



System Operator



Weather and Climate
Team



Weather Predictions for Track Resilience

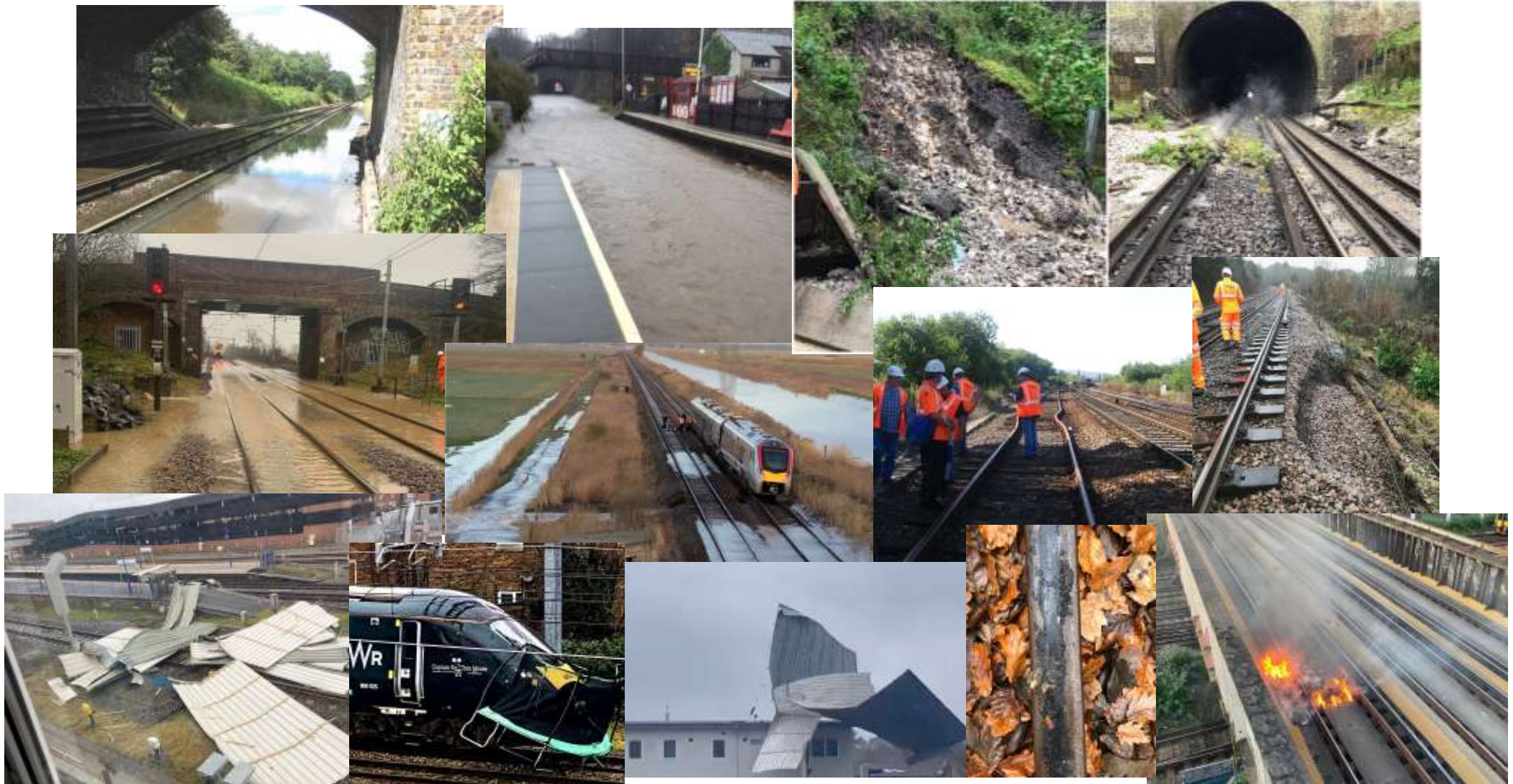
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Together, we're delivering a simpler, better, greener railway.

Simpler.
Better.
Greener.

How does weather impact our network?



