

ACED Conference Leads Update from PWI



Dr Brian Counter Technical Director, PWI

4th September 2025



THE PWI

EMPOWERING RAILWAY ENGINEERING

What is the PWI?

We are Railway Engineers!

INTRODUCTION Dr Brian Counter

AGENDA



1. What is PWI?
2. What do we do?
3. Where are we going?
4. The UK Rail Industry
5. The Challenges
6. Student Membership
7. Some technical stuff!



History

- The Permanent Way Institution was formed in 1884 as a learned (and friendly) society with the initial focus on the technology of Permanent Way (Track)
- Focus on wider Railway Infrastructure since early 1900s and Railway Plant since 1950s
- Accredited by the Engineering Council as a PEI in January 2019
- Became part of JBM in 2021
- We now cover Electrification, Power, Structures, Railway Geotechnics

Numbers

- 4500 members (including 1000 students/apprentices) and 68 corporate members
- 507 professional registrants
- Turnover of £1.7m, Engineering Education and Training £1m



THE PWI
EMPOWERING RAILWAY ENGINEERING

Our Vision, Mission & Values



Vision

To be a globally renowned engineering Institution
– inclusive, progressive and shaping the future of
a thriving railway industry.



Mission

To educate, empower and connect people –
sharing knowledge and experience, enriching
careers and championing railway engineering.



Values

Integrity.
Inclusivity.
Empowerment.

WHAT IS OUR UNIVERSITY INVOLVEMENT?



UK's longest rail viaduct – HS2 Colne Valley Viaduct

- **JBM Visits**
- **Finding Industrial Members for IAB's**
- **Encouraging Student Membership**
- **Guest Lecturing on Railway Theory and projects**
- **PWI Prizes for Railway Engineering Projects**
- **Level 6 Apprenticeships in Rail and new Civil Engineering**

WHAT HAS CHANGED AND WHERE ARE WE GOING?

- As a Railway Engineering PEI focused on systems we have provided a unique space for all engineers involved in railways and have now have many multidisciplinary members.
- We provide networking, inform, educate and qualify professional railway engineers involved in track, structures, geotechnics, power and electrification.
- To ensure people know who we are immediately and become a clearer voice to promote railways, we are proposing to change our name. This will be the subject of an all member referendum in late autumn 2025. The proposed name is:

RAILWAY ENGINEERING INSTITUTION (RaIEI)



THE PWI
EMPOWERING RAILWAY ENGINEERING



WHAT ARE THE PWI PRIORITIES GOING FORWARD?

- Expanding Knowledge through our 200 campaign
- Research liaison with UKRRIN group of Universities
- Innovation through 68 Industrial Partners
- Professional Development and promotion of routes including Education and Experiential Learning
- JBM accreditation and guidelines change to include more railways in the required curriculum

The UK Rail Sector

A showcase of world-class expertise

BUSINESS
IS
GREAT
BRITAIN

I AM SURE YOU KNOW ABOUT THE RAIL SECTOR

1.5 billion passengers

220,000 people

£17 billion spend per year

HS2 and links

Major Stations and Upgrades

Clients and Suppliers

Specialist Companies

University Research

Global - you can work anywhere!





Metros

Light Rail



Mainline



WHAT A COMPLEX SYSTEM THE RAILWAY IS!

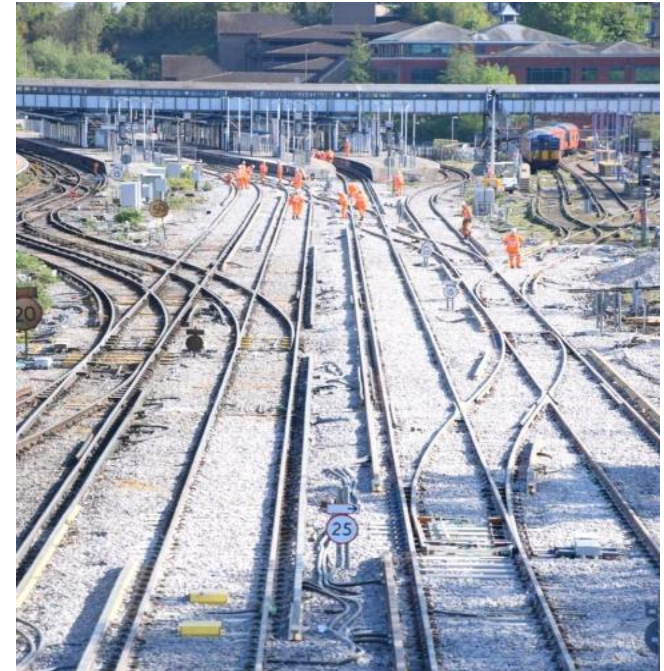




WHO IS THE RAILWAY TECHNOLOGY COMMUNITY TODAY?

