.3mm (+10.3%)
Cardiff	31.5mm (+12.8%)
Edinburgh	30.9mm (+10.7%)
London	28.8mm (+11.5%)

Impacts on people and places British Red Cross supports
Flooding can cause significant harm to people and damage to properties and assets. Generally every year someone in the UK will die in a flood, many people are physically injured, and there are extensive mental health impacts (see ‘Risk 6’ on page 43) due to trauma during flooding and distress when homes and assets are damaged. This can be compounded when people have to live temporarily outside of their homes for extended periods. Flooding also poses health risks due to poor sanitation and spread of infectious diseases and can delay people from getting the medical attention or medicines they need. Damage to property can include (i) Structural damage and the costs of rebuilding and repair, (ii) Upheaval and financial implications of cleaning up and (iii) loss of and damage to possessions.

The risk of flooding to people, communities and buildings is one of the most severe risks from climate hazards for the UK population currently.

- There are currently just under 1.9 million people across the UK exposed to frequent flooding from either fluvial, coastal, or surface water flooding. Approximately 82% of those at risk are in England, 8% in Wales, 8% in Scotland and 2% in Northern Ireland⁴³.
- Around 28% of **caravan and camping sites** (permanent and non-permanent) in England and Wales are at flood risk from rivers and the sea, with over two-thirds of these being at either significant or moderate flood risk⁴⁴. According to the 2021 Census, 104,000 people lived in a caravan or other mobile or temporary structure in England and Wales⁴⁵.
- Nearly half of London’s 33,205 **basement properties** in commercial use are exposed to surface water flooding. Of these, 5,692 face a “high” or “extreme” flood risk, with the greatest number of buildings in Westminster (Zurich Insurance, 2022).

⁴² Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf – theccc.org.uk | ⁴³ Sayers et al., 2020. | ⁴⁴ Developing a joint approach to improving flood awareness and safety at caravan and camping sites in England and Wales – publishing.service.gov.uk | ⁴⁵ Housing, England and Wales – Office for National Statistics ons.gov.uk

People and places most vulnerable⁴⁶:

Older people and some disabled people are less likely to respond to flood warnings (especially if they are not registered to receive them or have limited access to home internet or a mobile home) and are more reluctant and/or less physically able to leave their homes.

People with pre-existing mental health conditions may be vulnerable to the psychological impacts of flooding associated with trauma and displacement.

People with pre-existing physical health conditions as water-borne and vector-borne diseases are likely to increase with flooding. People with reduced immunity due to existing health conditions are particularly vulnerable to infection. For example, those living with Sickle cell disease, which is particularly common in people with an African or Caribbean family background.

People experiencing homelessness who are unable to access information on flood warnings.

People who face a language barrier are less likely to receive information on flood warnings.

People in socioeconomically disadvantaged groups as generally the most socially deprived tend to live in areas with greater exposure to flooding (e.g. where house prices are lower), and generally they have low levels of insurance cover.

People from ethnic minority communities are no more likely than their White peers to live in flood prone areas, however they are more likely to live in rented accommodation without flood related insurance and therefore would experience greater financial loss following flooding.

Gypsy and Traveller communities can struggle to get insurance on their homes.

Buildings which are situated within floodplains (e.g. in proximity to water ways) and/or in areas with low levels of green and blue infrastructure (e.g. high level of impermeable surfaces) are the most at risk from surface water and river flooding.

Basement flats are particularly vulnerable to damage in flood events.

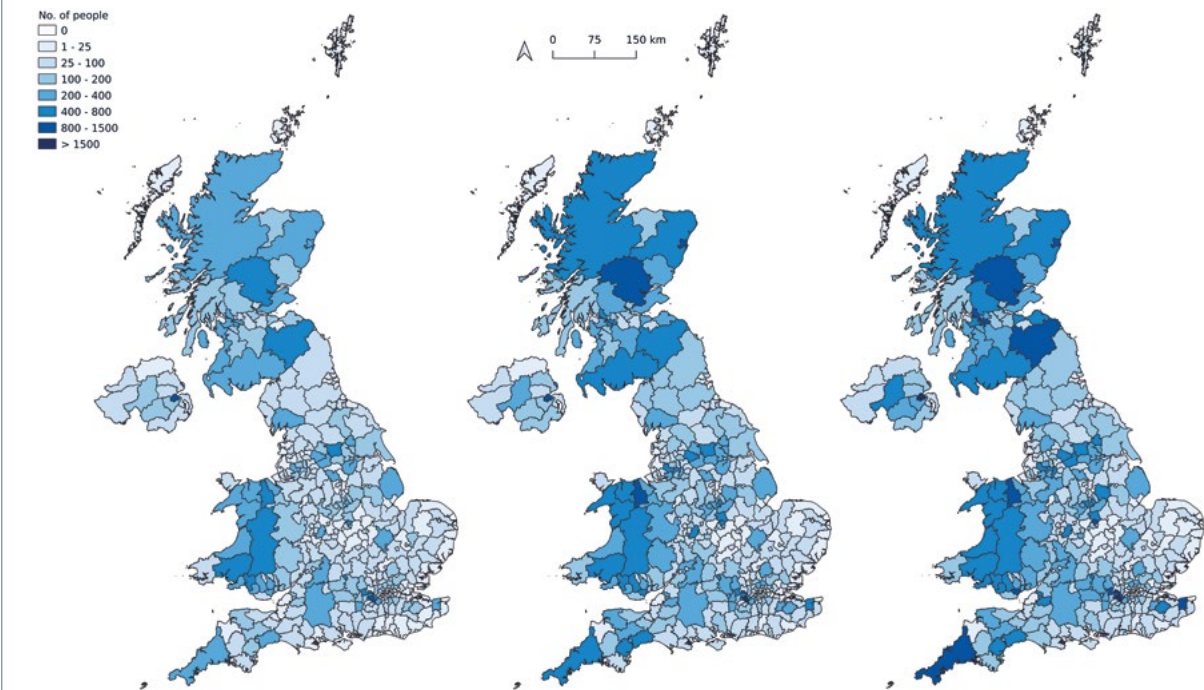


Figure 6 – Expected annual number of people flooded due to river flooding under current levels of adaptation. Left = present-day, middle = 2050s on a pathway to a +4°C by 2100 and right = 2080s on a pathway to +4°C by 2100. The number of people flooded by river flooding is particularly high in Scotland, Wales and south-west England in Cornwall (Source: Sayers et al 2020)⁴⁷.

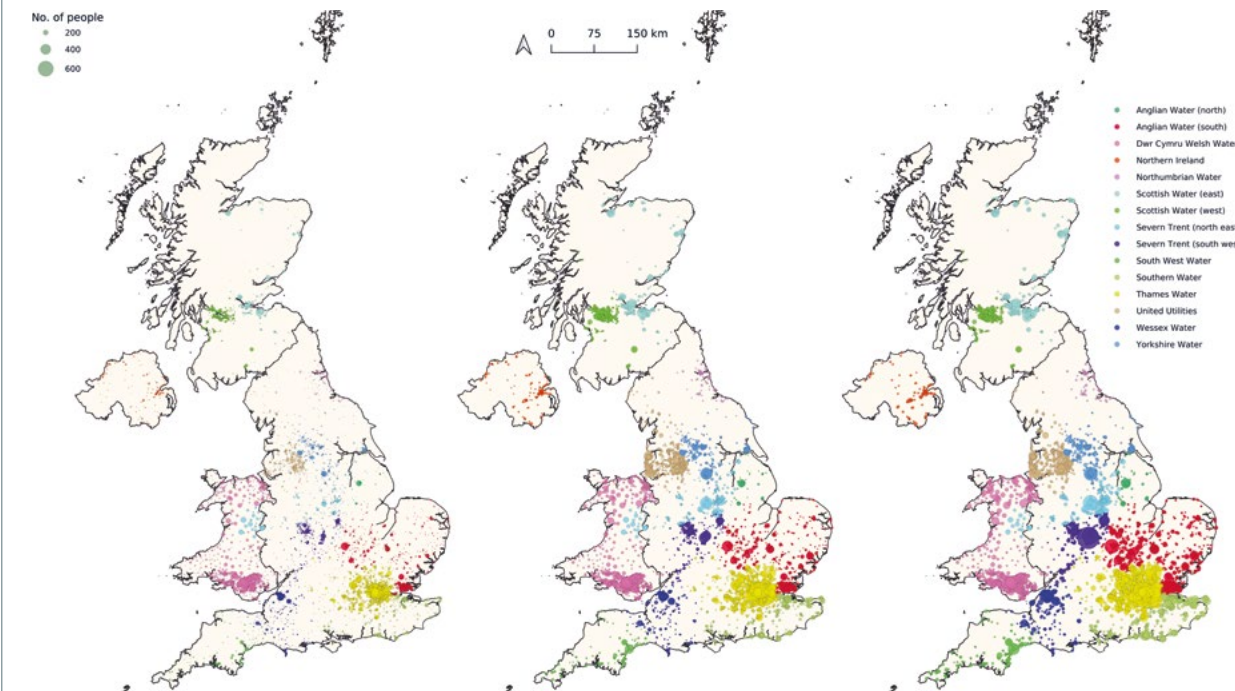


Figure 7 – This figure presents number of people exposed to surface water flooding more frequently than a 1 in 30 year surface water event (i.e. a 3.33% chance of the flood occurring annually). Left = present-day, middle = 2050s on a pathway to a +4°C by 2100 and right = 2080s on a pathway to +4°C by 2100. The size of the circle represents the number of people, different catchments shown as different colours. Surface water flooding exposure is particularly high in cities, such as London and Birmingham, and the south of Wales (Source: Sayers et al 2020)⁴⁷.

Figure 6 and Figure 7 highlight key areas and populations most at risk from river and surface water flooding. The number of people flooded due to river flooding is greatest in areas of Scotland, Wales, southeast and south west of England. Surface water flooding tends to be a higher risk in

urban areas such as London, Glasgow, Edinburgh and Birmingham. The number and distribution of people impacted by river and surface water flooding increases into the 2050s and 2080s under current levels of adaptation.

⁴⁶ Flooding and health: an overview – GOV.UK and https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1155636/AWHP_Evidence.pdf, England and Wales – Office for National Statistics ons.gov.uk

⁴⁷ Sayers, PB., Horritt, M, Carr, S, Kay, A, and Mauz, J (2020) Third UK Climate Change Risk Assessment (CCRA3): Future flood risk. Research undertaken by Sayers and Partners for the Committee on Climate Change (using the Future Flood Explorer). Published by Sayers and Partners and the Committee on Climate Change, London.

Impacts on British Red Cross

British Red Cross’ people (staff and volunteers) and services face a range of risks relating to flooding:

- Safely accessing sites: dependent on resilient transport and safe means of access during flood events. People may not feel comfortable or confident to drive in flood conditions to respond in flooded areas. In addition, vehicles may not be appropriate for some conditions, such as snow and ice (including impacts on batteries in cold weather).
- Safely responding and supporting communities: dependent on effective protocols, equipment, and uniforms to keep British Red Cross’ people safe and allow services to be safely provided.
- Managing capacity: Some of British Red Cross’ people may be affected themselves by flood conditions so are therefore unable to respond to support others.
- Managing stress and trauma for British Red Cross’ people.
- British Red Cross’ properties, vehicles, and equipment could be damaged by floods, and there may be instances where relocating properties/assets to reduce flood risk should be considered.

As a result of the intensity and frequency of extreme weather events, in some cases British Red Cross colleagues have had to weigh up their ability to respond. For instance, an emergency response operations manager stated:

“During the storm there was a period of 24 hours where we took a decision that we weren’t deploying anywhere, because we would have been deploying into an area too risky, and volunteers are not sufficiently trained and resourced for that. But then once the storm passed through, we worked with partners to determine whose needs were greatest.”

Natural Hazards Partnership

British Red Cross are members of the Natural Hazards Partnership (NHP) which brings together expertise from across the UK’s leading public sector agencies with the aim of drawing upon scientific advice in the preparation, response, and review of natural hazards. The partnership enables more coordinated and coherent advice for the government and the resilience community⁴⁹.

Key stakeholders include: the Cabinet Office Natural Hazards Team within the Civil Contingencies Secretariat, and the responder community across the UK.

As part of the NHP we are provided with information and updates from the Met Office, including access to the *Vehicle Overturning Model* which combines probabilistic wind hazard forecast information with vulnerability and exposure data to produce a forecast of the risk of vehicle overturning across the major trunk road network of Great Britain⁵⁰.

