INTERNATIONAL UNION
OF RAILWAYS

UIC

Initiatives in Climate Change Impact Assessment and Adaptation for Railways

Mercedes GUTIERREZ
Infrastructure & TTI Senior Advisor

UNECE GE on Assessment of CC Impacts and Adaptation for Inland Transport, 22nd April 2021

UIC: a long history of serving member railways and facilitating international railway cooperation

1921

Intergovernmental (diplomatic) conference in Portorož, Slovenia (formerly in Italy)

1922

Intergovernmental (diplomatic) conference in Genoa, Italy

October 1922

Constitutive Assembly of UIC (Paris): UIC statutes adopted by 51 railway administrations in 29 countries (Europe, Asia)

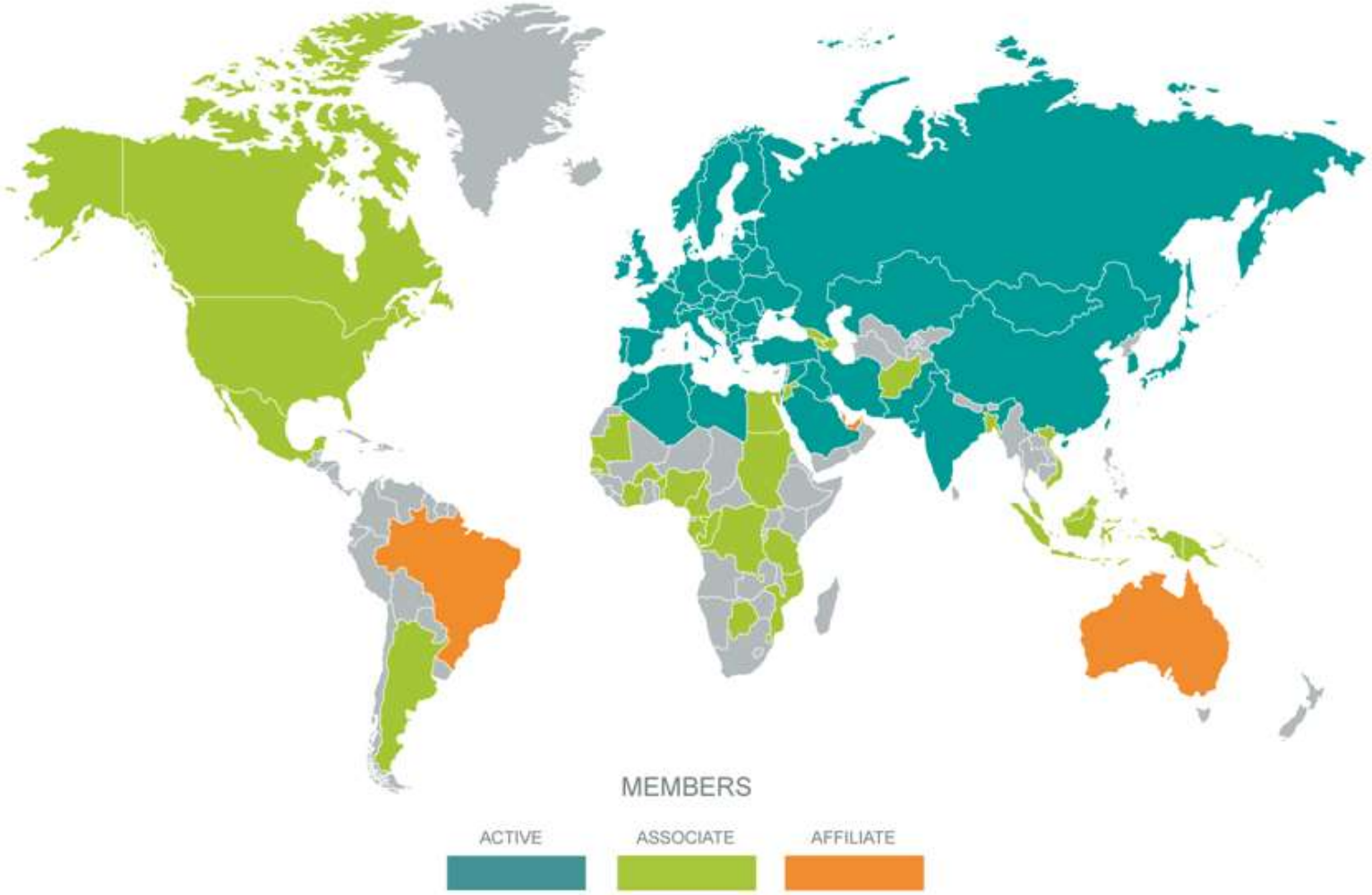
2020

200 member railways in 95 countries

UIC today

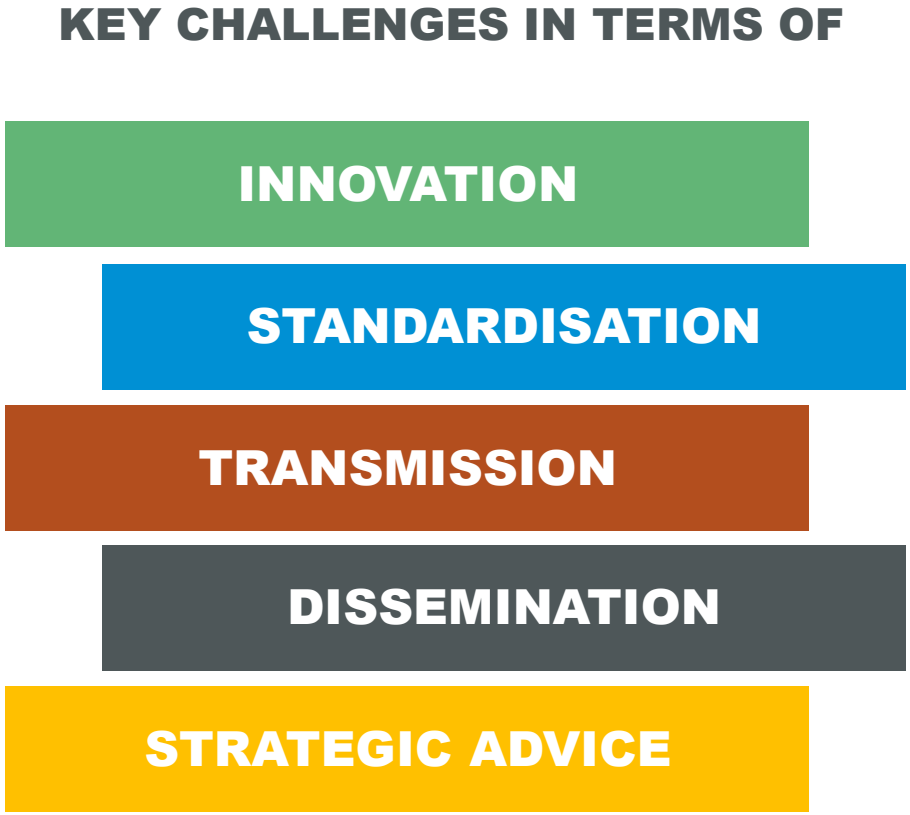
200 members in 95 countries	**3,000** billion passenger-kilometres	**10,000** billion tonne-kilometres	**1** million kilometres of line
7 million rail personnel	Cooperation with over **100** institutions	**700** UIC leaflets - new International Railway Solutions (IRS)	**85** congresses, conferences, workshops

