Department for Transport

Met Office

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Transport hazard summary series

Extreme heat

High temperatures can disrupt transport systems, affecting staff and passengers and threatening the safety and reliability of transport in the UK. As climate change leads to longer, more frequent and more intense extreme heat events, the transport sector must become more resilient to deal with these challenges.

The Department for Transport, Met Office and partners have created this series of **transport hazard summaries** to explain natural hazards and other hazards that are not the result of malicious acts, their impacts and how they may change in future. This summary will introduce what is meant by extreme heat and how it can impact transport and offers further information to help decision makers manage and adapt to these risks.

The 10 warmest years on record in the UK have all occurred since 2000.*

* Met Office, '2024: provisionally the fourth warmest year on record for the UK', 2025, available at: **www.metoffice.gov.uk/about-us/news-and-media/media-centre/weather-and-climate-news/2025/2024-provisionally-the-fourth-warmest-year-on-record-for-the-uk**

What is extreme heat?

An extreme heat event is a period where temperatures are much hotter than the average for a particular time and place. In the UK, a heatwave is defined by the Met Office as a period of at least 3 consecutive days when maximum temperatures meet or exceed a temperature threshold. The threshold varies by county, ranging between 25°C and 28°C depending on the local climate.

Heat stress factors

In addition to temperature, other factors influence the impact of heat on human health and are crucial for safety in various transport environments, both indoors and outdoors:*

High humidity can limit the body's ability to cool

Wind or ventilation has a cooling effect on the body

Direct sunlight can increase body temperature and temperature of infrastructure

With an air temperature of 30°C…

…asphalt can be 40-50°C

Road surfaces are typically tested to withstand temperatures up to 60°C. However, some roads may begin to soften at temperatures above 50°C, which could occur when air temperatures reach 30°C.†

…railway tracks can be 45-50°C

Most railway tracks can operate up to temperatures of 46°C, above which buckling may occur. In such cases, measures like speed restrictions are necessary. Air temperatures above 30°C can easily lead to temperatures reaching 50°C on the tracks.‡

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* Budd G. M., Journal of Science and Medicine in Sport, 'Wet-bulb globe temperature (WBGT)—its history and its limitations', pages 20 to 32, 2008, available at: **www.sciencedirect.com/science/article/abs/pii/S1440244007001478**

† National Highways, 'Preparing for climate change on the strategic road network - third adaptation report under the Climate Change Act', 2022, available at: **https://nationalhighways.co.uk/media/rtuexeu4/preparing-for-climate-change-on-the-strategic-road-network.pdf**

‡ Network Rail, 'Buckled rail', available at: **www.networkrail.co.uk/running-the-railway/looking-after-the-railway/delays-explained/buckled-rail-and-summer-heat/**

How are extreme heat events changing with climate change?

2022 was the hottest year on record in the UK and saw temperatures exceeding 40°C for the first time.*