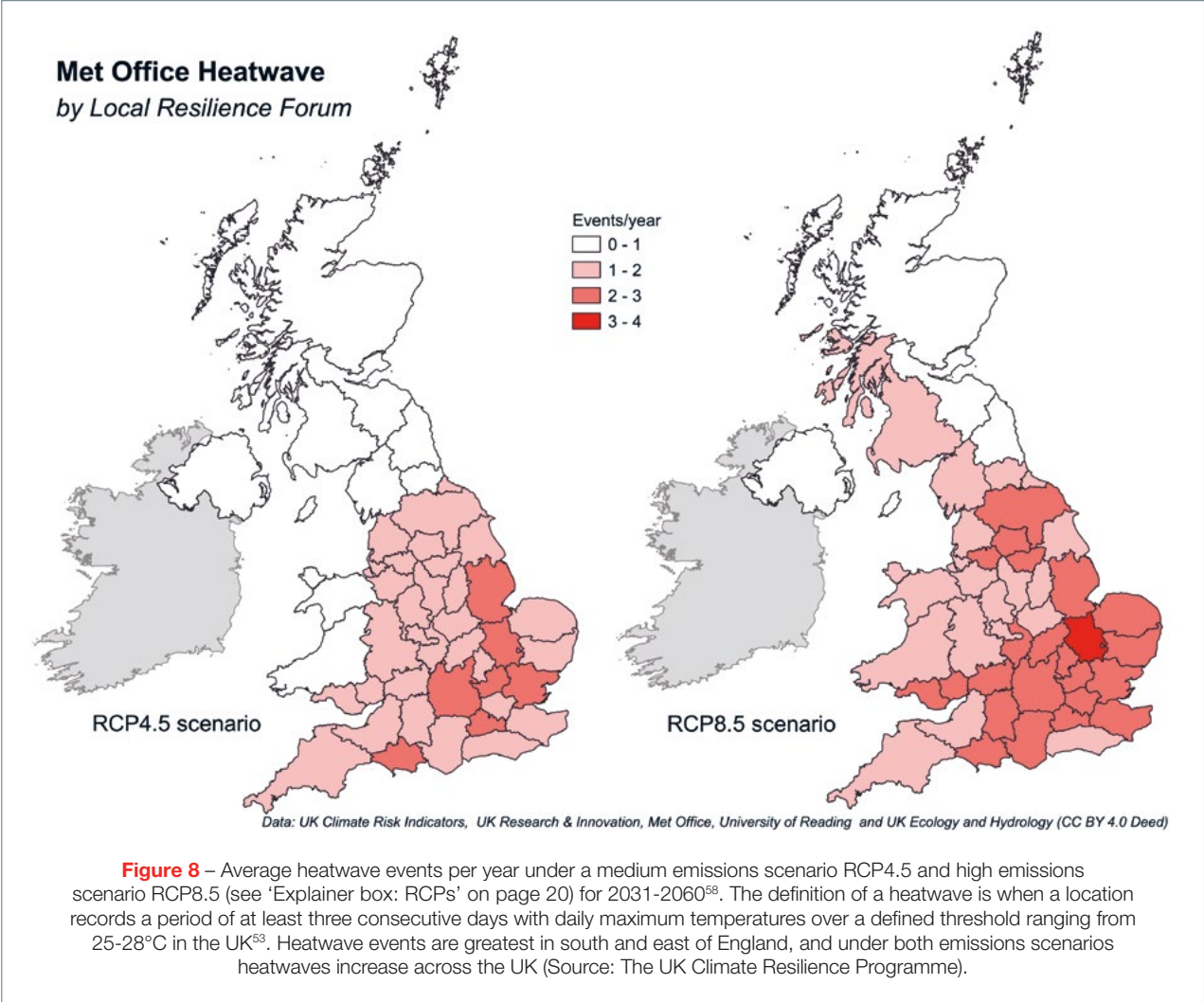
Risk 2: Risk to people from high temperatures

British Red Cross urgency score: Urgent – more action needed

Current and future risk

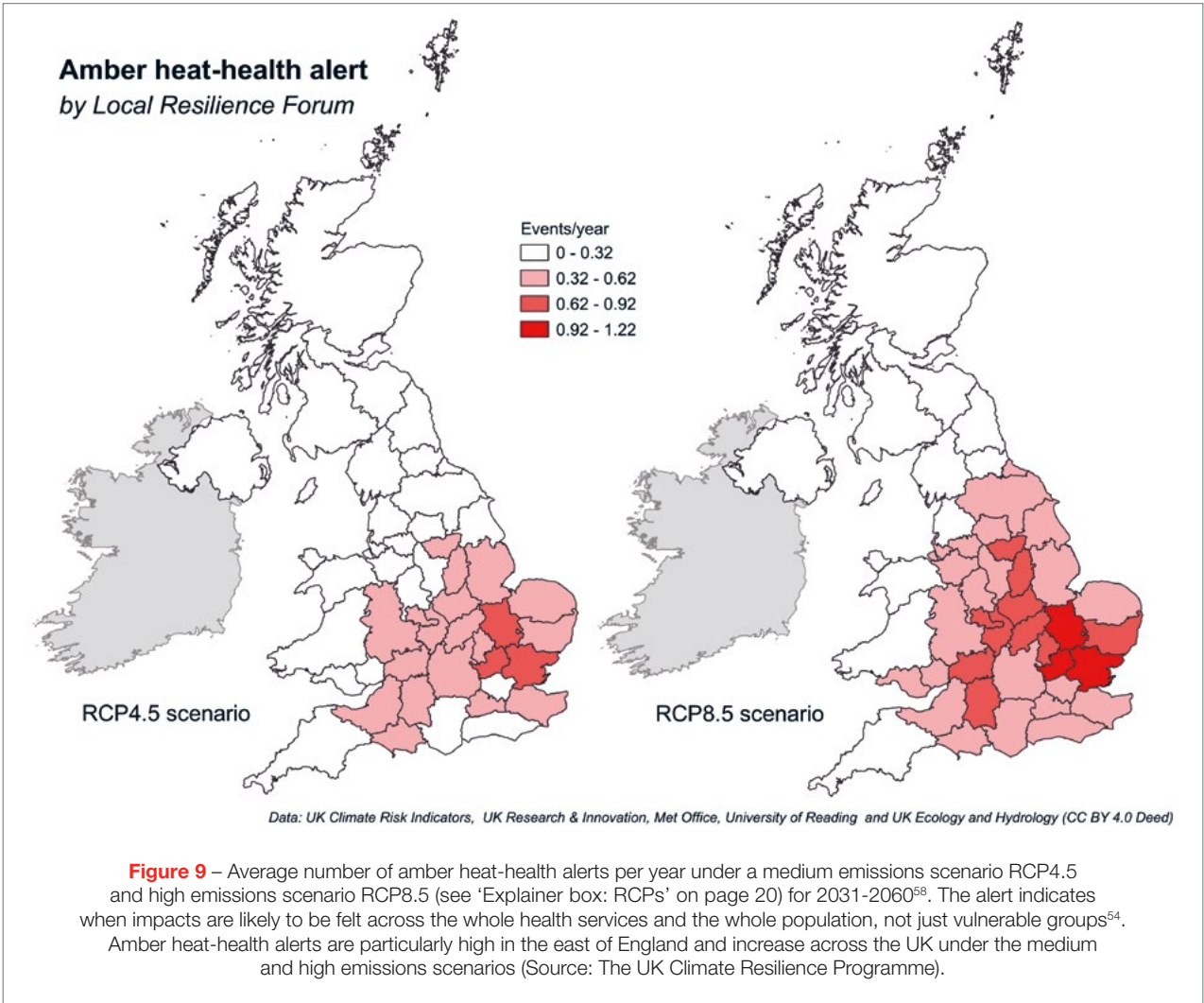
High temperatures can have a wide range of impacts on human health and wellbeing and the risks from combined exposures to heat, air pollution, drought and wildfires are becoming increasingly apparent. Direct impacts from high temperatures include heat stroke, heat exhaustion and in extreme cases loss of life. The UK has so far been experiencing warmer summers, consistent with global trends, with the length of heatwave events increasing throughout the country⁵¹.

Based on UKCP18 projections for the UK, the average summer temperatures and number of hot days and heatwave events are expected to increase across the country. All regions will experience more frequent and more severe extreme daily maximum temperatures. By 2031-2060 the number of heatwaves at parts of the UK are expected to be as high as 3 per year, compared to 1 event per year from 1981-2010⁵² (Figure 8). Projections also show that the ‘heatwave’ season will increase in length, meaning that heat risks may extend in early summer and spring⁵⁷. More intense and frequent heatwaves are also likely to increase heat-related mortality significantly.



49 The Natural Hazards Partnership – UKRI | 50 The Vehicle OverTurning Model – Met Office

53 What is a heatwave? – Met Office



Impacts on people and places British Red Cross supports

While the whole of the UK is expected to experience the impacts of high temperatures, south and east England is projected to face the most extreme changes, with heatwaves becoming more frequent and days with temperatures greater than 30°C becoming significantly more frequent⁵⁵. It is estimated that 20% of houses in England are at risk of overheating⁵⁶. There is currently limited preventative action to prevent overheating of the built environment.

People and places most vulnerable^{57,58,59,60}:

Older people, people with existing medical conditions, pregnant women, and menopausal women are more vulnerable to overheating, heat-related health complications, and disruptions to sleep due to hot nights causing health impacts. Some of these groups also tend to spend more time in their homes, increasing their exposure to overheating.

Water-borne and vector-borne diseases are likely to increase with warmer temperatures. **People with reduced immunity** due to existing health conditions are particularly vulnerable to infection. For example, those living with Sickle cell disease, which is particularly common in people with an African or Caribbean family background.

Unborn babies face higher risk of premature birth and foetal strain, and infants face development issues such poor development of lungs, brain, and future fertility.

Heatwaves can worsen **mental health issues** and increase the risk of depression, anxiety, schizophrenia, and eco-anxiety.

People **working outside** are more prone to injuries and heat-related health implications at times of extreme heat, and prone to reduced productivity. Population dependent on health and social care under increased risk as they might experience longer waiting times as these services will be receiving more calls for support during heatwave events.

Workers might experience reduced productivity in their workplace or home if working from home.

Students’ academic performance generally decreases in heatwaves, and there is an increase in missed school days.

High and medium rise flats, particularly those with poor ventilation and shade are at higher risk of overheating.

Newer buildings and flats with lower ceilings, and buildings with **communal heating** often experience higher summertime indoor temperatures.

Lower income households and renters are disproportionately affected as they may not be able to install adaptation measures to improve their thermal comfort and reduce their heat exposure (e.g. blinds, fans etc.). They generally also have less access to green spaces and are less likely to bounce back easily after extreme weather.

People from ethnic minority communities are more likely to live in poorly adapted housing within urban areas particularly vulnerable to the impacts of high temperatures. In addition, Research by the Runnymede Trust and Greenpeace found that Black, Asian, and other minority residents in cities are more likely to live in areas affected by air pollution which can be aggravated during heatwaves.

Increased risk of disease outbreak as more people swim in areas with poor water quality.

⁵⁴ Heat-Health Alerts issued by UKHSA and the Met Office – GOV.UK | ⁵⁵ UK and Global extreme events – Heatwaves – Met Office | ⁵⁶ The hidden problem of overheating – Climate Change Committee theccc.org.uk | ⁵⁷ Staying safe in extreme heat – UK Health Security Agency blog.gov.uk | ⁵⁸ Supporting vulnerable people before and during hot weather: social care managers – GOV.UK | ⁵⁹ Beat the heat: staying safe in hot weather – GOV.UK | ⁶⁰ Confronting Injustice: Racism and the Environmental Emergency – runnymedetrust.org

Impacts on British Red Cross

- Overheating of British Red Cross offices, Rest Centres, equipment, and vehicles – many of which do not have air-conditioning (including impacts on batteries due to hot weather)
- British Red Cross staff and volunteers prone to overheating in work uniforms
- Heatwaves impacting British Red Cross people and equipment and preventing/limiting British Red Cross capacity to respond to incidents, or placing people in harm’s way while they are responding. British Red Cross staff and volunteers have commented on reduced productivity during heatwaves, when experiencing overheating
- British Red Cross may face challenges procuring and supplying necessary items such as sunscreen or bottled water during extreme heat events due to increased demand

Some British Red Cross staff and volunteers have questioned the suitability of British Red Cross uniforms and protocols during hot weather. Protocols to ensure British Red Cross people have sufficient shade, rest, and water may need to be revisited, particularly when considering many volunteers are older and more susceptible to heatwaves. A British Red Cross staff member said: “We know what we do [and wear] in floods, but heat less so. People have waterproof coats and steel capped boots, we’re pretty safe in floods. But heat, we just don’t know yet.”