- Track Engineers
- Civil Engineers
- Architectural Engineers
- Structural Engineers
- Building Engineers
- Geotechnical Engineers
- Electrification Engineers
- System Engineers
- Plant Engineers
- Metallurgists
- Environmentalists
- Rolling Stock
- Signalling
- Communications
- Operations
- IT
- Data Analysts
- Ergonomics
- Behaviourists
- Transport Integration

Railway Technologists are Multi-disciplinary





UK RAILWAY ASSETS INCLUDE:

- 20,000 miles of track
- 30,000 bridges, tunnels and viaducts
- Thousands of signals, Level crossings and stations
- 190,000 Earthwork Assets
- 38.1% is electrified

WHAT ARE THE RAILWAY CHALLENGES OVER THE NEXT 20 YEARS AND WHY DO WE NEED PROFESSIONAL ENGINEERS?

- **Rail Staff and Rail System Safety**
- **GBR, Budget Reductions, Government Policy**
- **Response to Innovation and Change**
- **Climate Change Prediction**
 - Heat – what will 2025/26 bring? Winter Storms, Floods, Banks and Decarbonisation
- **People Issues**
 - Equity Diversity Inclusion, Qualified Professional Staff, Apprentices, Skills Shortages



WHY YOUR STUDENTS SHOULD BECOME STUDENT MEMBERS?



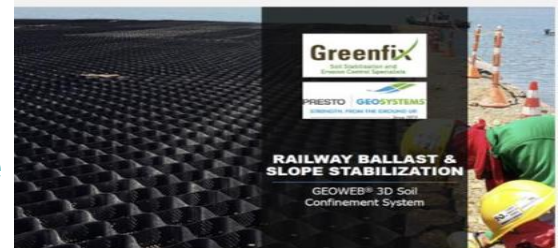
- It's free and easy to join on-line use this QR code and they get another free year on graduation
- They get access to up-to-date information and research for theses, coursework and dissertations in major infrastructure projects, railways, structures and earthworks.
- They become part of a network with many face-face and virtual sessions to meet industrialists and understand potential future job opportunities.



19 March 2024

PWI Lunch & Learn: Predictive maintenance

Fortnightly on-line lunch and learn with often over 120 people



14 May 2024

PWI Lunch & Learn: Railway ballast & slope stabilisation

PROFESSIONAL INSTITUTIONS LINKED TO RAILWAYS

We work closely with others and encourage dual membership



THE PWI

RAILWAY ENGINEERS

The Institution of
StructuralEngineers

ice

Institution of Civil Engineers



The Institution of
Engineering and Technology

Institution of
**MECHANICAL
ENGINEERS**



IRSE

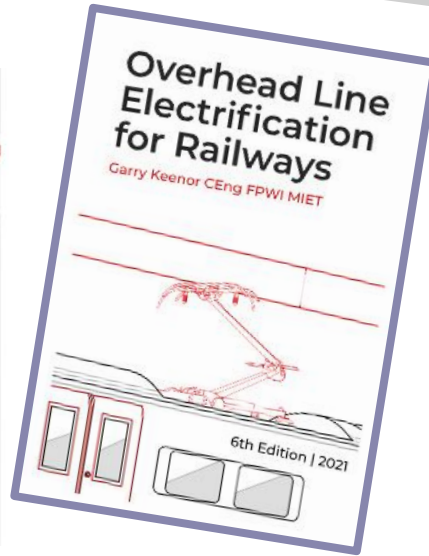
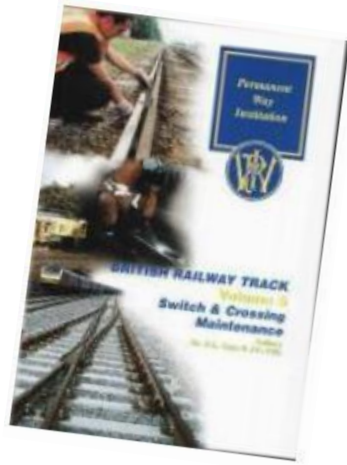
INSTITUTION OF
RAILWAY SIGNAL
ENGINEERS



THERE ARE NEW INTEGRATED DEGREE APPRENTICESHIPS WHICH COMBINE EPA WITH AN IENG REVIEW?



- These are Level 6 Civil Engineering and Rail and Rail System Engineering that are both accepted as meeting the academic base for Incorporated Engineer
- It is good to combine as the standard is the same in content, the questions will be the same and avoid duplication.
- All JBM institutions can do the Civils and PWI usually lead on the Rail.
- Progression to Chartered Engineer from DA's is common and straightforward through MSc, technical report or experiential learning.



We now have
Webinars,
Social Media,
Meetings,
Seminars,
Publications,
Textbooks



 **THE PWI** ABOUT MEMBERSHIP YOUR CAREER WHAT'S ON THE JOURNAL KNOWLEDGE HUB SHOP 

Before you click on the new portal, make sure to familiarise yourself with the steps to register for your online account.

**PWI LUNCH
& LEARN
TUESDAYS
1230-1330**

 99 



THE PWI
EMPOWERING RAILWAY ENGINEERING

LET'S GET MORE TECHNICAL FOR A FEW MINUTES!

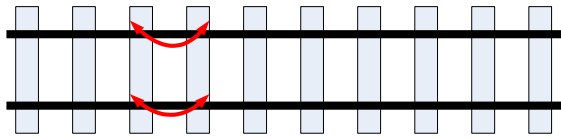
PWI Seminars in the last few years
Contributions to knowledge
Some highlights



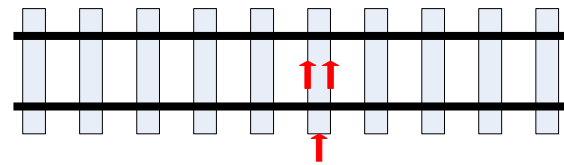
Inherent Resistance to Buckling of Track

This equation is over 60 years old – is it still valid?