Snow and Ice

Cold wintery conditions bring challenges to the railway. Snow days are few and far between but when it does fall it can cause significant impact to:

- Performance of our assets
- Safety on stations
- Safety of our employees and their ability to get to work

During cold, icy conditions we also see:

- Tunnel icing
- 3rd rail icing – **our weather forecasters provide a bespoke forecast to Network Rail for this!**

For areas of our network that have 3rd rail we run winter treatment (anti-icing) circuits, as well as conductor rail heaters.



Hot Weather

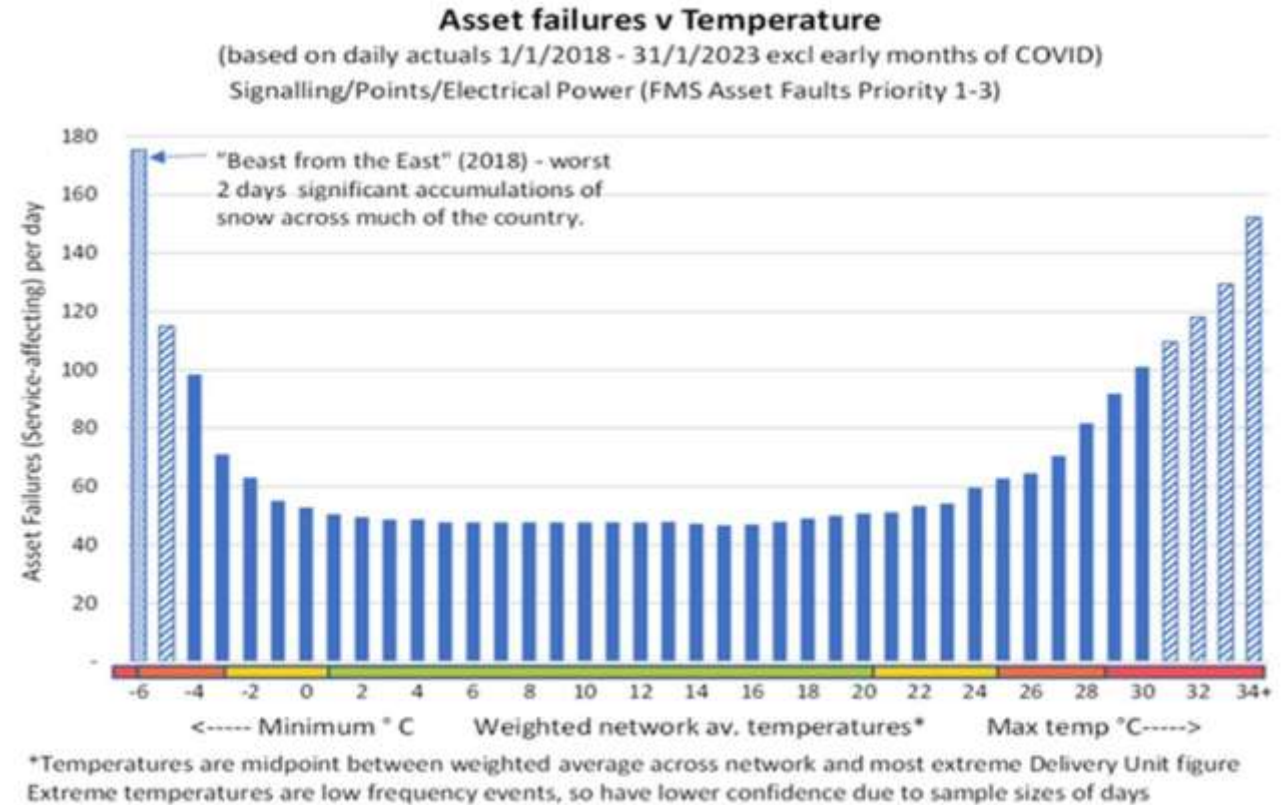
As we saw in Summer 2022, extreme heat can impact our rail network.

Hot weather and direct sunlight can head up the rail causing the steel to expand. This expansion can result in the track buckling or train detection equipment being damaged.

Rail temperatures rise and fall depending on:

- Amount of cloud/clear sky
- Wind speed
- Ambient air temperature

Our overhead lines are also susceptible to hot weather – expanding and sagging in the heat. During hot weather, trains may run at a reduced line speed to prevent damage to the lines.