Risk 3: Risk to people and property from moisture, mould, and heavy rain

British Red Cross urgency score: Further investigation needed

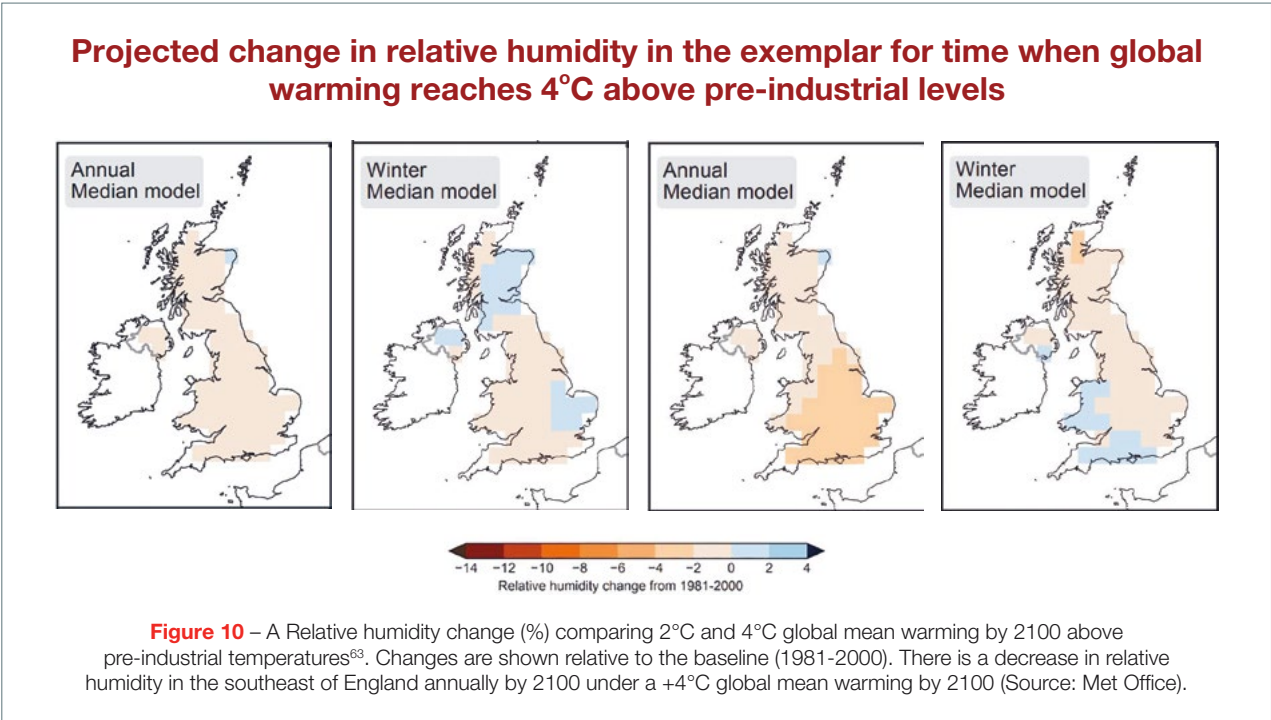
Current and future risk

Homes can be impacted by heavy rainfall and excess moisture leading to damp, mould growth, and costly repairs. Moisture accumulation in buildings is caused by poorly insulated structures in low temperatures, high moisture levels internally, and water ingress into cracks in the building fabric, associated with flooding and rainwater or groundwater penetration⁶¹.

In future, moisture risks from climate change are projected to increase due to projected increases in heavy rainfall events leading to inundation into homes. Winter rainfall is projected to increase across the UK, as shown in maps in the previous sections, which in combination with lower temperatures may result in mould growth where there is water ingress⁶⁷. Heavier rainfall in future may result in increased penetration of vertical

walls in homes⁶⁷. An opportunity arises from projected increases in temperatures which may reduce the risk of mould growth for homes with appropriate ventilation⁶⁷.

Humidity levels are a function of surface air temperature and water vapour content ⁶⁹. Humidity levels are projected to increase in winter, notably in Scotland, Northern Ireland and the east of England when temperatures reach 2°C above pre-industrial levels at the end of the century (Figure 10). Whereas Wales, Northern Ireland and southwest England are projected to have increased humidity when temperatures reach 4°C above pre-industrial levels at the end of the century. It should be noted that changes remain at small magnitudes in winter (ranging from -2% to 2% increase) compared to annual changes which show a decrease in humidity of +4 to +6% in the south east of England.



⁶² UKCP18-Derived-Projections-of-Future-Climate-over-the-UK.pdf – metoffice.gov.uk | ⁶³ UKCP18-Derived-Projections-of-Future-Climate-over-the-UK.pdf – metoffice.gov.uk | ⁶⁴ Understanding and addressing the health risks of damp and mould in the home – GOV.UK

Impacts on people and places British Red Cross supports

Damage to building fabric entails costs to the homeowner for repair. Damp buildings cause harm to people’s physical health and mental wellbeing (see Risk 6). Damp and mould impacts health due to the production of allergens, irritants, and mould spores . This may also reduce people’s ability to work, resulting in lost income.

Impacts on British Red Cross

- British Red Cross offices and the rest centres we support may be impacted by moisture ingress and mould without adequate insulation and ventilation.
- Some of British Red Cross people may live in homes impacted by moisture and mould, impacting their health and their capacity to support others when incidents occur.
- Additionally, British Red Cross staff and volunteers may be exposed to mould when they provide services, which could aggravate existing conditions.

People and places most vulnerable⁷⁰:

There is a small projected increase in humidity in Scotland, Northern Ireland and east and southeast England in 2100 under varying climate scenarios. A small increase in humidity may increase the risk of moisture ingress and mould formation in these regions, however, projected increases in temperature may reduce this impact⁶⁵.

People with underlying health conditions such as asthma, allergies, and those with weakened immune systems such as pregnant people, older people, and those with chronic health conditions.

People from ethnic minority communities are more likely to be living in homes at risk of damp, which can be exacerbated by heavy rainfall even without flooding. Damp and mould are common in Traveller sites despite regulatory standards⁶⁶.

People living with a mental health condition (see Risk 6).

Children and young people who are more likely to suffer from respiratory problems.

People who are bedbound or have mobility problems making it difficult to go outside, such as older people and some disabled people.

Tenants who have less agency to remove mould safely from their homes.

Risk 4: Risks to people from poor water quality and household water supply interruptions

British Red Cross urgency score: Further investigation needed

Current and future risk

Water supply interruptions can occur due to several climate hazards:

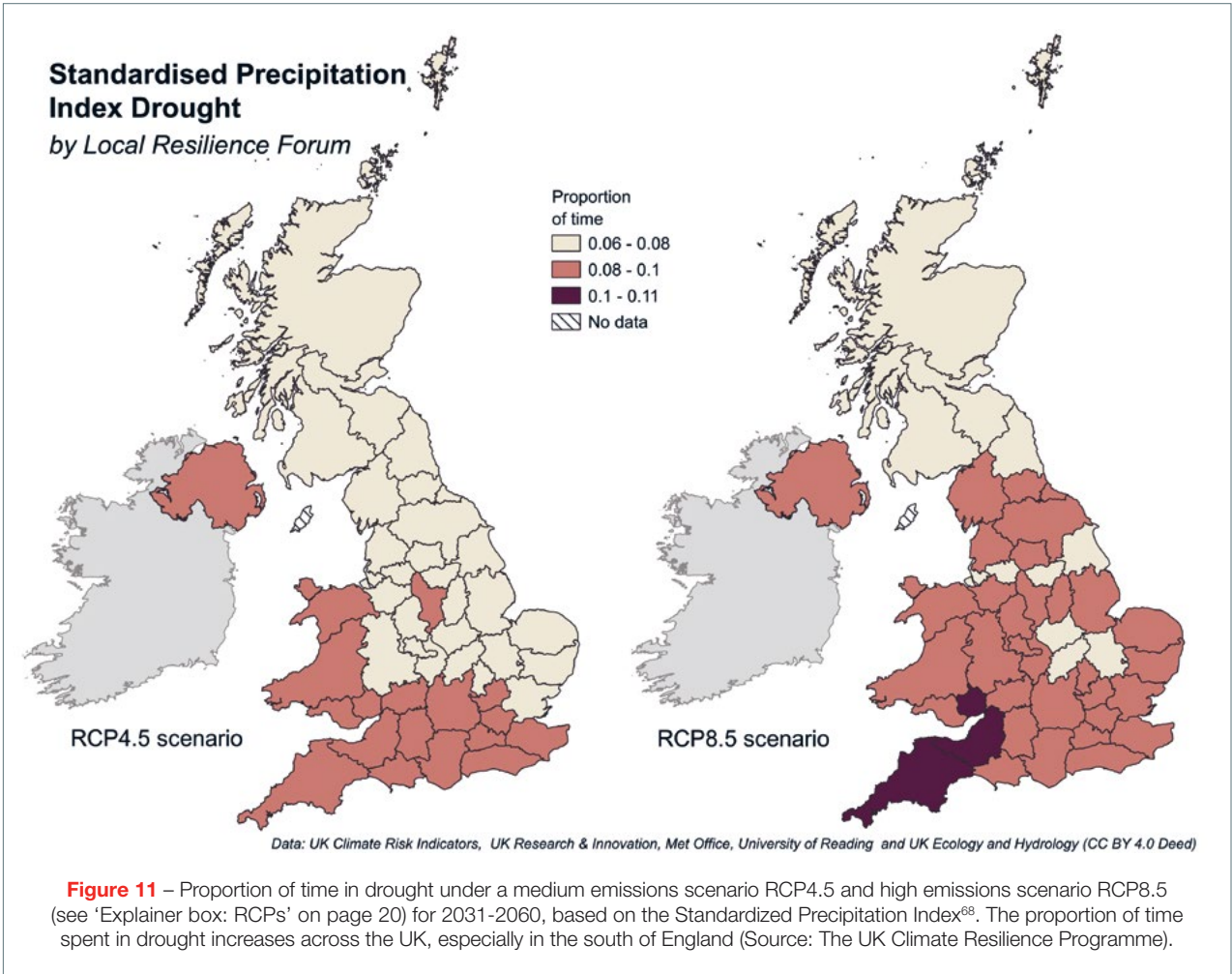
- Drought/water scarcity limiting water supply, or damaging water networks due to ground subsidence.
- Heatwaves resulting in high demand for water alongside capacity constraints in networks or water supply.
- Heavy rainfall, storms, floods, and wildfires contaminating water supplies or damaging water networks.
- Ecology change driven by climate change can also lead to increased water quality issues, for example resulting in more algae blooms and invasive non-native species.

Drought is a major risk for parts of the UK and was identified as a hazard that British Red Cross is increasingly responding to. In particular, the South and East of England are already water stressed⁶⁷, and this will be compounded by high population growth alongside reduced summer precipitation and increased heatwaves due to climate change, as shown in the map in the previous section and in Figure 11. The Standardized Precipitation Index (SPI) is a measure of drought risk, accounting for rainfall⁶⁸. Based on the SPI, the median proportion of time parts of the UK spend in drought is projected to increase to 10% of time by 2031-2060 under both RCP4.5 and RCP8.5, from a baseline proportion of time less than 7% (1981-2010).



⁶⁵ CCRA3-Chapter-5-FINAL.pdf – ukclimaterisk.org | ⁶⁶ How-will-the-climate-and-nature-crises-impact-people-from-Black-Asian-and-Ethnic-Minority-Communities.pdf – gypsy-traveller.org

⁶⁷ CCRA3-Chapter-5-FINAL.pdf (ukclimaterisk.org) | ⁶⁸ Standardised Precipitation Index (SPI) – NIWA



Higher run off into rivers and lakes can result in greater levels of sediment, nutrients, and pollutants into water supplies⁷⁶. Poor water quality associated with this run off may worsen in future due to projected increased heavy rainfall events leading to increased run off (Table 2). Future heavy rainfall events may consequently overwhelm current water treatment capacity⁷⁰. Water treatment failures have been reported across all UK countries associated with extreme weather.