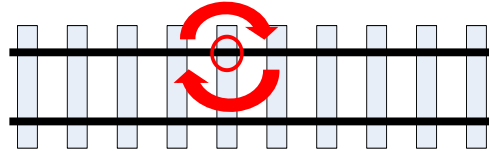
$$P = \frac{\pi^2 E I_s}{l^2} + \frac{\pi^2 C}{16D} \sqrt{\frac{\pi l}{q_b}} + \frac{W l^2}{D \pi^2 q_b}$$



Resistance of Rails



Resistance of Sleepers

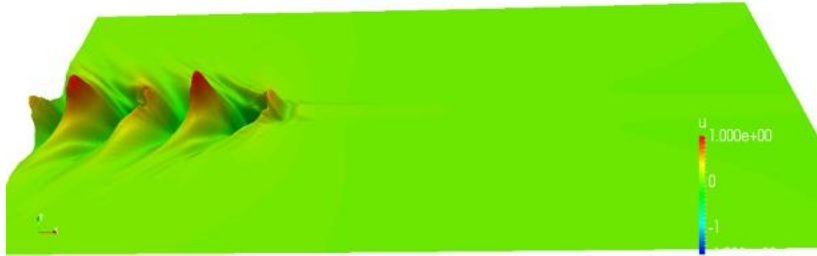


Resistance of sleeper/fastening

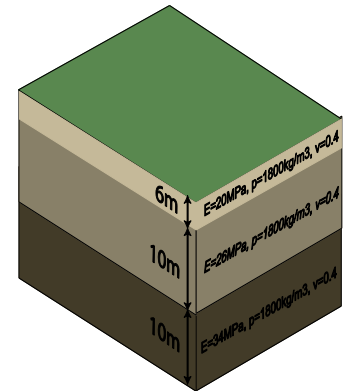