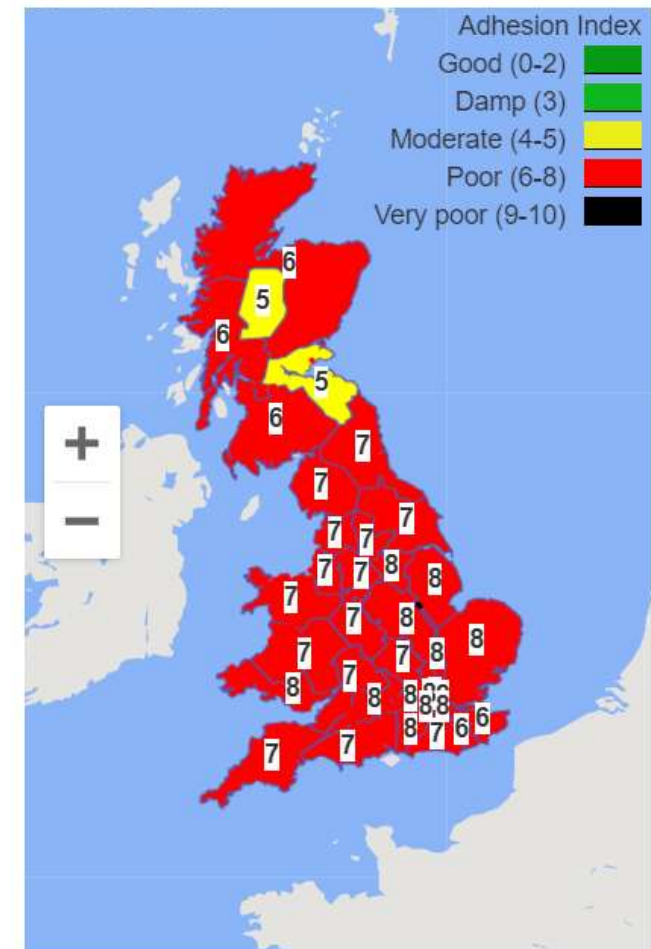
Leaf fall

The combination of Autumnal **leaf fall**, **low winds** and small amounts of **precipitation** result in **poor rail adhesion** as a layer of contamination builds up on the railhead.

During the season, we use rail head treatment trains (RHTTs) and new technologies, such as Interflon, to treat and remove the contamination from the rail reducing the risk of low adhesion incidents such as:

- Wrong side track circuit failures (WSTCFs)
- Signals passed at danger (SPADs)
- Station overruns

Our forecaster provides a bespoke forecast for adhesion. These forecasts allow us to appropriately treat the network and effectively manage areas of low adhesion (such as hand sanders or using Interflon).



How do we prepare and respond to Extreme weather?



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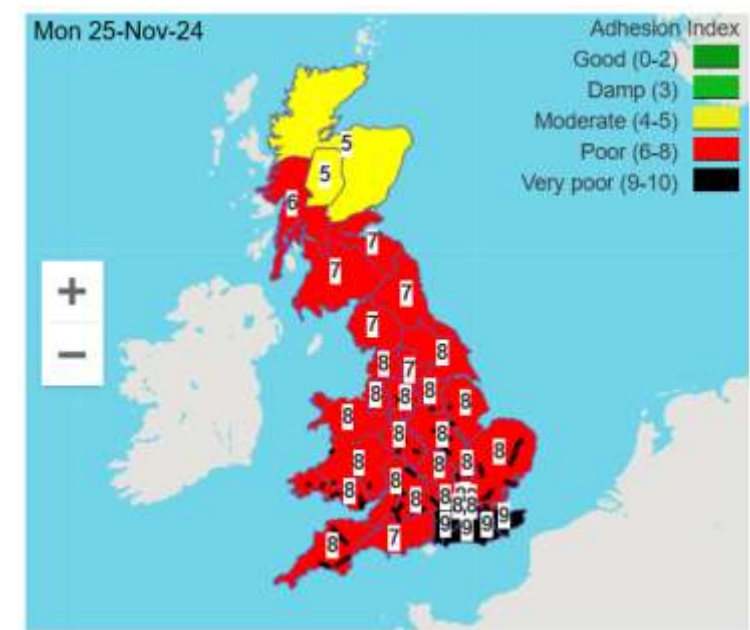
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How do we identify extreme weather?

Network Rail's forecasting provider, MetDesk, issue daily weather forecasts. These forecasts are aligned to **thresholds defined by Network Rail** and each weather hazard is given a RAG status.