Impacts on people and places British Red Cross supports

Poor water quality and increased water supply disruptions would have health, social and economic impacts, particularly for vulnerable households⁷¹.

- Health and wellbeing impacts – water quality issues can make people sick and cause death in extreme situations. Water supply disruptions can reduce wellbeing, for example due to reduced hygiene and
- Increased isolation and social deprivation: disruptions to water can further isolate vulnerable people and increase loneliness and mental health impacts
- Economic losses: water outages can force businesses to close, and can prevent people from being able to work, with associated lost income.

People and places most vulnerable⁷⁷:

The south and east of England is currently water stressed, with projected decreases in summer precipitation and increased drought likelihood in future.

By the 2050s, negative water resource availability is projected across 22 catchments, with the majority in Wales⁷². By 2100, this is projected to increase to 74 catchments across Wales, southwest England, north of England and western Scotland. This could lead to interruptions in household supply and temporary use bans if adaptation action is ineffective.

Low-income households unable to reduce their water use are more vulnerable to differential water charging, particularly those who do not qualify for support schemes such as WaterSure.

Remote communities are often more vulnerable to drought and water quality impacts due to relying more on private water supplies⁷³.

Young people, older people and those with physical and mental long-term illnesses or disabilities are impacted the most by water supply interruptions⁷⁷.

Impacts on British Red Cross

British Red Cross people and services can be impacted in several ways:

- Water outages/poor water quality impacting British Red Cross offices and Rest Centres
- Water outages/poor water quality impacting British Red Cross people and preventing/limiting their capacity to respond to incidents, or placing them in harm's way while they are responding
- British Red Cross may be unable to procure/ supply bottled water/alternative water supplies to vulnerable people if these are in short supply/if increased demand

Risk 5: Risk to people and properties from wildfires

British Red Cross urgency score: Further investigation needed

Current and future risk

Increasing summer temperatures accompanied by drier conditions increase the risk of wildfires breaking out and spreading uncontrollably⁷⁴. With risk magnitude increasing linearly with temperature change, higher climate change scenarios are expected to bring more frequent and intense wildfires⁸⁰. Wildfires in the UK are generally concentrated in spring and summer when there is a greater amount of dry vegetation

prone to burning. Frequency and magnitude of wildfires in the country have already been increasing noticeably, with the last 3 years having significantly higher burn rates⁸⁰. The number of days when the Met Office declares a Fire Danger in Cambridgeshire are expected to increase to up to 50 by 2031-2060, compared to a historical average of 34 days (Figure 12).

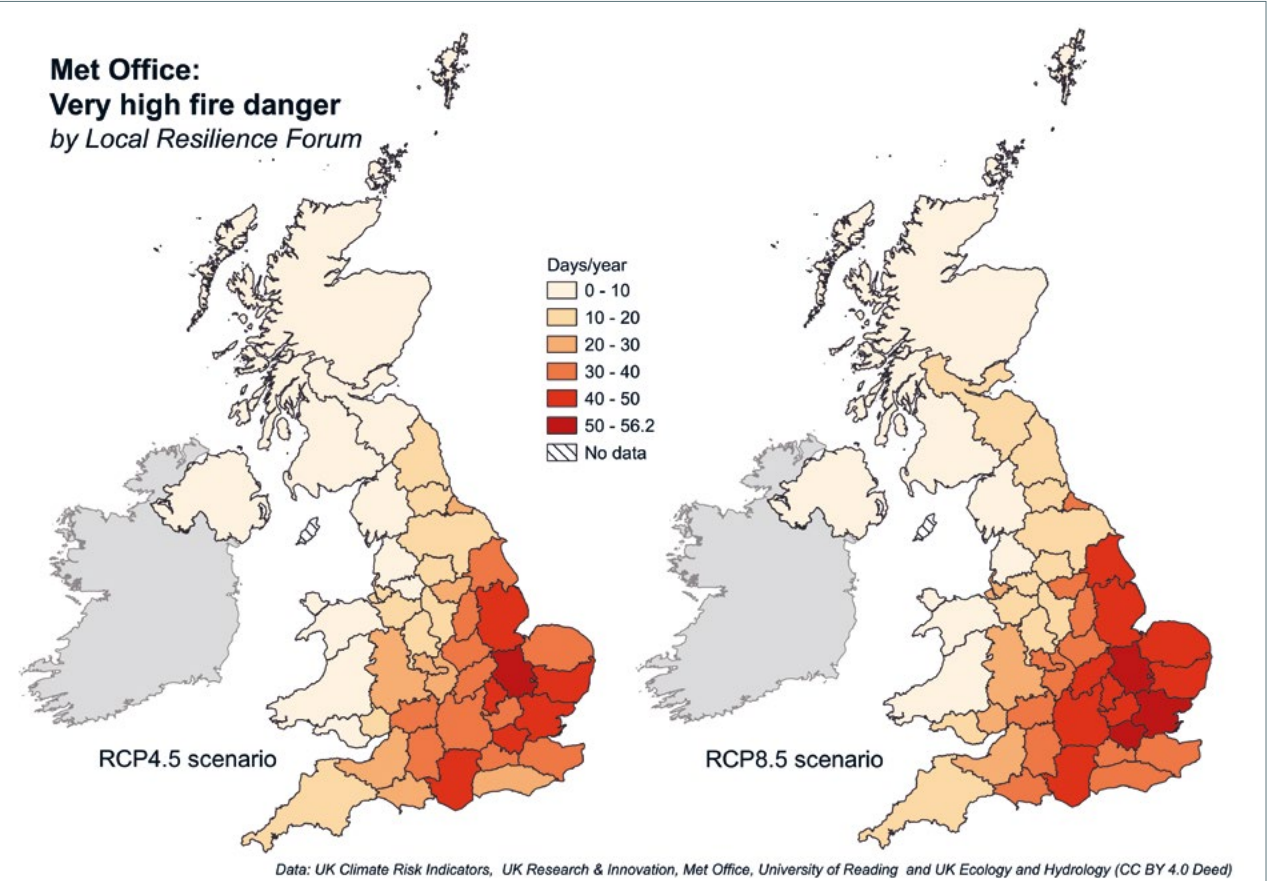


Figure 12 – Number of days per year which the Met Office declares Fire Danger under a medium emissions scenario RCP4.5 and high emissions scenario RCP8.5 (see ‘Explainer box: RCPs’ on page 20) for 2031-2060. Fire danger is most frequent in England, to the south and east. Fire danger is projected to increase across the UK by 2031-2060 (Source: The UK Climate Resilience Programme).

The British Red Cross Wildfire Index identified areas in the UK where people might be vulnerable to wildfires in the UK during summer months⁷⁵. The index is based on past ‘fire points’ (locations where previous fires have occurred from 2001-2022 from satellite imagery), topography, temperature, precipitation, wind speed and vegetation cover. The index also takes into account distance to roads and population. During the summer months, the local authorities in the UK which are most socially vulnerable and susceptible to wildfires are in the southeast of England and in cities such as Kingston upon Hull and London.



Figure 13 – Local authorities most socially vulnerable and susceptible to wildfires in the summer months. The south-east of England and cities such as Kingston-Upon-Hull and London are more socially vulnerable and susceptible to wildfires in the summer months⁷⁶.

Impacts on people and places British Red Cross supports

Wildfires in the UK pose a significant threat to life, communities and the built environment. While the largest recorded wildfires often occur in National Parks, Special Areas of Conservation and Sites of Special Scientific Interest, most fires occur near residential or **built-up areas and gardens**, with the annual average being close to 16,000 vegetation fires a year⁷⁷. The proximity of a lot of wildfires to built-up areas also means that the building fabric of cities and urban areas are prone to damage as a result of wildfires, with potential damage to homes and shelters having cascading impacts on the well-being of communities. Wildfires pose a threat to the health and wellbeing by **worsening air quality** and can adversely affect water quality by discharging ash and heavy metals into nearby water supplies⁷⁸.

Agricultural and forestry productivity from fires can have high localised impacts – for example, wildfires in summer 2018 cost UK farms approximately £32 million in total⁷⁹. Wildfires can also disrupt transport, cause power and communications outages, and prevent businesses from opening, with associated economic impacts. British Red Cross is increasingly responding to wildfire incidents across the UK. Staff and volunteers have noted agricultural land being damaged as well as animals (livestock and pets) being affected by wildfires.

74 CCRA3-Chapter-5-FINAL.pdf – ukclimaterisk.org

75,76 Red Cross Strategic Insights & Foresight Briefing: Summer risks to inform Crisis & Emergency Response planning | 77 CCRA3-Chapter-5-FINAL.pdf – ukclimaterisk.org | 78 CCRA3-Chapter-5-FINAL.pdf – ukclimaterisk.org | 79 Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf – ukclimaterisk.org

People and places most vulnerable:

Fires pose a direct risk of injury or mortality, and some groups of people can be disproportionately affected:

People with pre-existing respiratory conditions are more prone to respiratory problems as a result of wildfires⁸⁴.

People with mobility issues will have more difficulties evacuating safely in time.

Houses with poor ventilation are likely to be more affected by worsened air quality as a result of wildfires which may lead to or aggravate allergy and asthma as well as other airborne infections, pulmonary and cardiovascular diseases⁸⁰.

The impacts of reduced agricultural production on domestic food supply can have important implications in terms of food availability and price, which can be especially severe for people with low incomes⁸¹.

Wildfires and the subsequent loss of properties and belongings can also have long-term impacts on mental health and aggravate mental health conditions for affected individuals (see Risk 6).

People living in isolated settlements with limited road access are more vulnerable to any road closures and travel disruptions which can also affect their access to aid⁸⁴.

Impacts on British Red Cross

Wildfires can impact the British Red Cross in several ways:

- Safely accessing sites: dependent on resilient transport and safe means of access during wildfire events. People may not feel comfortable or confident to drive in wildfire conditions.
- Safely responding and supporting communities: dependent on effective protocols, equipment, and uniforms to keep British Red Cross people safe and allow services to be safely provided.
- Managing capacity: Some of British Red Cross people may be affected themselves by wildfires, so are therefore unable to respond to support others.
- Managing stress and trauma for British Red Cross staff and volunteers.
- Our own or our partner’s assets such as rest centres could be exposed to damage.

Risk 6: Risk to mental health from climate shocks and stresses

British Red Cross urgency score: Further investigation needed

Current and future risk

Climate change poses a risk to mental health and wellbeing. People living through events such as flooding, storms, and wildfires can be exposed to potentially traumatic events such as witnessing serious injury or death. As a result, many people will experience higher levels of psychological distress and a minority may develop more serious mental health problems, such as post-traumatic stress disorder (PTSD), depression, or substance use disorders⁸². The loss of utilities such as gas, water and electricity, financial concerns relating to house repairs and value, loss of sentimental items and potential displacement can cause stress and anxiety⁸³.

As temperatures are projected to rise in future, there is likely to be an increased rate of mental health conditions. In the UK during previous heatwaves, there was an increased risk of suicide and evidence of increased hospital admissions for mental illnesses during increased temperatures⁸⁴. Higher temperatures can also affect sleep patterns and result in isolation if temperatures are so extreme that people are unable to leave their homes⁸⁵. Droughts can affect people’s mental health due to disruption in day-to-day activities, damage to property due to subsidence and impacts to livelihoods for example, reduced crop yields^{86,90}.

As well as direct exposure to climate hazards, a growing number of people report psychological reactions related to confronting the prospect of climate change. There are indirect mental health consequences caused by observing the impacts of climate change on others and anticipating the effects it may have on oneself. Some surveys^{87,88,89} suggest that in the UK, the worsening climate situation has led to a large number of people experiencing ‘eco-anxiety, which has been defined as “a chronic fear of environmental doom” caused by “watching the slow and seemingly irrevocable impacts of climate change unfold” combined with “worrying about the future for oneself, children, and later generations”⁹⁰.



Photo © Rich Jones/BRC

80 The impact of poor housing and indoor air quality on respiratory health in children – PMC nih.gov | 81 Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf – theccc.org.uk

82 Flooding and health: an overview – GOV.UK | 83 How to recover from flooding – GOV.UK | 84 Adverse Weather and Health Plan: Supporting evidence – publishing.service.gov.uk | 85 Effects of thermal environment on sleep and circadian rhythm – PMC nih.gov | 86 The Mental Health Outcomes of Drought: A Systematic Review and Causal Process Diagram – PMC nih.gov | 87 BPS survey highlights eco-anxiety in UK youth – BPS | 88 Survey reveals scale of climate anxiety among British children – savethechildren.org.uk | 89 Survey reveals eco-anxiety over climate crisis – News and events, University of York | 90 American Psychological Association: Mental Health and our Changing Climate

People and places most vulnerable:

People with pre-existing mental health conditions may experience an exacerbation of these conditions due to climate change impacts⁹⁶.