STEEL

GROUND WAVE PROFILES – RAYLEIGH WAVES FOR HIGH SPEED LINES



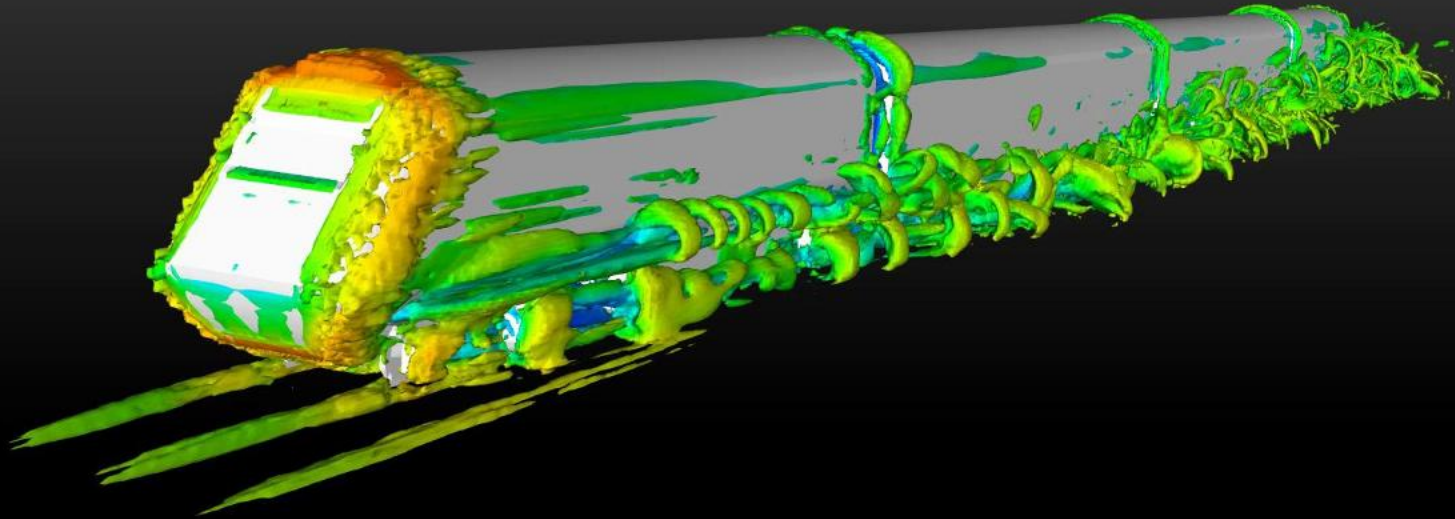
Above critical speed



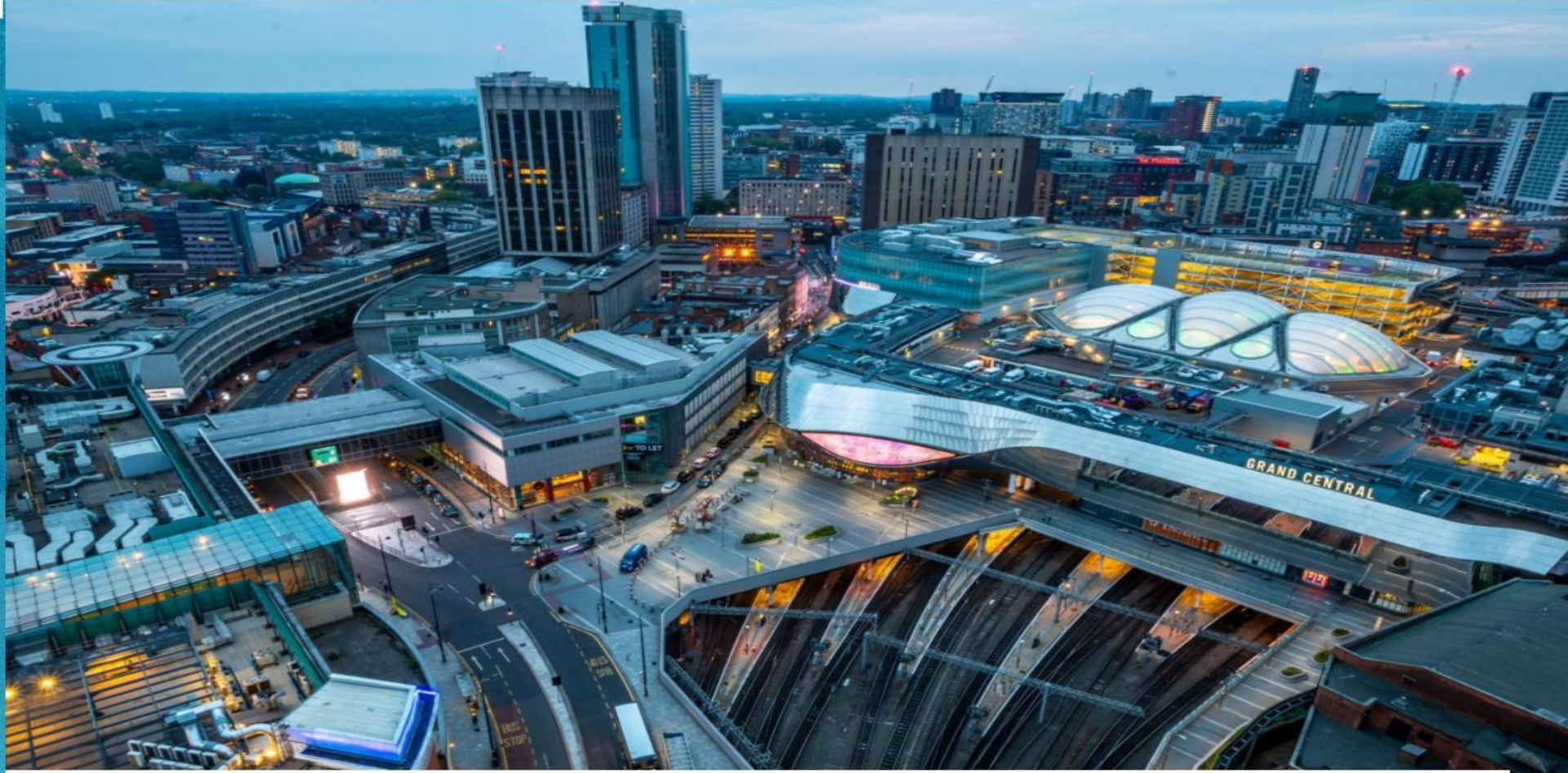
Below critical speed

Connolly et al.
University of Leeds

modelling



We thrive on complexity! Where is this?