UIC in 2019



UIC's missions

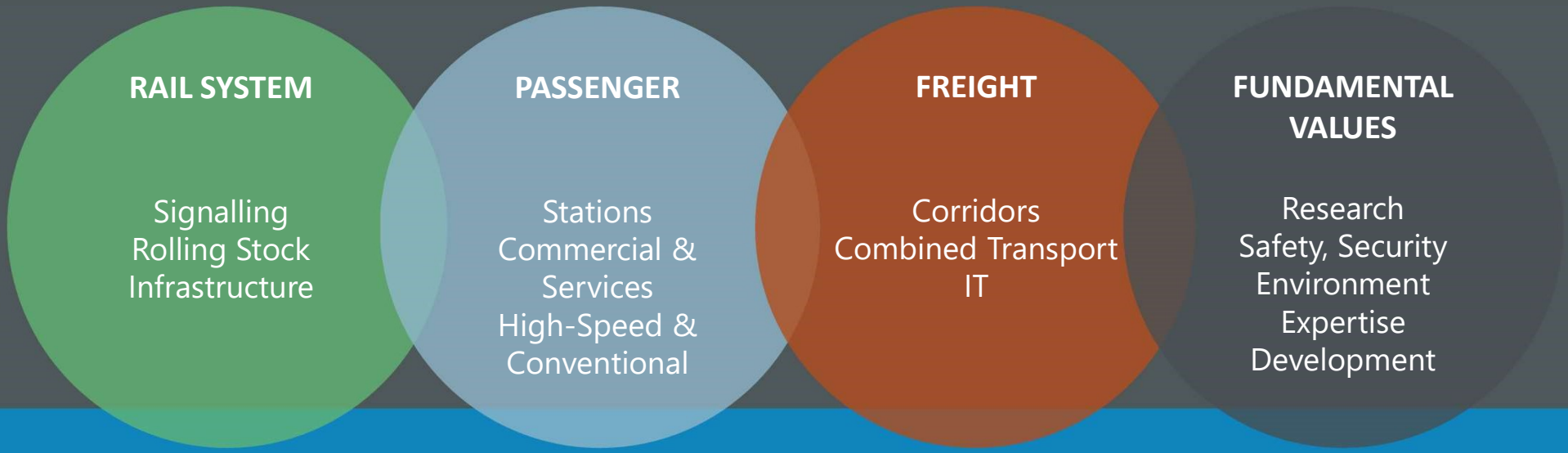
Promoting the development of rail transport globally to respond to challenges in respect of mobility and sustainable development



6 UIC focus areas for global cooperation serving the entire railway community

- **Environment & Sustainable Development**
- **Safety & Security**
- **Freight/Intercontinental corridors**
- **Railway Signalling & Control Command**
- **Standardisation**
  UIC leaflets, IRSs
- **Research & Expertise Development**

UIC organisation structure



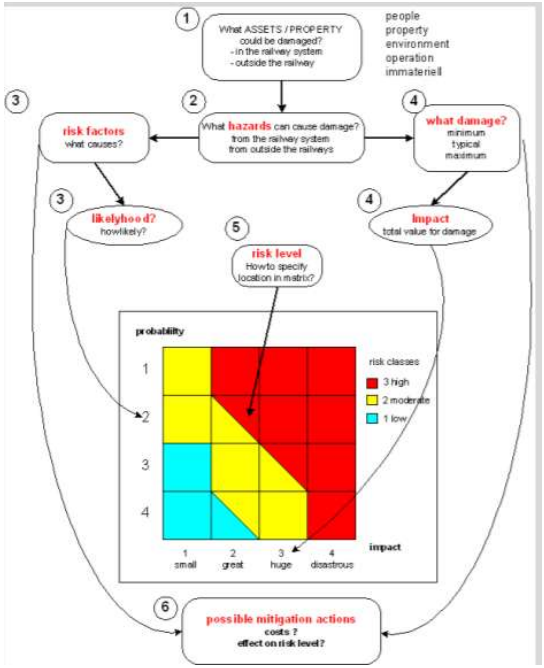
COMMUNICATIONS · INSTITUTIONAL RELATIONS · HR & SOCIAL · FINANCE

UIC background adaptation to Climate Change

Adaptation of Railway Infrastructure to Climate Change recommendations on how to develop adaptation plans

- ARISCC Project. Adapt Rail Infrastructure to Climate Changes →2010
- ARISCC Asia Project. Adapt Rail Infrastructure to Climate Changes Asia →2011

http://www.ariscc.org/



Readiness → To be well prepared for extreme weather events
Resilience → To systematically increase the resilience of the whole system
Recovery → To have contingency plans allowing for fast and full recovery

UIC background adaptation to Climate Change

Natural risk study - report on strong wind hazard

https://www.shop-etf.com/en/natural-risk-study-report-on-strong-wind-hazard

Main conclusions:

- ✓ Theoretical frameworks developed seem similar and coherent with European models
- ✓ Although protection strategies are also coherent, their implementations are not the same

UIC background adaptation to Climate Change

Natural risk study - report on flood hazard

https://www.shop-etf.com/en/natural-risk-study-report-on-flood-hazard

Main conclusions:

- ✓ Monitoring Systems are widely used in Asian countries compared with European countries
- ✓ Implementation of protection strategies and monitoring systems are not the same in all the countries
- ✓ For both ballasted track and slab track , the major risk in case of a flood event comes from the railway subgrade and not the track itself
- ✓ The requirements to reduce the impacts of a flood event in the existing standards are different depending on the country