We receive a wide range of forecasts including:

- 5 day hazard summary (including wind, rain and temperature)
- Convective Rainfall Forecasting Tool – known as CAT (Convective Alerting Tool)
- Hot running rail forecast
- Conductor rail forecast
- Adhesion and leaf fall forecast



Adhesion maximum forecast (Mon 25 November 2024)

Route/Station	Max Air Temp (06-18) °C	Max Rail Temp (°C)	Time of Max Rail Temp	Period above 40°C
Scotland - Perth	16.0	41	14:00	10%
Scotland - Glasgow	24.0	46	14:00	50%
Scotland - Highland	12.5	38	15:00	10%
Scotland - Manchester	23.0	42	14:00	10%
Scotland - Edinburgh	25.5	42	13:00	50%
London North - London	24.0	42	14:00	10%
London North - Luton	25.5	44	14:00	10%
London North - Central West	28.0	47	14:00	15-16
London North - Central East	28.5	48	14:00	15-16
London South - West Midlands	21.0	46	14:00	12-16

5 day hazard summary forecast (Fri 24 January – Tue 28 January 2025)

Day (0600 to 0600)	Wind		Heavy Rain Accum.		Convective Rainfall Intensity		Snow		Frost		Min Temp Morn (06-11)	Max Temp (06-18)	Min Temp (18-06)	Temp Range		Ice Day		Lightning Risk	
	Hazard	Conf.	Hazard	Conf.	Hazard	Conf.	Hazard	Conf.	Hazard	Conf.				Hazard	Conf.	Hazard	Conf.	Hazard	Conf.
Fri	Extreme	High	Adverse	Low		High	Aware	Low	Aware	High	2.0	9.5	-1.5		High		High		Low
Sat		Low	Aware	High	Aware	High	Aware	High	Aware	High	-1.0	6.5	-2.5		High		High	Aware	Low
Sun	Adverse	Low	Extreme	Low		High	Aware	High	Aware	High	-2.0	5.5	-0.5		High		High		High
Mon	Aware	High	Adverse	Low		High		High	Aware	High	0.0	8.5	0.0		High		High		High
Tue	Aware	High		High		High		High		High	0.5	8.5	1.0		High		High		High

Prepare for Extreme Weather Event

When a route has an 'Extreme' hazard forecasted, the route will call an **Extreme Weather Action Teleconference (EWAT)**.

Day (0600 to 0600)	Wind		Heavy Rain		Snow		Frost		Min Temp Mon (06-11)	Max Temp (06-18)	Min Temp (18-06)	Temp Range		Ice Day		Lightning Risk		Freezing Fog	
	Hazard	Conf.	Hazard	Conf.	Hazard	Conf.	Hazard	Conf.				Hazard	Conf.	Hazard	Conf.	Hazard	Conf.	Hazard	Conf.
Tue		Low	Aware	Low		High		High	3.5	10.0	4.0		High		High		High		High
Wed	Adverse	Low		High		High		High	10.0	15.0	3.0		High		High		High		High
Thu	Aware	High	Aware	Low		Low		High	3.5	9.5	2.5		High		High		High		High
Fri	Extreme	Medium	Aware	Low		Low		Low	5.5	11.0	0.5		High		High		High		High
Sat		Low		Low		Low		High	1.0	10.0	6.0		High		High		High		High

Example from Storm Eunice in February 2022.

Route EWATs are attended by Network Rail operations colleagues (e.g. Route Control Manager, Operations Director, Controllers), Train Operating Companies, Freight Operating Companies, Station Managers, Communications Teams.

During the EWAT the latest forecast will be provided by MetDesk followed by discussions about how we will continue to safely run the railway. This will include any speed restrictions we will impose or line closures that need to be put in place. Passenger communication is a key part of the call with the aim of providing consistent messaging with our train operating companies. Finally, we will discuss how we will recover the network and resume normal service for passengers as soon as possible – this may include mobilising additional resource to help with recovery.

If multiple routes have an 'Extreme' forecast, we will hold a National EWAT. All routes will attend this call as well as representatives from MetDesk, Rail Delivery Group, Department for Transport, British Transport Police, National Communications Team, National Operating Centre and National Weather Team.