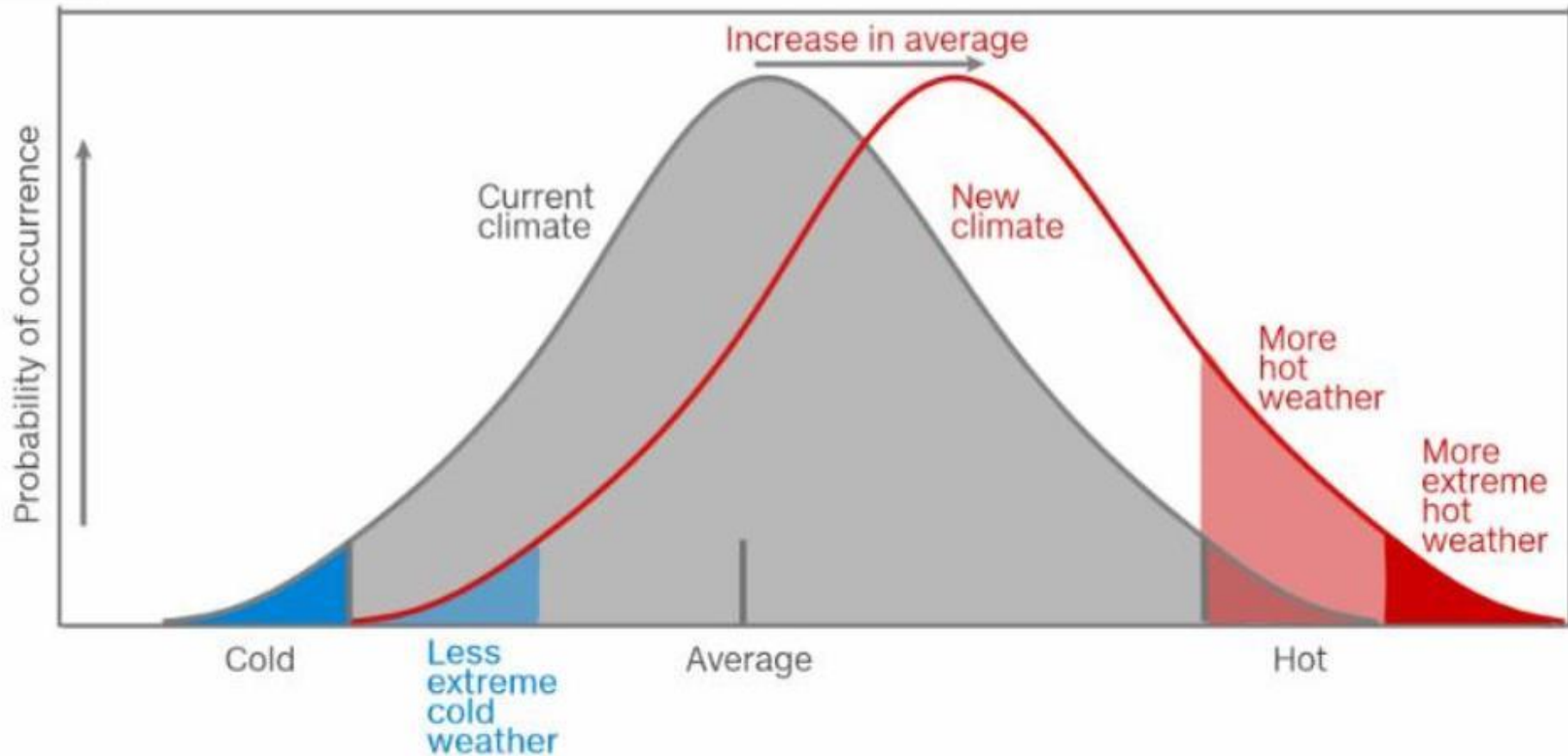


THE PWI
EMPOWERING RAILWAY ENGINEERING

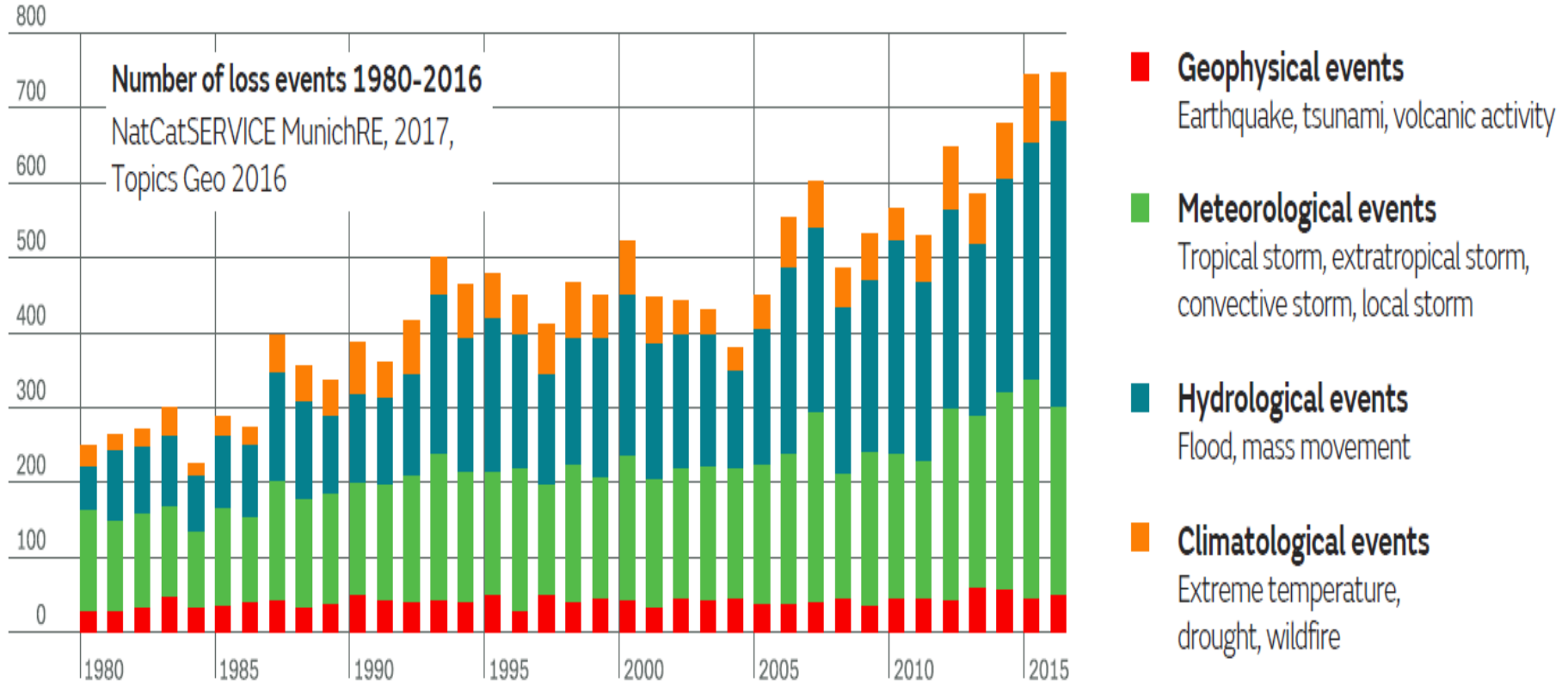
I MENTIONED CLIMATE CHANGE
AS OUR MAJOR CHALLENGE
FOR RAILWAY ENGINEERING
AND RESEARCH