UIC background adaptation to Climate Change

UIC-High speed and intercity natural risks

https://www.shop-etf.com/en/high-speed-and-intercity-natural-risks

Proposals:

- Design stage and operation
- It is needed to develop deeper approaches to complete the risks assessed
- Flooding risk should deserve particular attention

UIC background adaptation to Climate Change

UIC Rail System Department

- UIC Capacity for Rail → Paving the way for the specification of future railway technologies and system
  http://capacity4rail.eu/results#SP1-Infrastructure

Results:

- Infrastructure
- New concepts fot efficient freight systems
- Operations for enhanced capacity
- Advanced monitoring
- System assessment and migration to 2030/2050
- Dissemination, explotation and trainning

UIC background adaptation to Climate Change

Rail Adapt. Adapting the railway for the future → recommendation on how to develop adaptation plans

https://uic.org/sustainable-development/environment/article/adapting-to-climate-changes#Building-a-resilient-railway-UIC-RailAdapt-project

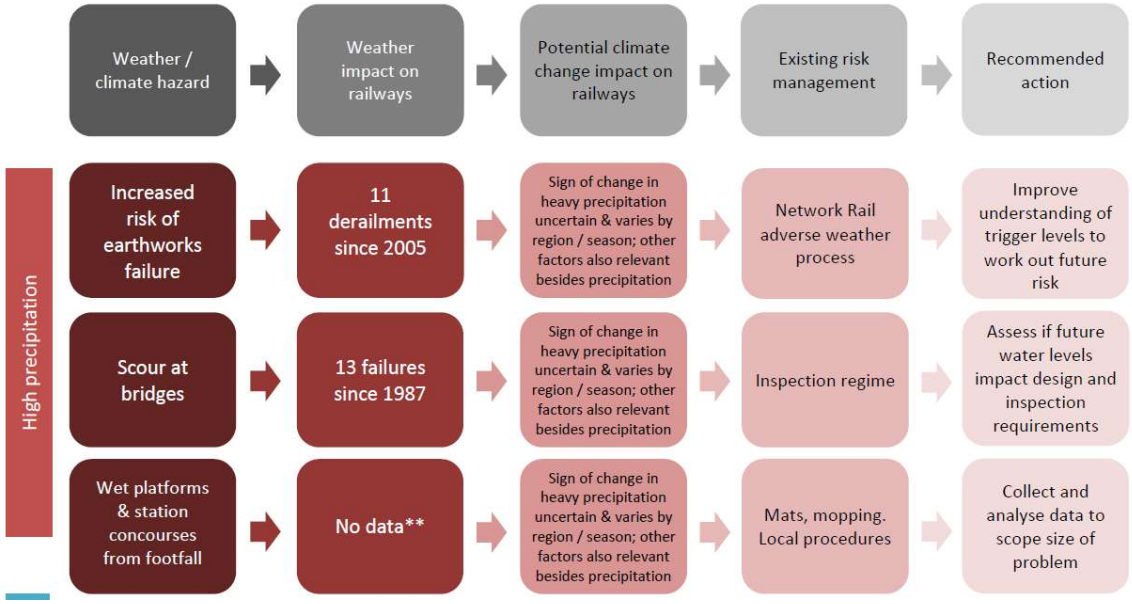
Natural risks studied

- ✓ Extreme temperaturas/Frost
- ✓ Snow/Avalanches
- ✓ Change of humidity or high humidity
- ✓ Strong wind
- ✓ Sand-dust
- ✓ Heavy rain/embankment collapse
- ✓ Flood/Tsunami
- ✓ Fallen rock
- ✓ Seismic evento
- ✓ Surronding fire
- ✓ Salt injury
- ✓ Fallen leaves
- ✓ Thunderstorm

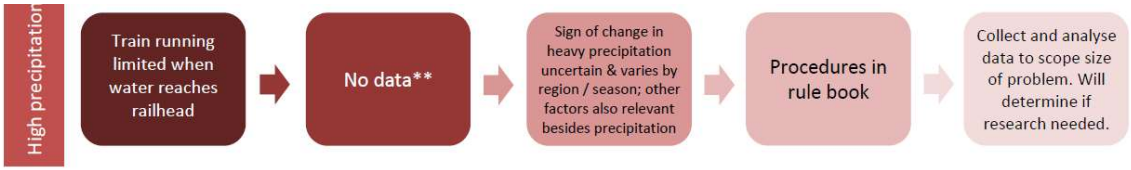
UIC background adaptation to Climate Change

Rail Adapt. Adapting the railway for the future

Infrastructure



Operations



UIC background adaptation to Climate Change

Rail Adapt. Adapting the railway for the future

T1009 fact sheet: Management of flooding risk

Introduction & outline of task

The Tomorrow's Railway and Climate Change Adaptation research programme focuses on climate change adaptation for Great Britain's (GB) railway network. It is funded by RSSB (project reference T1009) and sponsored by the Technology Strategy Leadership Group (TSLG – a cross-industry group including Network Rail, train operating companies, etc).