Seasonal Preparation

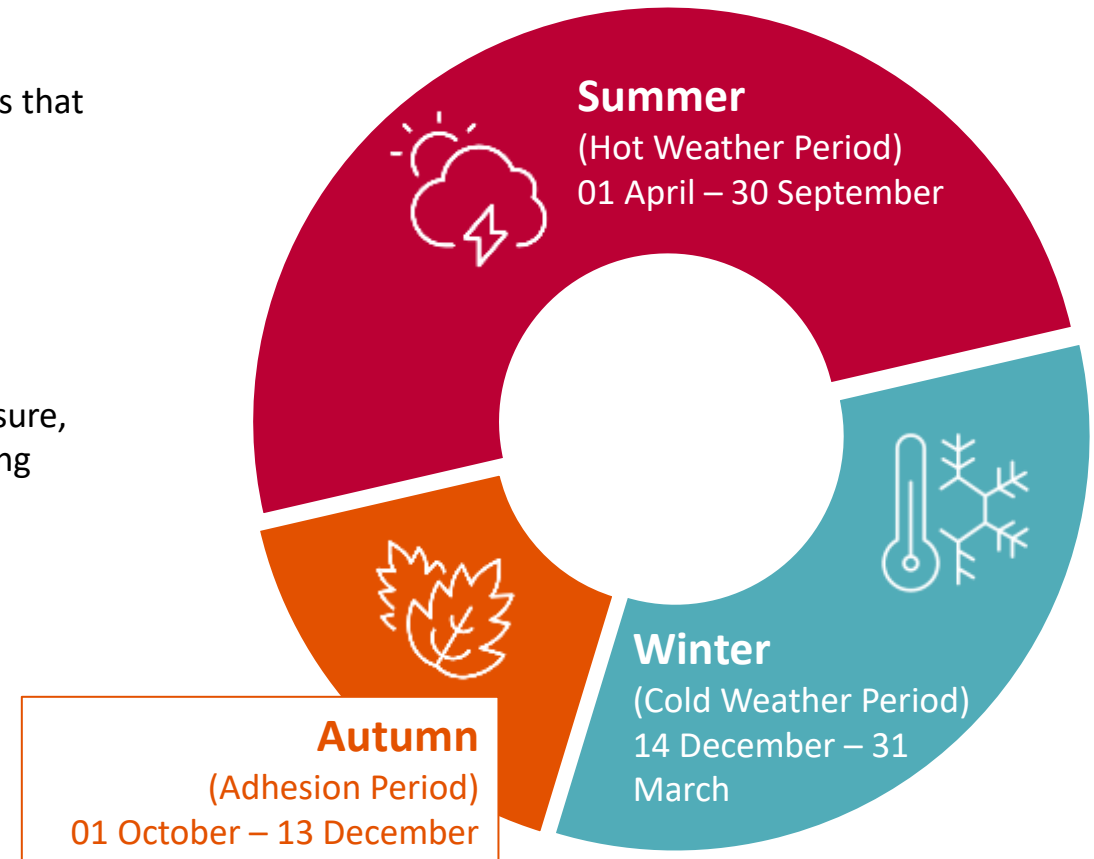
The National Weather Team sets out the guidance and policies for both operational weather management and **seasonal preparedness**.

There are three GB Rail approach documents which set out the control measures that routes must comply with ahead of each season:

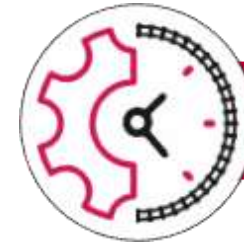
- Hot Weather Approach Document
- Adhesion Approach Document
- Cold Weather Approach Document

Seasons delivery teams across the routes collate responses to each control measure, liaising with their route teams including operations, maintenance and engineering teams.

These responses are submitted to the National Weather Team who provide a national picture of preparedness for the organisation, highlighting any key risks and mitigating these from a national perspective where possible.



Improving for the future



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How are we improving for the future?