OR IS IT CLIMATE EMERGENCY?

Climate change and extreme weather



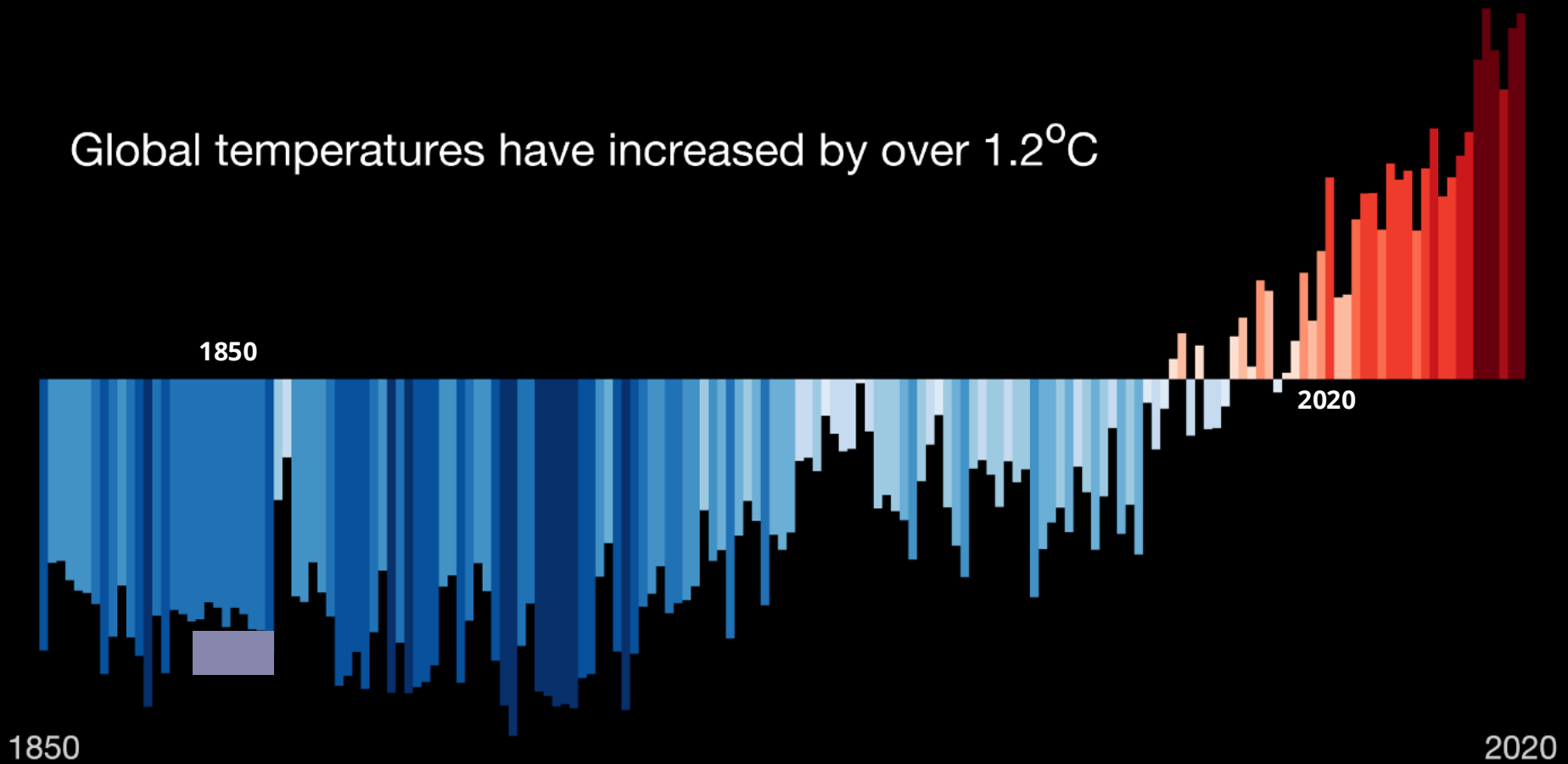
Are extremes more frequent?