As part of the T1009 programme, an "overseas analogue study" has been conducted to establish how the railway in Great Britain (GB) could learn from other countries' experiences in **weather resilience and climate change adaptation (WR/CCA)**. The approach is outlined on the right.

Step 1: GB climate analogues: Which countries' present-day climates are similar to those projected for GB in the future (mid- and end-21st century)?

Step 2: GB railway analogues: Which countries' railways share key operating characteristics with the GB railway?

Step 3: Which countries are both climate analogues and railway analogues?

Only five countries were both climate and railway analogues ("combined analogues") according to our analysis: Belgium, France, Denmark, Germany and the Netherlands

Step 4: What WR/CCA measures are being used by other railways across the globe?

- Assessed via stakeholder engagement, literature review, and collation of learning from other large projects examining WR/CCA in transport (e.g. WEATHER, MOWE-IT)
- Compendium produced of all WR/CCA measures compiled from these sources

Key WR/CCA themes: flooding – how can flooding be managed, strategically and operationally?

Strategic planning for flooding

Overview

Flooding affecting railway, Somerset, UK, Winter 2013/14. © Network Rail 2015

- Management of flooding requires **careful planning** and the **development of appropriate strategies** (e.g. emergency timetables, coordination with other operators, etc)
- **Strategies should be reviewed** after events, and **adapted in the light of new information**

Understand the weather hazard:
Collect appropriate weather data, and develop appropriate systems for monitoring and warning

Flood warnings example from Met Office website. The Met Office and Environment Agency / SEPA / Natural Resources Wales work together to produce these. © Crown copyright Met Office 2015

In addition, **understand the source of the flood hazard**: surface water, fluvial (river), groundwater, or coastal.

Develop **flood hazard / flood risk maps**.

- *Many countries have developed these, including the UK, the Netherlands, Norway & Ireland.*

Understand the vulnerability:
Assess the impact of flooding on railway assets and operations

Flooded trackside equipment in Somerset, UK. © Network Rail 2015

Effective and timely maintenance **supports and enhances preparedness** (e.g. clearing debris from culverts)

Lifting mesh to repair drainage pipe. © Network Rail 2015

During **post-event repairs, incorporate measures to increase resilience**

Ensure any **lessons learned** after events are embedded into normal working practices

Take climate change into account when designing and siting new assets.

- *In the UK, Network Rail has updated its drainage manual to incorporate a 20% increase in the estimated present day design flow.*

Consider **relocation / re-siting** for particularly vulnerable existing assets.

- *In locations vulnerable to flooding in the Netherlands, track has been elevated. Railways have been routed away from rivers.*

Consider **different engineering solutions**, e.g.

- *Slab track: may have better flooding resilience as no erosion/washout of ballast, and drainage channels can be incorporated into the design)*
- *Pile construction: may decrease the vulnerability of buildings containing important equipment (e.g. signalling)*

Operational management of flooding

Training and personnel

- Have extra personnel on standby to help with additional duties during a flood event or to replace crews displaced by delayed/cancelled trains
- Understanding the source of the flood hazard can be relevant in responding to it

Flooded signal equipment at Maidenhead, Feb 2014. Groundwater flooding events like these result in water rising from beneath the surface rather than accumulating via runoff over the surface. © Network Rail 2015

Preparation

- Have operational flood response plans in place, which can be used to prioritise use of limited resources during flooding events
- Be ready to issue flood warnings, or act upon warnings issued by other agencies, when required
- Have flood mitigation equipment (e.g. water pumps) ready for use

Weather-proofing infrastructure

- Install or deploy flood protection measures such as flood protection walls, inflatable dams or flood gates

Inflatable dam in use, December 2013. © Network Rail 2015

System-wide factors

- In some places, the railway itself can act as a flood barrier
- Understand system interdependencies and effect of flooding on these (e.g. flood at electricity substation resulting in loss of traction power, even if the railway is not affected directly)
- Ensure that communication channels routinely support the sharing of information between industry organisations, between industry and customers (passengers and freight) – and, in extreme conditions, also with media and emergency responders

This fact sheet is one of a series of three on weather resilience and climate change adaptation measures collated during the T1009 Phase 2 project. Other fact sheets on measures for winter weather management and hot weather management are available. Please contact us if you would like further information!