Tenants may be less able to improve their living conditions from impacts of climate change. For example, the presence of damp and mould in homes can affect mental wellbeing due to concerns of health impacts and destruction of property and belongings⁹¹.

Young people can be particularly vulnerable to mental health conditions as a result of climate change such as depression, anxiety, and eco-anxiety⁹².

People who live in urban areas or in high density living who have reduced access to green spaces, which can help improve wellbeing and reduce mental ill-health, especially during heatwaves^{90,93}.

People living in areas already prone to climate risks, such as in areas prone to coastal flooding where there is uncertainty and anxiety about the long-term viability of some coastal communities⁹⁶.

Impacts on people and places British Red Cross supports

British Red Cross workshops highlighted the emotional impacts of extreme weather events including loss of sentimental properties and belongings leading to depression, frustration and sense of loss. In addition, the emotional toll of being displaced during or after an incident was highlighted.

Impacts on British Red Cross:

First responders, emergency workers and others involved with responding to extreme weather-related disasters are at increased risk for mental health consequences both in the short and long term. British Red Cross workshops found that there is a perception that heatwaves have already negatively affected wellbeing volunteers and staff.

Risk 7: Risk to energy, transport, and telecommunication networks due to climate hazards and cascading failures

British Red Cross urgency score: Watching brief

Current and future risk

Energy, transport, and telecommunication networks are vulnerable to all climate hazards, for example^{94,95}:

- High temperatures: can put strain on energy networks as demand for cooling increases, road surfaces can melt and degrade, rail lines can buckle, power lines can sag, and communications equipment can overheat, causing disruptions to services.
- Drought: can reduce hydropower generation, affect cooling for energy and telecommunication systems, and result in ground subsidence impacting roads and rail.
- Flooding and storms: can damage power substations and distribution networks, inundate roads and rail, and interfere with mobile telecommunications. Strong storms can result in property damage and lead to road closures if falling trees are blocking roads. Cars may be damaged, overturned or swept away, trapping people inside and making rescue efforts more challenging.
- Snowstorms: can lead to displacement and flooding due to freeze thaw, result in health implications like hypothermia, exacerbated by energy poverty, communities might be completely cut off as conditions can prohibit volunteers from traveling either due to road conditions or lack of suitable equipment. Food and fuel poverty may also be exacerbated by cold spells, having an impact on nutrition and mental health. Homeless people are adversely affected due to increased chances of injury or death.

Infrastructure systems do not operate in isolation and issues can cascade through systems and cause more serious disruptions¹⁰⁰. For example, rail and telecommunications rely on resilient power supply, so a power outage in one area can impact many people in other areas due to cascading impacts. Infrastructure networks are interdependent, for example – effective operation and maintenance of the power supply relies on resilient transport and communications networks so that personnel can access sites and address issues before they become major disruptions.

The potential risk to infrastructure network is already significant, as 40% of transport and utilities infrastructure are in areas at current risk of flooding, either directly or due to dependence on other sectors⁹⁶. Risks to energy, transport, and telecommunications services varies across the UK, with some areas being more prone to particular climate hazards. Without adaptation actions it is expected that disruptions to infrastructure networks will become more common under future climate change scenarios.

⁹¹ Understanding and addressing the health risks of damp and mould in the home – GOV.UK | ⁹² Climate anxiety in children and young people and their beliefs about government responses to climate change: a global survey – The Lancet Planetary Health | ⁹³ Eco-anxiety among Children and Young People: Systematic Review of Social, Political, and Geographical determinants – medRxiv

⁹⁴ Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf – theccc.org.uk | ⁹⁵ CCRA3-Chapter-4-FINAL.pdf – ukclimaterisk.org | ⁹⁶ Environment Agency (2019). Long-term investment scenarios www.gov.uk/government/publications/flood-and-coastal-risk-management-in-england-longterm-investment/long-term-investment-scenarios-ltis-2019

Illustrative impacts on roads

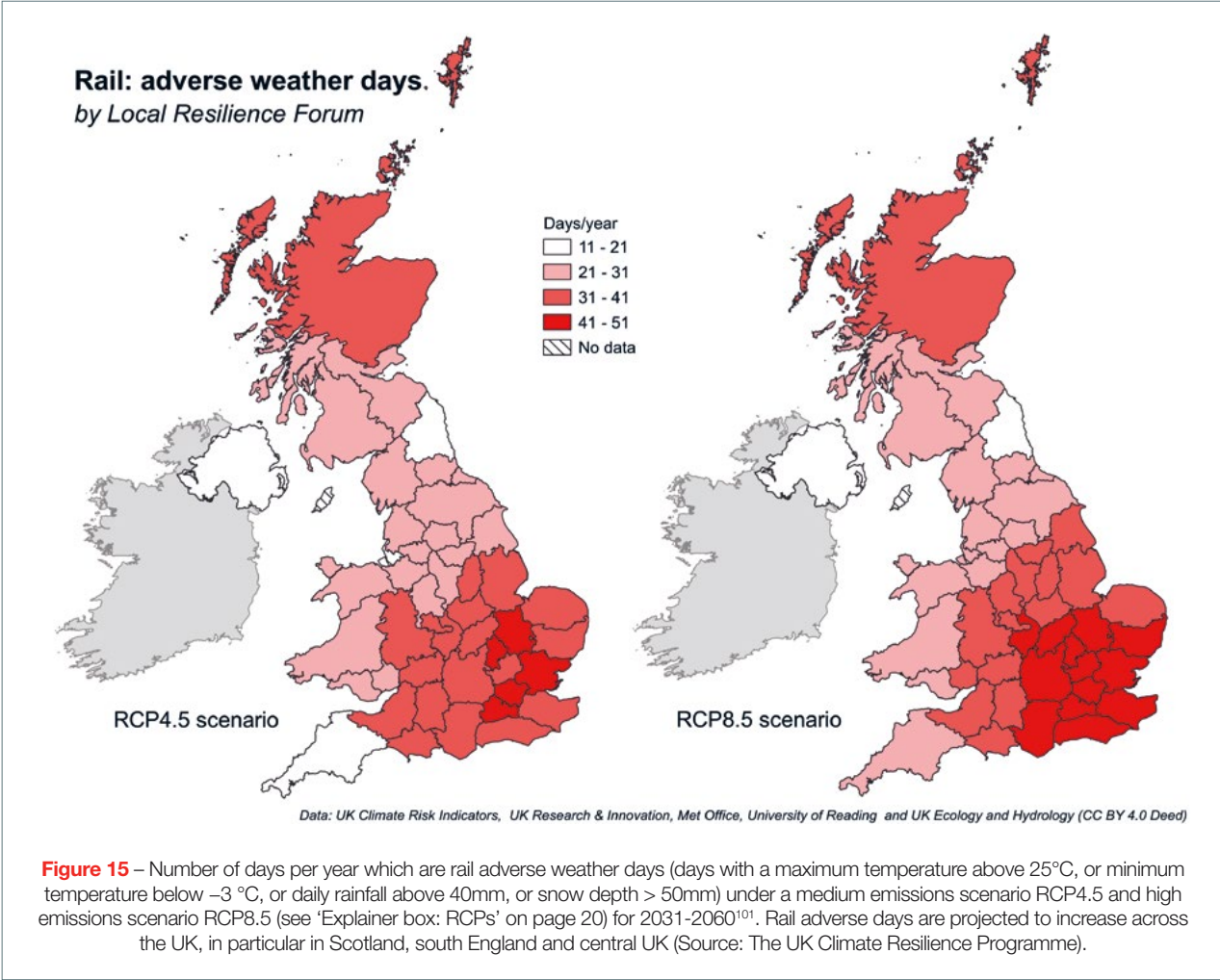
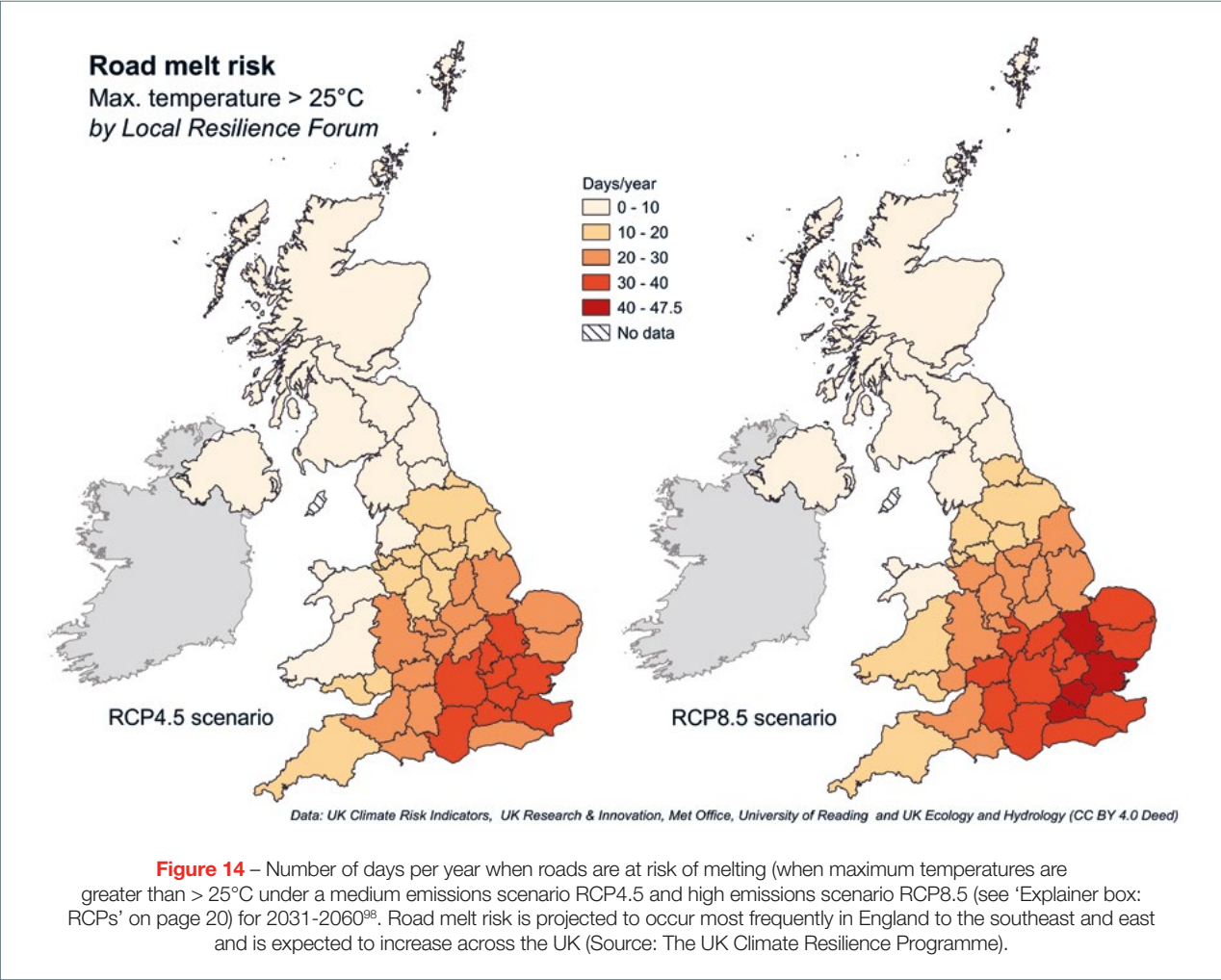
When maximum temperatures exceed 25°C there is an increased risk of road surfaces melting and becoming degraded, leading to potential disruption to roads. During 1981-2010 the average number of days above 25°C was 22 days/year in the hottest parts of the UK. Road

melt risk is projected to reach up to 40 days/year under RCP4.5 and 47 days/year under RCP8.5 by 2031-2060 (Figure 14). This change is expected to be more pronounced in the south regions of the UK, with London experiencing the highest numbers of road melt risk days⁹⁷.