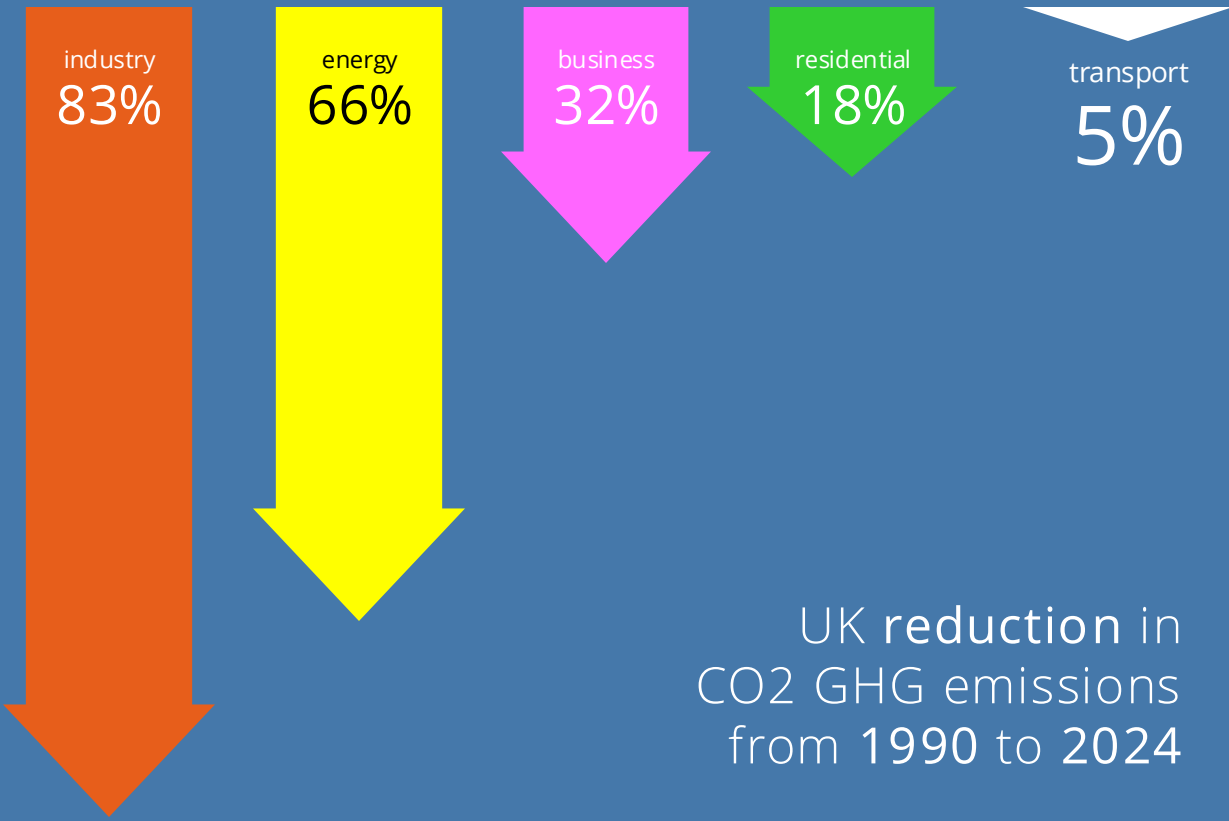


WHAT IS THIS?



Global temperatures have increased by over 1.2°C





UK reduction in
CO2 GHG emissions
from 1990 to 2024



Water is the
Railway
Engineer's
Enemy
(1964)