UIC ongoing projects related to adaptation to CC

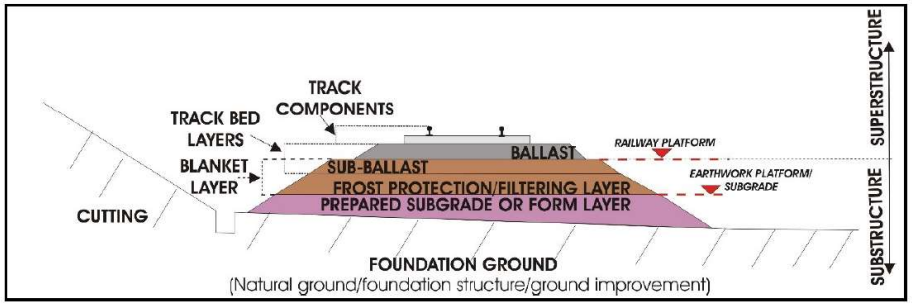
Update of Technical Leaflets 719 & 722

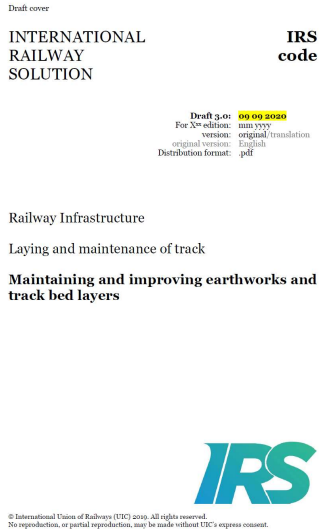
- 719: Earthworks and track bed construction for railway lines

https://www.shop-etf.com/en/track-structure-earthworks-and-track-bed-layers-for-railway-lines-design-and-construction-principles

- 722: Methods for improving the track formation of existing lines

https://www.shop-etf.com/en/methods-of-improving-the-track-formation-of-existing-lines-2124




Draft cover

INTERNATIONAL RAILWAY SOLUTION

IRS code

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Railway Infrastructure

Laying and maintenance of track

Maintaining and improving earthworks and track bed layers

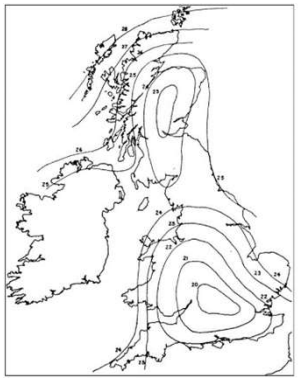
UIC ongoing projects related to adaptation to CC

SAFIRST → Sidewind assessment for infrastructure & rolling stock

Objectives: develop wind curves for RS (WP1), a common method to assess wind exposure (WP2) and a method to prove crosswind safety for IMs (WP3)

- Method for speeds 140 -2520 km/h for crosswind safety for manufacturers, as there is an open point in the TSI for this issue
- Method to assess the wind exposure along lines for IMs, as there is no clearly defined common method defined in standards
- Method for IMs to apply Reference Characteristic Wind Curves to demonstrate the crosswind safety of the line with appropriate mitigations applied as necessary