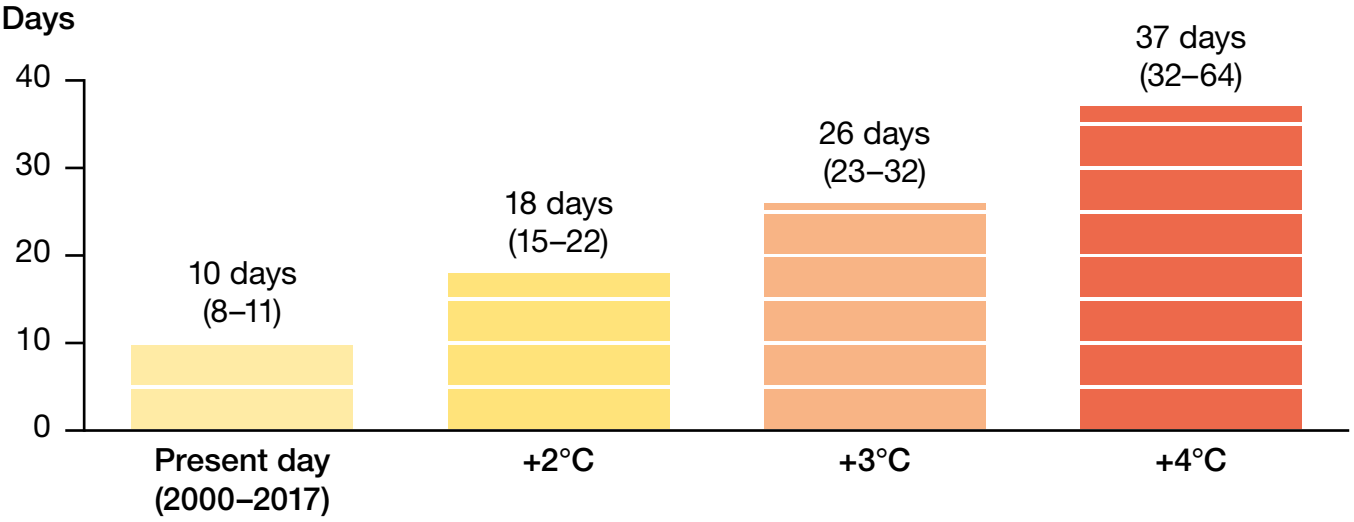
Temperatures of 40°C remain very rare in the UK. However, by 2100 they could occur once every 15 years on average in a medium emissions scenario and every 3 to 4 years on average in a high emissions scenario.† Emissions scenarios, climate projections and global warming levels are explained in 'The changing climate' transport hazard summary.

Figure 1 shows the projected increase in days above 25°C at different global warming levels. Temperatures above 25°C can start to have impacts on human health.‡

By the middle of the century there is a 25% chance each year of experiencing a heat event with 3 consecutive days above 35°C, under a high emissions scenario.§

The duration of heatwaves is expected to increase with time. By the 2070s, heatwaves exceeding 25°C could last 10 days on average and up to 50 days in extreme circumstances, under a high emissions scenario.§

Figure 1: Projected number of 'summer days' (>25°C) per year in the UK at different global warming levels with the range of the potential number of days in brackets‡



* Kendon, M., Doherty, McCarthy, M., Jevrejeva, S., Matthews, A., Williams J., Garforth, J., Sparks T. and West F., International Journal of Climatology, 'State of the UK Climate 2022', pages 1 to 83, 2023, available at: **https://rmets.onlinelibrary.wiley.com/doi/10.1002/joc.8167**

† Met Office, 'UK and Global extreme events – Heatwaves', available at: **www.metoffice.gov.uk/research/climate/understanding-climate/uk-and-global-extreme-events-heatwaves**

‡ Hanlon, H.M., Bernie, D., Carigi, G. and others, Climatic Change, `Future changes to high impact weather in the UK', volume 166, article number 50, 2021, available at: **https://link.springer.com/article/10.1007/s10584-021-03100-5**

§ Network Rail Extreme Heat Task Force, 'EHTF Weather and Climate Change Report March 2023', 2023, available at: **www.networkrail.co.uk/wp-content/uploads/2024/04/Extreme-Heat-Task-Force-Weather-and-Climate-Change-Report.pdf**

- Between now and the middle of the century, continued climate change is largely inevitable.
- Global warming of 2°C is reached by most emissions scenarios by the middle of the century.
- In the second half of the century, a wide range of global warming levels remain possible.
- 4°C of global warming is reached only by the higher emissions scenarios, and not until later in the century.*

2018 case study

The prolonged hot spell in June and July 2018, while not the hottest event on record, was extremely impactful and could occur 'as often as not' each year by the middle of the century.† Many areas of the UK saw temperatures exceed 30°C for more than 15 days. Both the high temperatures and duration of the heatwave caused problems for transport.

Flights were unable to take off at full capacity in 34°C at London City Airport due to reduced lift, meaning some passengers had to be disembarked.

At Folkestone, high temperatures caused issues with the air conditioning on Euro Tunnel trains, meaning many tickets had to be cancelled.

Some roads 'melted' as the bitumen in the surface softened. Local highway authorities deployed gritters to spread rock dust as a 'non-stick' layer.