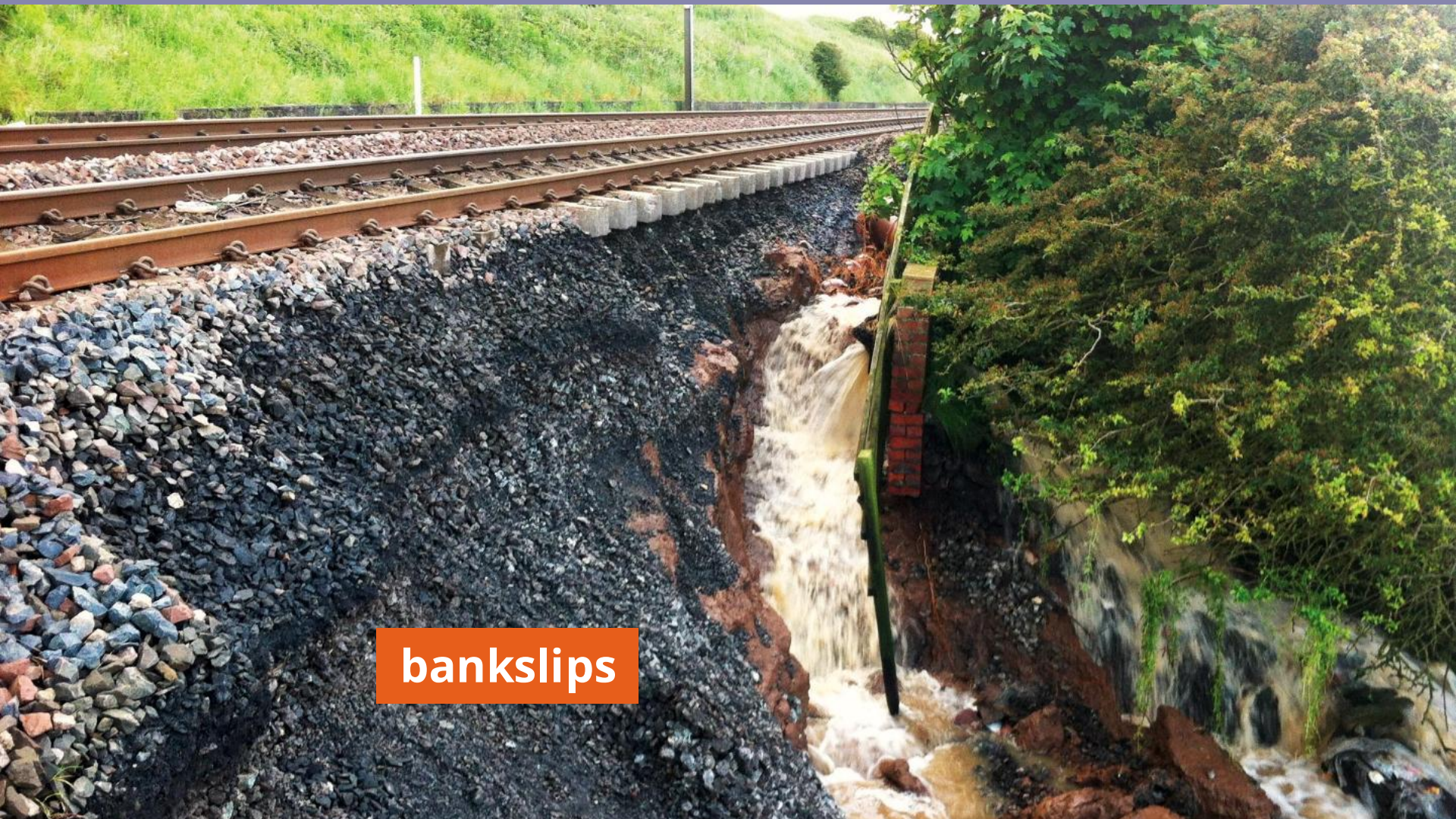




floods

An aerial photograph of a mountain slope covered in brown and reddish vegetation. A large, vertical, greyish-brown landslide scar runs down the center of the slope. A train with several dark-colored cars is crossing the landslide area horizontally. In the upper left corner, a snow-capped mountain peak is visible. An orange text box with the word "landslips" is positioned in the upper right quadrant of the image.

landslips



bankslips

A dramatic coastal storm scene. Large, white-capped waves are crashing against a dark, industrial pier structure on the left. The sky is dark and overcast, with a single bird visible in the distance. The water is turbulent and foamy. An orange rectangular box is overlaid on the center of the image, containing the text "coastal storms" in white, bold, sans-serif font.

coastal storms



coastal storms



high temperatures





low temperatures





snow



wind





THE PWI
EMPOWERING RAILWAY ENGINEERING

There are sets of tools that we have
that can really make a difference:

Data collection

Analysis

Review





Railway innovations





THE PWI
EMPOWERING RAILWAY ENGINEERING

Railway Engineering professionals make **daily decisions** that have an impact on climate change

By understanding the way **those decisions can shape the future**, we can make choices that result in a sustainable built environment

This means that **we discharge our obligations** as Society and Industrial Professionals

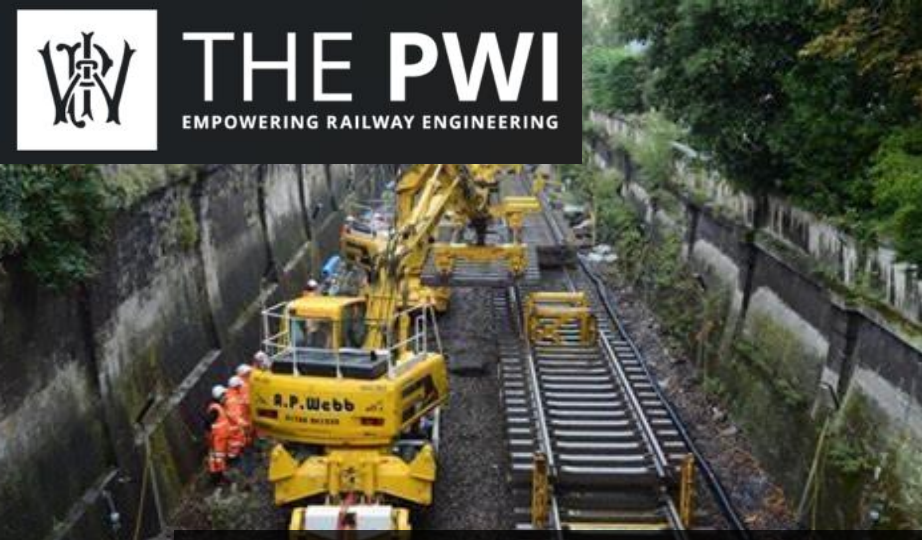


THE PWI
EMPOWERING RAILWAY ENGINEERING

**DID I MENTION
PWI MEMBERSHIP IS
FREE FOR ALL
STUDENTS!**



THE PWI
EMPOWERING RAILWAY ENGINEERING



Professional journeys start with us!



JOINT BOARD OF MODERATORS



INSTITUTE OF HIGHWAY ENGINEERS



email: technicaldirector@thepwi.org
telephone: 07971 477090