Illustrative impacts on rail

Network Rail defines Railway adverse weather days as days with Max temperature above 25°C, or minimum temperature below -3 °C, or daily rainfall above 40mm, or snow depth > 50mm⁹⁹. Rail adverse weather is generally expected to impact south and central UK more

than the northern regions¹⁰⁰, with the median number of days with rail adverse weather expected to increase from 31 days/year over the baseline period (1981-2010) to up to 43 and 50 days/year by 2031-2060 under RCP4.5 and RCP8.5 respectively (Figure 15).



⁹⁷ Climate hazard metrics are weighted by the length of road network in the region. | ⁹⁸ Climate Risk Indicators – uk-cri.org

⁹⁹ Indicators of climate risk in the UK at different levels of warming. | ¹⁰⁰ Climate hazard metrics are weighted by the length of railway network in the region. | ¹⁰¹ Climate Risk Indicators – uk-cri.org

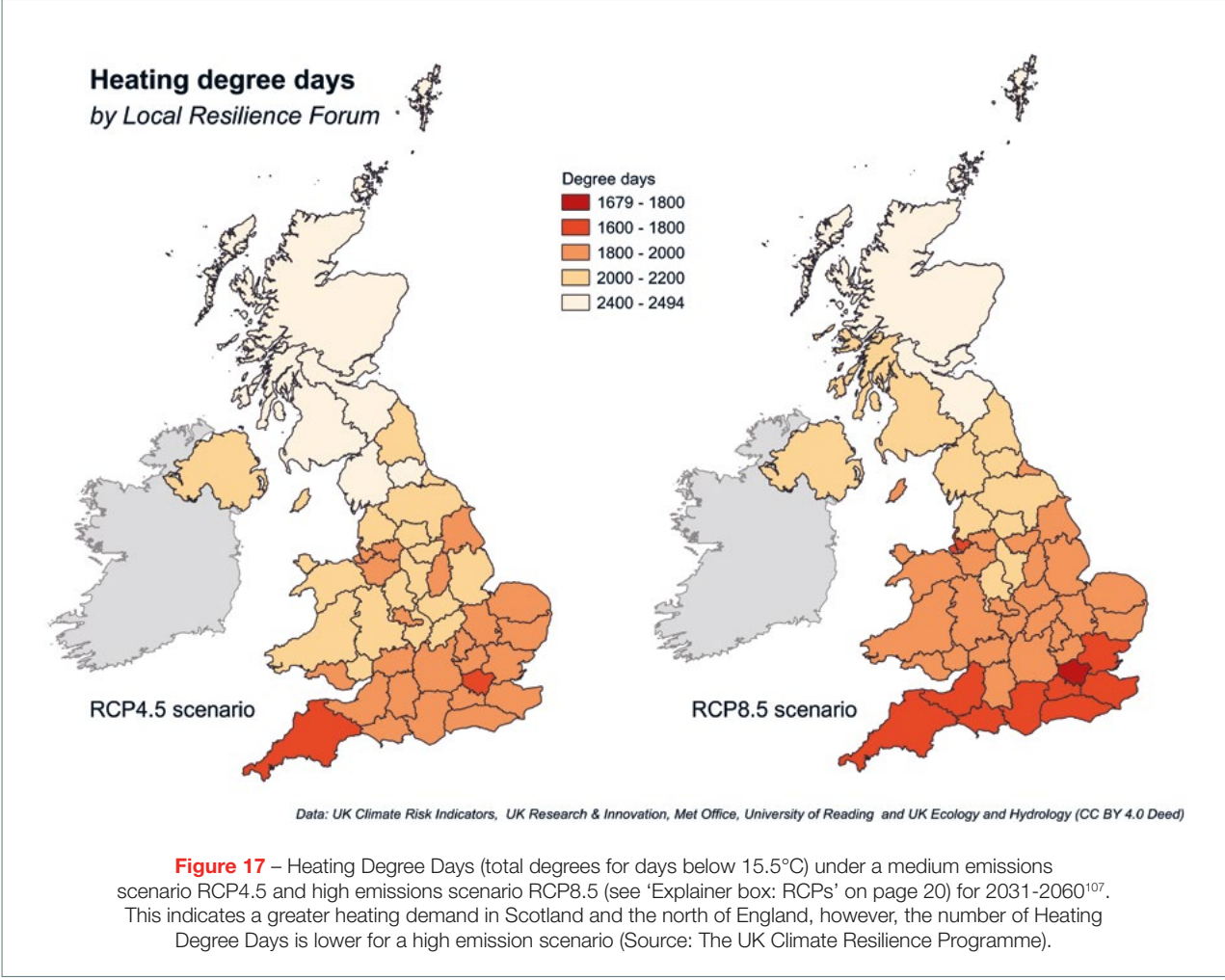
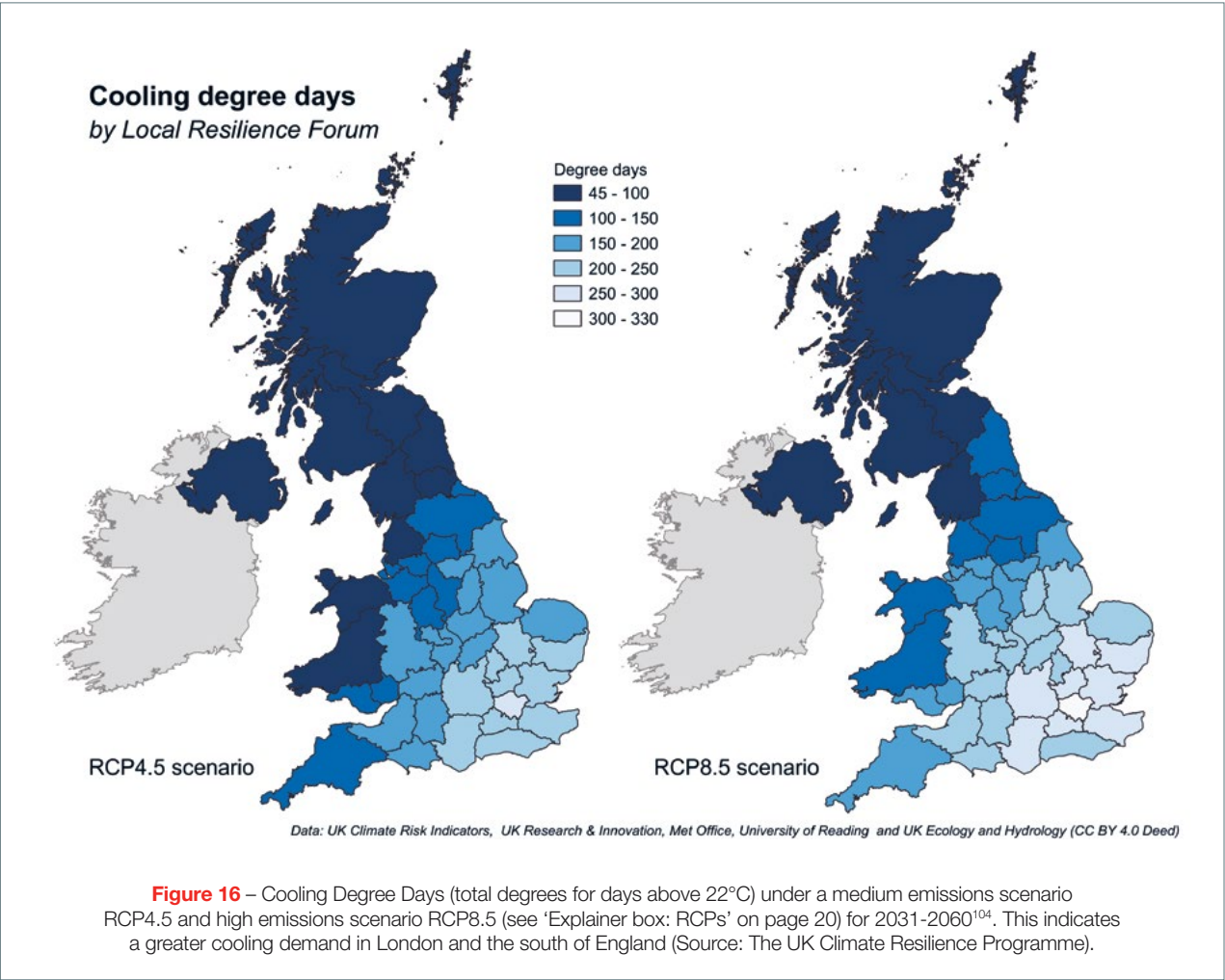
Illustrative impacts on energy networks

Days with temperatures above 22°C indicate days where indoor cooling is generally preferred, if its available¹⁰². Cooling has a major impact on energy networks, and the increasing installation of air-conditioning and mechanical ventilation will place greater strain on energy networks during heatwave events, potentially leaving people vulnerable if power networks are interrupted during these extreme events. Annual Cooling

Degree Days are the annual sum of the number of degrees the daily average temperature is above 22°C each day. By 2031-2060 the number of cooling degree days across the UK is expected to increase significantly, for example in London, from 173 degree-days (1981-2010 historical average) to 280 degree-days and 328 degree-days by 2031-2060 under RCP4.5 and RCP8.5 respectively¹⁰³ (Figure 16).

Days with temperatures below 15.5°C indicate days where indoor heating is generally preferred, if its available¹⁰⁵. Annual Heating Degree Days are the annual sum of the number of degrees the daily average temperature is below 15.5°C each day. The frequency of heating degree days is projected to be considerably different by 2031-2060. The overall trend in the Heating Degree Days is a general decline, down from the historical average of 2,689 degree-days¹⁰⁶.

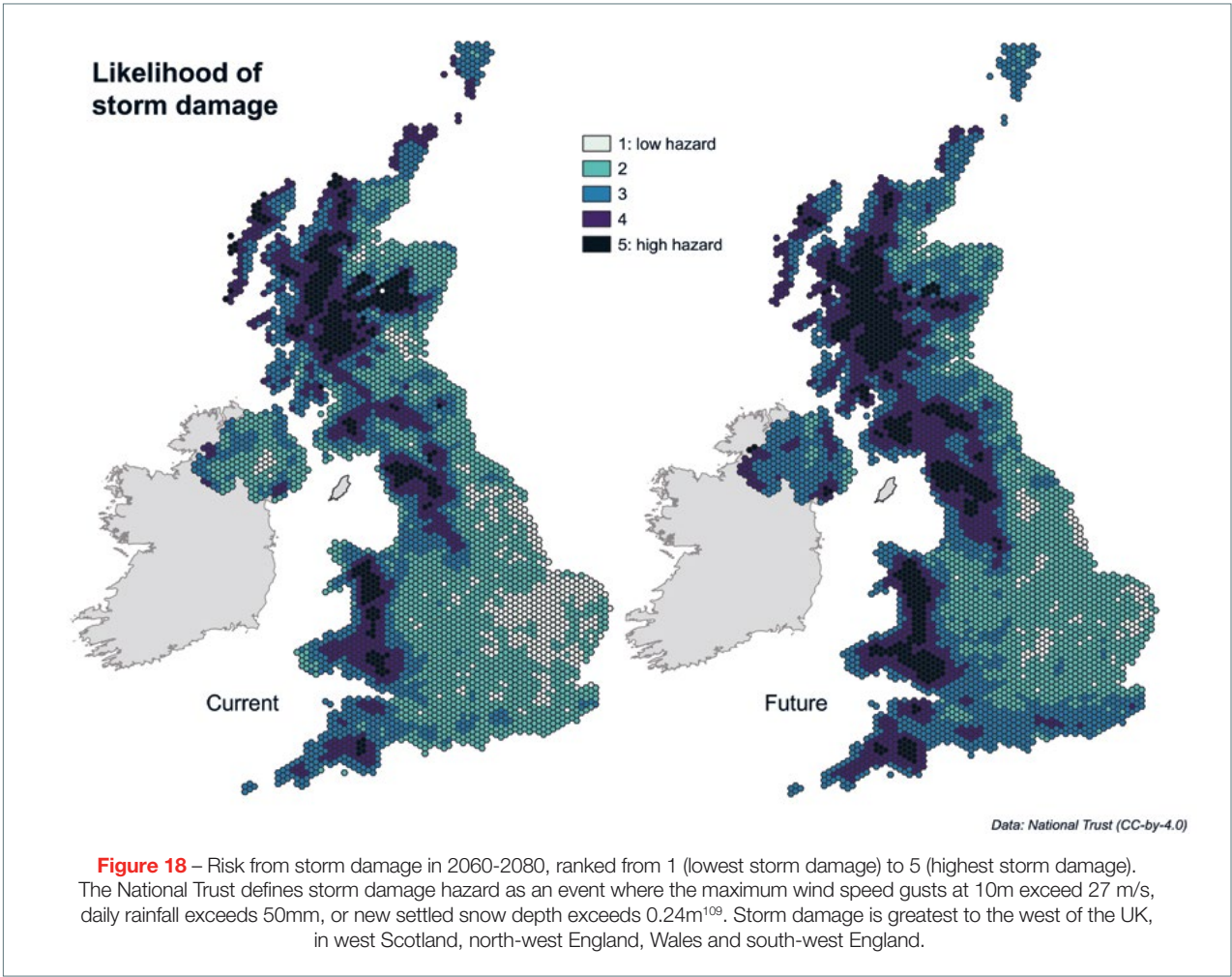
This presents an opportunity related to climate change, as projections indicate heating demand will reduce which may have a positive impact on vulnerable people who are exposed to high costs of heating and the inability to heat their home due to energy poverty. Nevertheless, when there are cold conditions energy networks are put under pressure to supply heat and electricity, so disruptions to energy networks during these times will lead to significant impacts on people.