All Weather:

- Continuously improve our control framework and forecasting/hazard awareness systems
- Deliver training through our weather academy to increase people's ability and confidence in using weather information to deliver a safe service
- Deliver more science led understanding of how our assets behave during extreme weather

Rainfall:

- Projects that improve our management of geotechnical, drainage and water management assets
- Implement the Met Office's science work on rainfall to adjust our earthworks rainfall thresholds and improve our response
- Implement our PRIMA tool to make decisions that are proportionate to the risks

Hot weather:

- Improve our 'key route strategies' to proactively prepare for extreme heat as forecast (instead of reacting when and where hot weather occurs)
- Resolve our known electrical defects using risk based maintenance and renewal
- Reduce instances of track buckles (and reduce the service impact when track buckles occur)

Wind/storms:

- Implement our GUSTO tool to make decisions that are proportionate to the risks
- Find a better balance between our ecological responsibilities and railway hazards (e.g. trees falling on the line)
- Improve passenger information in advance of storms to improve customer satisfaction



Rail Operations Weather Service



ROWS

An accessible digital platform that will use enhanced forecast data to present map-based weather information. The platform will enable a more hazard and impact-based approach to operational decision making.

ROWS will replace NRWS (current forecasting system) in 2025 and will give our users:

- More granular weather forecasts with enhanced map-based functionality supporting a **targeted operational response**.
- Longer forecasting horizon enabling **better planning and rostering for responding to weather events**.
- Customisable interface enabling more focus and **improve decision speed**.
- ROWS creates the data foundation to **unlock future potential** use cases for weather data, including access to historical weather data.



Summer Forecast



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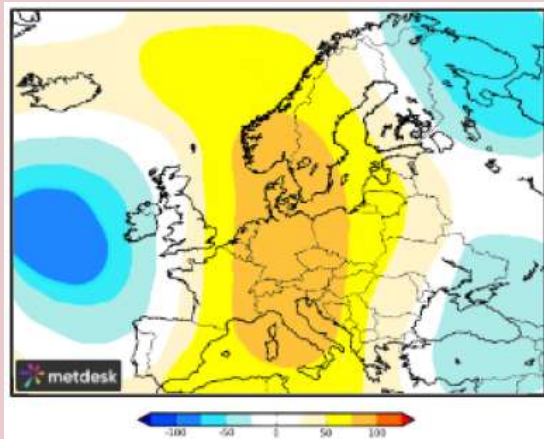
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Long Range Forecast



June



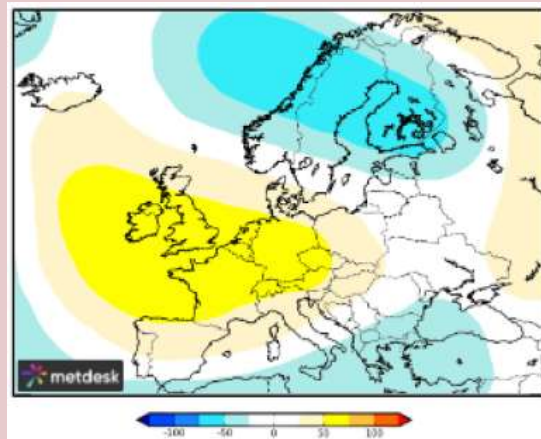
Confidence: Medium

Good potential for June 2025 to be hotter than last year. High pressure near continent will favour hot southerly winds – possibility for high rail temperatures at times.

Western areas could see some heavy rain.

Risk of thunderstorms at end of hot spells.

July



Confidence: Low

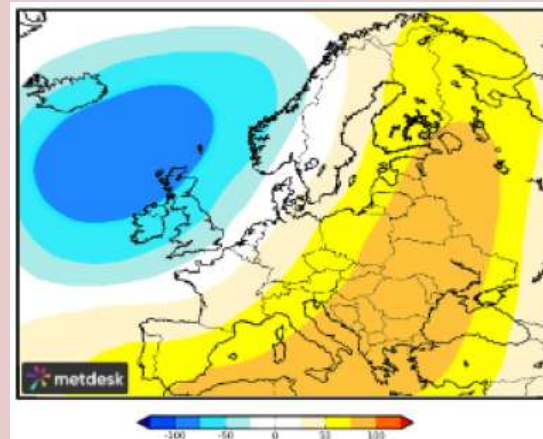
Scotland has the potential to be breezy and wet in the west.

Further south over the UK it is likely to be a warm and more settled month.

Lack of rainfall in the south and a few hot days expected.

Less wet/windy vs July 2023 but not as extremely dry/hot as July 2022.

August



Confidence: Medium

Low pressure dominated month, especially in the north. Wind and rain hazards likely to be more prominent.

Warmth more short-lived and isolated vs early summer.