* Climate Change Committee, 'Proposed methodology for the Fourth Climate Change Risk Assessment – Independent Assessment', 2024, available at: **www.theccc.org.uk/publication/proposed-methodology-for-the-ccra4-advice/?chapter=3-proposed-methodological-approach-for-ccra4-ia**

† Met Office 'Past weather events', 2018, available at: **www.metoffice.gov.uk/weather/learn-about/past-uk-weather-events**

Direct transport impacts due to extreme heat

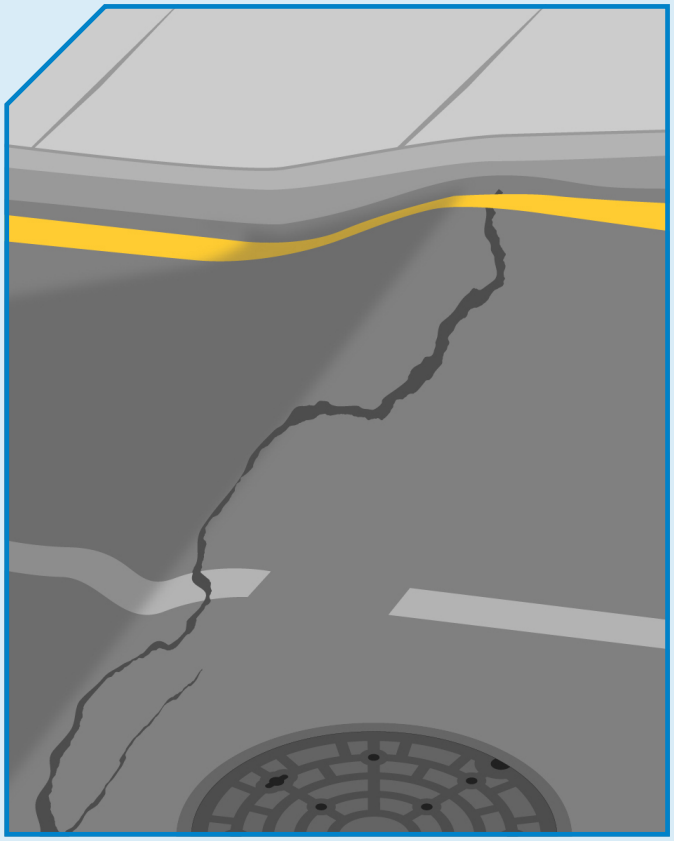
Human health

- Temperatures above 25°C can cause heat stress, heat stroke, and other health issues for vulnerable people and children.*
- In hot weather, active transport like walking and cycling may become unsafe, and those waiting outdoors or travelling in hot vehicles may be affected.
- High temperatures may limit safe work activities such as construction, maintenance, work on roads, ships or in vehicles, and may limit safety inspections.

Vehicle performance and operations

- Buses, trains and other vehicles may overheat leading to mechanical failures.
- In hot weather, aircraft may experience reduced lift, leading to increased fuel consumption and a lower capacity for cargo or passengers.

* UK Health Security Agency, 'Adverse Weather and Health Plan', 2025, available at: **www.gov.uk/government/publications/adverse-weather-and-health-plan**



Infrastructure

- Asphalt can soften at temperatures above 30°C if not specially treated, causing road surfaces, pavements, runways and other surfaces around ports and railway stations to deteriorate, crack, or rut.*
- Rail track buckling can occur where air temperatures rise over 30°C.†
- Overhead power lines may sag, requiring speeds to be restricted.
- Extreme heat can put strain on bridges due to the expansion of joints.

Interdependencies with other sectors: Power outages due to infrastructure failure or disruption to water supply due to high demand can affect transport. Increased energy demand from transport air conditioning may add strain to the power network.