¹⁰² Indicators of climate risk in the UK at different levels of warming – nerc.ac.uk | ¹⁰³ Climate hazard metrics are weighted by the population in the region. | ¹⁰⁴ Climate Risk Indicators – uk-cri.org

¹⁰⁵ Indicators of climate risk in the UK at different levels of warming – nerc.ac.uk | ¹⁰⁶ Climate hazard metrics are weighted by the population in the region. | ¹⁰⁷ Climate Risk Indicators – uk-cri.org

Storms are a key climate hazard which pose a threat to infrastructure networks. The National Trust defines storm damage hazard as an event where the maximum wind speed gusts at 10m exceed 27 m/s, daily rainfall exceeds 50mm, or new settled snow depth exceeds 0.24m¹⁰⁸. Risk mapping undertaken by the National Trust indicates future storm risk is highest in the west of the Great Britain (Figure 18).



Impacts on people and places British Red Cross supports

Disruptions to energy, transport, and telecommunication networks can lead to numerous impacts:

- Dangerous conditions during power outages: for example, loss of lighting can lead to trips/falls and injuries, loss of heating or cooling can impact health and wellbeing and be life threatening in some cases, and household medical equipment might be disrupted.
- Increased isolation and social deprivation: for example, disruptions to power, transport and telecommunications can further isolate vulnerable people and increase loneliness and mental health impacts
- Economic losses: infrastructure disruptions can force businesses to close, and reduce people's ability to work, with potential lost income.

People and places most vulnerable^{110,111,112,113,114}:

Isolated communities and areas with limited digital and transport connectivity are at disproportionately high risk from any disruptions to infrastructure services. These communities also often experience slower response times to rectify services, as they are located further away from priority zones (e.g. urban centres, industrial/business zones)

People with fewer options/alternatives during a disruption face greater impacts, for example people without access to a mobile phone, mobile internet, personal vehicle, or backup power supplies (e.g. batteries, generators).

People experiencing fuel poverty, living in homes with poor energy efficiency, and in homes prone to overheating. People experiencing fuel poverty and/or homes overheating are likely to be more reliant on electric heating and/or cooling and are therefore more exposed to the impacts of power outages, with limited access to alternative heating and cooking methods.

Recent migrants are at higher risk in the face of infrastructure outages/disruptions, as they often lack social ties for support or provision of alternative options e.g. mobile internet, alternative modes of transport.

While **older people** might be more prepared for power outages relating to previous experience with such events, it's been recorded that a disproportionate number of falls occur over times of power outages, and these can be fatal.

People with existing medical conditions and some disabilities, where these people rely on access to electricity for medical equipment or mobility.

People living with a mental health condition (see Risk 6).

^{108, 109} National Trust Open Data (2023) Storm Damage Future – <https://open-data-national-trust.hub.arcgis.com/maps/9a237ac9c548495083e56ba986a100f0/about>

¹¹⁰ CCRA3-Chapter-4-FINAL.pdf – ukclimaterisk.org | ¹¹¹ Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf – theccc.org.uk | ¹¹² UKERC (2021) Resilience of the Future Energy System: Impacts of Energy Disruptions on Society – https://d2e1qxpsswcpqz.cloudfront.net/uploads/2021/01/UKERC_WP_Resilience-Energy-System_Impacts-of-Disruptions-on-Society.pdf | ¹¹³ People on low incomes – Climate Just | ¹¹⁴ Older people and power loss, floods and storms – ageuk.org.uk



Photo © VCCP/BRC

Impacts on British Red Cross:
Disruptions to energy, transport, and telecommunication networks can pose several issues for the British Red Cross:

- Delay or limit our ability to support service users, for example due to disruptions to transport/ access to people in need, and due to difficulties locating/contacting people
- Infrastructure outages can put British Red Cross people at risk when responding to incidents. In addition, British Red Cross people may not feel comfortable or confident to drive in storm conditions and vehicles may not be appropriate for some conditions, such as snow and ice (including impacts on batteries in cold weather).
- British Red Cross offices, vehicles, and equipment could be affected by power and communications outages.
- Adverse weather can have an impact on volunteers’ wellbeing and their capacity to respond to incidents.
- Storms might create unsafe conditions for volunteer deployment.

Risk 8: Risk to communities from coastal flooding and erosion

British Red Cross urgency score: Watching brief

Current and future risk

Coastal flooding and erosion are already a major risk for some coastal communities, and climate change is amplifying this risk. As global temperatures rise and sea ice melting accelerates, global sea level is rising at an increasing rate. Low-lying coastal regions of the UK are especially susceptible to the impacts of rising sea level as they are likely to suffer from increased coastal erosion, landslip, and flooding. The mean sea-level around the UK is expected to continue rising at least for another three centuries, even if global greenhouse emissions are reduced¹¹⁵. The table below provides projections for sea level rise by 2070 for capital cities of the UK.

Table 4

Future projected sea level rise under a medium emissions scenario RCP4.5 and high emissions scenario RCP8.5 (see ‘Explainer Box: RCPs’ on page 20) in 2070, compared to a 1995-2014 baseline¹¹⁶. Sea level rise is greatest in London under both emissions scenarios, followed by Edinburgh.

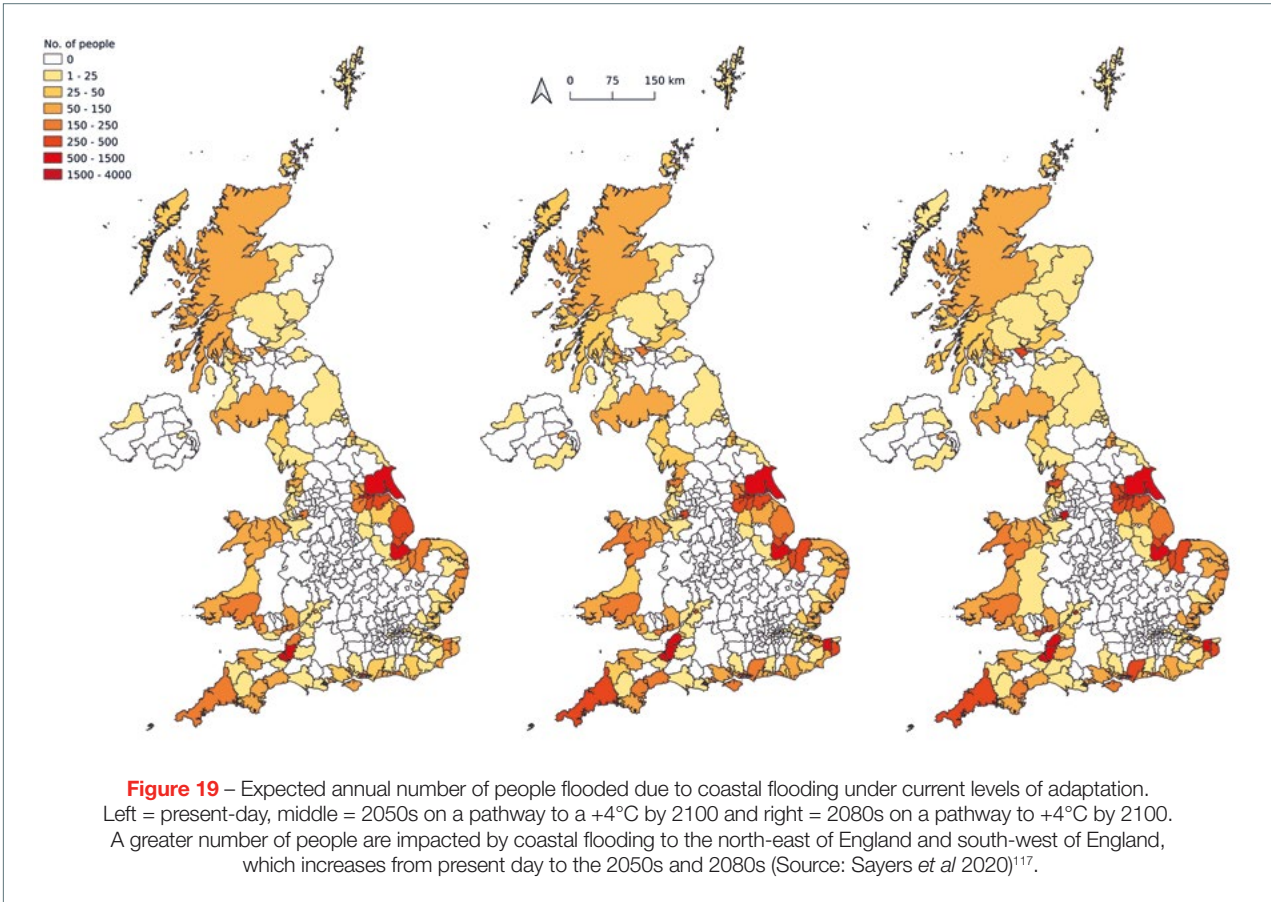
City	Sea Level Change by 2070 RCP4.5	Sea Level Change by 2070 RCP8.5
Belfast	0.24 m	0.30 m
Cardiff	0.34 m	0.40 m
Edinburgh	0.30 m	0.34 m
London	0.36 m	0.41 m

The coastal zone is one of the most valuable natural ecosystems for economic, social, cultural and health prosperity and is also one of the most vulnerable areas, especially in the UK.

A significant proportion of the UK coastline is currently under increased threat from coastal erosion and flooding¹²¹:

- In England alone, 8,900 properties are at risk from coastal erosion if no further adaptation action is taken.
- In Northern Ireland, 2,720 houses and 5,675 people are estimated as being at risk of coastal flooding.
- In Scotland, between a half and a third of all coastal infrastructure including buildings, roads, rail, and water networks are within the most erodible sections of coastline in the country.
- In Wales, 400 properties are currently at risk of coastal erosion.

¹¹⁵ Independent-Assessment-of-UK-Climate-Risk-Advice-to-Govt-for-CCRA3-CCC.pdf – theccc.org.uk | ¹¹⁶ NASA Sea Level Change (2024) Sea Level Projection Tool – <https://sealevel.nasa.gov/ipcc-ar6-sea-level-projection-tool>



Impacts on people and places British Red Cross supports

Coastal flooding and erosion can damage properties and infrastructure, and cause harm to people physically and mentally. Coastal communities can become isolated due to infrastructure disruptions, and people can experience considerable anxiety and concern about the long-term viability of communities due to sea level rise.

People and places most vulnerable:

The vulnerability of different places and population groups is greatly dependent on several interconnected factors including:

Social deprivation adds significant financial burdens on local authority resources, and people who require emergency accommodation as a result of coastal erosion often have to depend on the availability of council housing¹¹⁸.

Geographical isolation is a factor that increases the dependence of people on their immediate supporting community infrastructure (e.g. transport and communications links and social activities) and are therefore more vulnerable to any impacts brought about by coastal erosion¹¹⁹.

The population of coastal areas is also often made up of higher proportions of **older residents** and **transient populations**, lower employment rates and higher seasonality of work which are contributing factors to higher vulnerability and lower coping capacity¹²⁰.

It has also been observed that the most socially vulnerable communities are exposed to higher flood risk¹¹⁸.

Socio-economic status and **pre-existing health conditions** are recognised as factors that increase the risk of adverse outcomes from flood events.

Risk perception and **coping capacity** also affect the ability of communities to prepare for and manage flood risk.