* National Highways, 'Preparing for climate change on the strategic road network - third adaptation report under the Climate Change Act', 2022, available at: **https://nationalhighways.co.uk/media/rtuexeu4/preparing-for-climate-change-on-the-strategic-road-network.pdf**

† Network Rail, 'Buckled rail', available at: **www.networkrail.co.uk/running-the-railway/looking-after-the-railway/delays-explained/buckled-rail-and-summer-heat/**

Hazards associated with extreme heat

Drought

Drought makes the ground dry putting less moisture in the air. This can lead to higher temperatures which in turn leads to more evaporation.

Landslides and earthwork failures

Frequent cycles of drying, due to hotter, drier weather and wetting, can cause soil degradation on slopes making them prone to fail.*

Poor air quality

High temperatures, strong sunlight and lack of winds can lead to increased pollution, particularly in urban areas.

Subsidence and soil degradation

Extreme heat and drought can lead soils to shrink and crack, which can lead to subsidence and degradation on roads and other infrastructure.

Surface water flooding

Soil can become very dry due to extreme heat, which can affect its ability to absorb water, causing it to run off. When heavy rain occurs following extreme heat, the risk of flooding could be increased.†

Wildfire

Extreme heat combined with drought can lead to very dry vegetation and conditions suitable for wildfires to develop.

Further information on these hazards can be found in our series of Transport hazard summaries: **www.gov.uk/government/collections/transport-hazard-summaries**

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* Stirling, R. A., Toll, D. G., Glendinning, S., Helm, P. R., Yildiz, A., Hughes, P. N., Asquith, J. D., Geotechnique, 'Weather-driven deterioration processes affecting the performance of embankment slopes', volume 71, issue 11, pages 957 to 969, 2021, available at: **www.icevirtuallibrary.com/doi/10.1680/jgeot.19.SiP.038**

† Gimbel, K. F, Puhlmann, H. and Weiler, M. 'Does drought alter hydrological functions in forest soils?', 2015, available at: **https://hess.copernicus.org/articles/20/1301/2016/**

Risk mitigation and adaptation

Various risk mitigations are already in place in the UK, and lessons can be learned from countries with hotter climates whose infrastructure has been built to withstand the heat. Examples include:

- gritting roads with ground-up stone when melting may occur
- applying light coloured coatings, for example, painting sections of railway tracks white to reflect heat
- insulating vehicles against heat and installing tinted windows
- applying speed and/or weight restrictions on rail or road*
- upgrading air conditioning in transport hubs, vehicles and vessels and carrying out regular maintenance
- having public communications plans in place with advice for traveling during hot weather
- training staff to be prepared for heat related medical emergencies and setting up water distribution centres when needed

Questions for decision makers

- How might extreme heat impact your area of transport?
- Which assets or infrastructure could be exposed and vulnerable to extreme heat?
- Where could extreme heat lead to health problems or emergencies on the network and how can these be prevented?
- Can safe temperatures be maintained for staff and those using transport?
- Are resources available to carry out mitigating actions or respond to extreme heat (for example gritters in the summer)?
- Can you adapt your plans to deal with frequent periods of 30-35°C by the 2040s?

* House of Commons Environmental Audit Committee 'Heatwaves: adapting to climate change: Government Response to the Committee's Ninth Report', 2018, available at: **https://publications.parliament.uk/pa/cm201719/cmselect/cmenvaud/1671/1671.pdf**

Further reading

Buckled rail – Network Rail

EHTF Weather and Climate Change Report March 2023 – Network Rail and Met Office 'Extreme Heat Task Force' report outlining climatological factors impacting the railways

Heatwaves: adapting to climate change: Government response to the Committee's Ninth Report – House of Commons Environmental Audit Committee 2018 report outlining heatwave risks and recommendations

Heat – GOV.UK – UK Health Security Agency collection of documents providing information on risks to health from heat

UK and Global extreme events – Heatwaves – Met Office

UKCP18 Factsheet: Temperature

What is a heatwave? – Met Office

What rail passengers need during extreme heat – Network Rail comissioned study focusing on communication with travellers

Climate information and risk assessment

See 'The changing climate' and 'Transport hazards, risks and resilience' transport hazard summaries for more information on identifying and planning for risks to transport and where to find climate data, including more detail on projected changes on a regional level.