Impacts on British Red Cross:

- Safely accessing sites: dependent on resilient transport and safe means of access to flooded sites and areas that have experienced coastal erosion. People may not feel comfortable or confident to drive in flooded conditions.
- Safely responding and supporting communities: dependent on effective protocols, equipment, and uniforms to keep British Red Cross staff and volunteers safe and allow services to be safely provided.

¹¹⁷ Sayers, PB., Horritt, M, Carr, S, Kay, A, and Mauz, J (2020) Third UK Climate Change Risk Assessment (CCRA3): Future flood risk. Research undertaken by Sayers and Partners for the Committee on Climate Change (using the Future Flood Explorer). Published by Sayers and Partners and the Committee on Climate Change, London.

¹¹⁸ Social deprivation and the likelihood of flooding – Environment Agency | ¹¹⁹ People on low incomes – Climate Just | ¹²⁰ Impacts of climate change on disadvantaged UK coastal communities – Joseph Rowntree Foundation jrf.org.uk

Summary of British Red Cross CER CCRA

This CCRA has presented a high-level screening of exposure to climate hazards across the regions the British Red Cross operates in, an assessment of vulnerability of communities that British Red Cross supports, and a detailed risk assessment of the most urgent climate risks which impacts the British Red Cross’ CER operations. This CCRA helps inform our Theory of Change and provides an evidence base for our adaptation work.



Photo © Phil Rich Jones/BRC

Key findings from the CCRA are as follows:

- The UK’s climate is changing. By 2050 the UK summers are projected to be hotter and drier and UK winters are projected to be warmer and wetter.
- A changing climate will place increased pressure on British Red Cross CER operations as the most vulnerable communities become more exposed to climate hazards such as flooding, increased temperatures, and wildfires.
- The most urgent risks to communities that British Red Cross supports and to CER operations are from river and surface water flooding and high temperatures. These were identified as most urgent during workshops held with British Red Cross staff and volunteers.
- The impacts on communities due to climate change cannot be overstated. Flooding will cause significant harm and damage to communities and properties, resulting in physical injuries and mental health impacts. High temperatures will increase the likelihood of heat exhaustion and excess deaths from heatwaves, especially for vulnerable groups such as older people and people with existing medical conditions.

Our Climate Adaptation Programme

To address the key risks we’ve identified and support communities to enhance climate resilience, we have developed our Climate Adaptation Programme. Our Theory of Change for the programme sets out the impact we want to create, and we’ve identified priority activities which we plan to test and implement over the coming years. Details are provided in the UK Climate Adaptation Theory of Change and our annual work programmes.



Photo © Phil Greenwood/BRC

Our future ambitions

The climate risk assessment we’ve undertaken is an initial UK-wide assessment solely focused on our Crisis and Emergency Response service. In future, we plan to develop more detailed climate risk assessments with each British Red Cross CER region across the UK, and we’d also like to explore CCRAs for other services within British Red Cross UK Operations. Over time we aim to enhance our British Red Cross organisational resilience and capacity to support people in need – before, during, and after disasters occur. We will continue to collaborate with other organisations and the UK government to prepare for and respond to climate change, and advocate for other organisations to play their part to deliver climate adaptation and resilience.

Appendix: climate change risk assessment methodology

How the risks were identified by British Red Cross:

- 8 workshops with British Red Cross CER staff and volunteers were held to understand:
 - › How they had experienced different weather and climate hazards to date
 - › Identify where impacts had been felt
 - › Explore who in their areas were most at risk and vulnerable
 - › Their perceptions of climate change risks in the future.
- Review of UK Climate Change Risk Assessment (CCRA3) and National Risk Register to compare findings.

The most commonly identified risks (across areas) were summarised in this report as follows, in line with the UK CCRA3 and taking into account key risks identified during workshops with British Red Cross CER staff and volunteers.

Key climate risks impacting British Red Cross	British Red Cross urgency scoring
1. Risks to people and properties from river and surface water flooding	Urgent – more action needed
2. Risk to people from high temperatures	Urgent – more action needed
3. Risk to people and properties from moisture, mould, and heavy rain	Further investigation needed
4. Risks to people from poor water quality and household water supply interruptions	Further investigation needed
5. Risk to people, properties, agricultural land, and forests from wildfires	Further investigation needed
6. Risk to mental health from climate shocks and stresses	Further investigation needed
7. Risk to energy, transport, and telecommunication networks due to climate hazards and cascading failures	Watching brief
8. Risk to communities from coastal flooding and erosion	Watching brief

Risks were assigned an urgency score based on workshop findings and are defined by the CCRA3 as follows:

Urgency score	Description (as defined by the UK CCRA3) ¹²¹
Urgent – more action needed	New, stronger or different [Government] action, whether policies, implementation activities, capacity building or enabling environment for adaptation – over and above those already planned – are beneficial in the next five years to reduce climate risks or take advantage of opportunities.
Further investigation needed	On the basis of available information, it is not known if more action is needed or not. More evidence is urgently needed to fill significant gaps or reduce the uncertainty in the current level of understanding in order to assess the need for additional action.
Watching brief	The evidence in these areas should be kept under review, with continuous monitoring of risk levels and adaptation activity (or the potential for opportunities and adaptation) so that further action can be taken if necessary.

The above urgency scoring outlines the level of action required by British Red Cross to respond to climate risks impacting British Red Cross and action required by the UK Government and external partners to ensure ongoing action and monitoring of key risks. The UK CCRA3 urgency scoring approach is used by British Red Cross as *“it is transparent and can be understood and considered with ease and speed by policymakers with responsibility for large and diverse policy areas.”*¹²²

Sources used for Climate hazard screening

Ten key climate hazards were assessed based on a low (1 – yellow), medium (2 – amber) and high (3 – red) scoring of exposure of each region to the climate hazard.

Score	Description
3	High exposure to climate hazard
2	Medium exposure to climate hazard
1	Low exposure to climate hazard

Scoring is high level and is based on expert judgement of available evidence, such as regional level projections of temperature, precipitation, soil moisture, coastal erosion, subsidence and expected damage from flooding.

Three scenarios were assessed:

- **Baseline:** current level of exposure to each climate hazard for each region. Generally, the period 1981-2010 is used as the baseline period, however, this varies dependent on available data used to analyse exposure to different climate hazards.
- **2050s, RCP4.5:** future level of exposure to each climate hazard for each region in the 2050s, assuming a medium emissions scenario trajectory (+2.4°C increase in global temperatures by 2100).
- **2050s, RCP8.5:** future level of exposure to each climate hazard for each region in the 2050s, assuming a high emissions scenario trajectory (+4.3°C increase in global temperatures by 2100).

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The following data sources were used to assess each hazard:

Hazard	Data source used to inform hazard exposure score	Caveats/further information	Source
Heatwaves	- UK Climate Risk Indicators: Met Office heatwave (events/year), Amber heat-health alert, tropical nights, maximum temperatures. Baseline period: 1981-2010	Weighted by 2011 populations. Heatwave thresholds vary across regions. ‘Amber alert’ temperature thresholds vary across England. Different policies apply in Wales, Scotland and Northern Ireland, so there are no specific temperature thresholds for these regions and here values for neighbouring regions were used as an indication of risk.	<i>Climate Risk Indicators</i> – uk-cri.org
Cold snaps	- UK Climate Risk Indicators: cold weather alerts, minimum temperature. Baseline period: 1981-2010	Weighted by 2011 populations.	<i>Climate Risk Indicators</i> – uk-cri.org
Drought	- UK Climate Risk Indicators: % change in summer rainfall, potential soil moisture deficit, SPI drought. Baseline period: 1981-2010	Rainfall % change is from the 1981-2010 mean. Not weighted by population. SPI and soil moisture deficit weighted by area of cropland and improved pasture.	<i>Climate Risk Indicators</i> – uk-cri.org
Increased rain/humidity	- UK Climate Risk Indicators: % change rainfall (annual). Baseline period: 1981-2010 - Met Office humidity projections.	Rainfall % change is from the 1981-2010 mean. Not weighted by population.	<i>Climate Risk Indicators</i> – uk-cri.org
Surface flood	- Surface flood risk maps: Environment Agency, National Resources Wales, Scottish Environmental Protection Agency, Northern Ireland Department for Infrastructure - Sayer and Partners – Future flood risk Expected Annual Damage as part of the UK’s CCRA3. Based on change in exposure from present day (2020).	Expected Annual Damage figures used take into account population growth, number of people exposed to flooding events and property exposed.	<i>EA flood risk mapping</i> – Defra Data Services Platform <i>SEPA flood risk mapping</i> – SEPA Flood Maps arcgis.com <i>National Resources Wales flood risk map – Flood and Coastal Erosion Risk Maps</i> – naturalresources.wales <i>Projections of Future Flood Risk</i> – UK Climate Risk

Hazard	Data source used to inform hazard exposure score	Caveats/further information	Source
River flood	- River flood risk maps: Environment Agency, National Resources Wales, Scottish Environmental Protection Agency, Northern Ireland Department for Infrastructure - Sayer and Partners – Future flood risk Expected Annual Damage as part of the UK’s CCRA3. Based on change in exposure from present day (2020).	Expected Annual Damage figures used take into account population growth, number of people exposed to flooding events and property exposed.	<i>UK maps Risk of Flooding from Rivers and Seas</i> – parallel.co.uk <i>National Resources Wales flood risk map – Flood and Coastal Erosion Risk Maps</i> – naturalresources.wales <i>Projections of Future Flood Risk</i> – UK Climate Risk
Coastal flood and erosion	- Coastal flood risk maps: Environment Agency, National Resources Wales, Scottish Environmental Protection Agency, Northern Ireland Department for Infrastructure - Dynamic Coast - Sayer and Partners – Future flood risk Expected Annual Damage as part of the UK’s CCRA3. Based on change in exposure from present day (2020).	Expected Annual Damage figures used take into account population growth, number of people exposed to flooding events and property exposed.	<i>National Resources Wales flood risk map – Flood and Coastal E-tions of Future Flood Risk</i> – UK Climate Risk dynamiccoast.com
Storms	- National Trust storm damage	Storm damage hazard event occurs when maximum wind speed of gusts at 10m exceed 27 metres per second, daily rainfall exceeds 50mm.	<i>National Trust Climate Hazards</i> – National Trust Open Data arcgis.com
Wildfire	- UK Climate Risk Indicators: Met Office Fire Danger (days/yr). Baseline period: 1981-2010	Weighted by area of heathland, moorland and grassland.	<i>Climate Risk Indicators</i> – uk-cri.org
Landslides and sinkholes	- British Geological Society Observed Landslides. Based on change in exposure from present day (2020). - Landslide locations and susceptibility mapping.	Landslide database map used for hazard exposure score.	<i>BGS National Landslide Database</i> – British Geological Survey

Assessment of key climate change risks

The following key topics were assessed under each defined risk:

Current and future risk: current and future climate was assessed for key climate variables associated with the defined risk. Climate projections are presented for a number of climate variables, where available from UKCP18 projections (the latest published projections by the Met Office) to understand future pathways. Two Representative Concentration Pathways are explored in this report where available¹²³:

- **RCP4.5** – a **medium** greenhouse gas emissions scenario considered an ‘intermediate’ scenario. Global surface temperature is projected to be **2.4°C higher in 2081-2100** compared to the pre-industrial period (1850-1900).
- **RCP8.5** – a **high** greenhouse gas emissions scenario considered a ‘worst case’ scenario where greenhouse gas emissions continue to grow unmitigated. Global surface temperature is projected to be **4.3°C higher in 2081-2100** compared to the pre-industrial period (1850-1900).

It should be noted that other future scenarios are also explored due to data availability, such as 2°C and 4°C warming by 2100.

Impacts on people and places British Red Cross supports: impacts are explored and assessed based on the quantitative analysis presented in the ‘current and future risk’ section and is supported by literature and findings from the workshops undertaken with British Red Cross CER staff and volunteers.

People and places most vulnerable: those most vulnerable to the climate risks are outlined, supported by key literature and findings from the workshops undertaken with British Red Cross CER staff and volunteers. This section outlines the unequal impacts of climate change and highlights vulnerable groups to be prioritised by national adaptation programmes and British Red Cross adaptation programmes.

Impacts on British Red Cross: impacts from each risk on British Red Cross operations, volunteers and staff are assessed. Impacts are supported by qualitative data from workshops undertaken with British Red Cross CER staff and volunteers.