Source: RIS-7704-INS

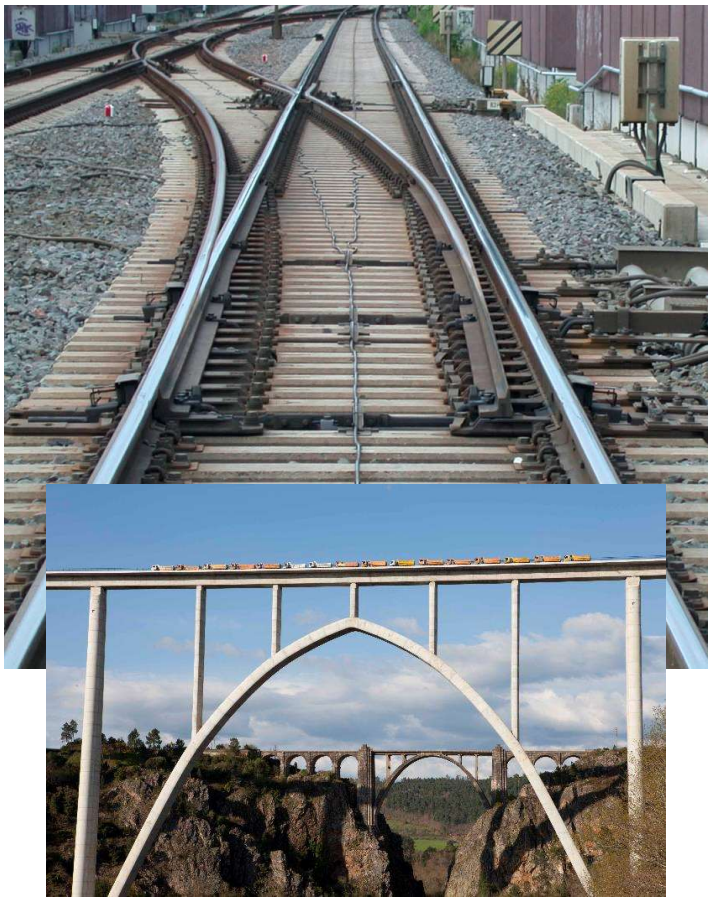


UIC ongoing collaborations - adaptation to CC

EU FORESEE PROJECT Adaptation measures for resilient transport infrastructures: new materials and systems

https://foreseeproject.eu/

- Adaptation measures for resilient transport infrastructures: new materials and systems
- The Foresee Project is delivering a toolkit to provide short and long term resilience schemes for rail and road corridors and logistic terminals that are able to reduce the magnitude and/or duration of disruptive events produced by humans or nature
- Will assure that infrastructure managers can systematically identify appropriate resilience enhancing actions and ensure the effective allocation of limited resources



UIC new Weather Task Force

Produce some guidances:
- related with the monitoring and the control of trains operations during extreme weather events
- impacts on the infrastructure

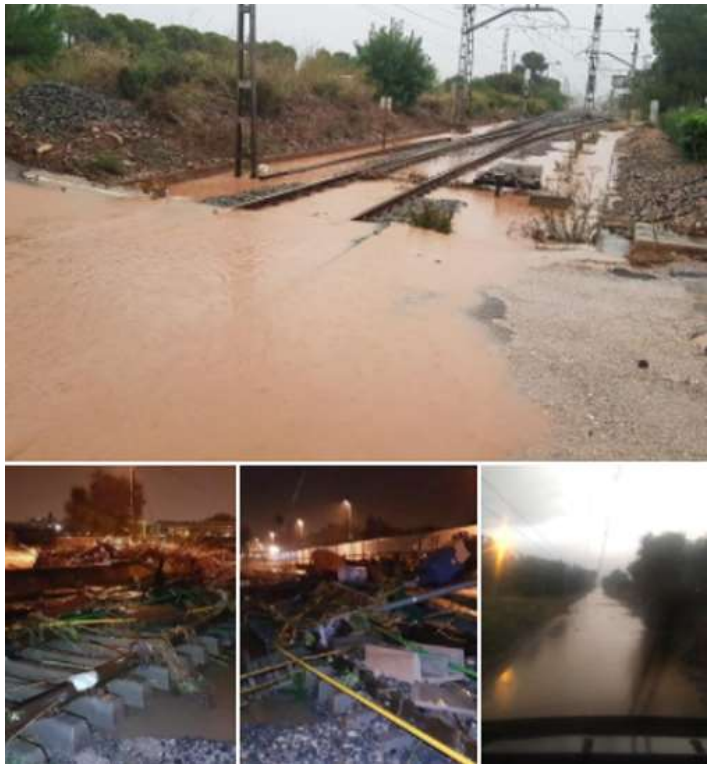
Phase 1 - Sharing of actual experiences and best practices

- Under the UIC umbrella, associating experts
- Definition of scenarios to be challenged
- Return of Experiences/Lessons learnt/Best practices
- Guidance/Booklet

UIC new Weather Task Force

Phase 2 – Research Activities, including safety climate changes and potential consequences

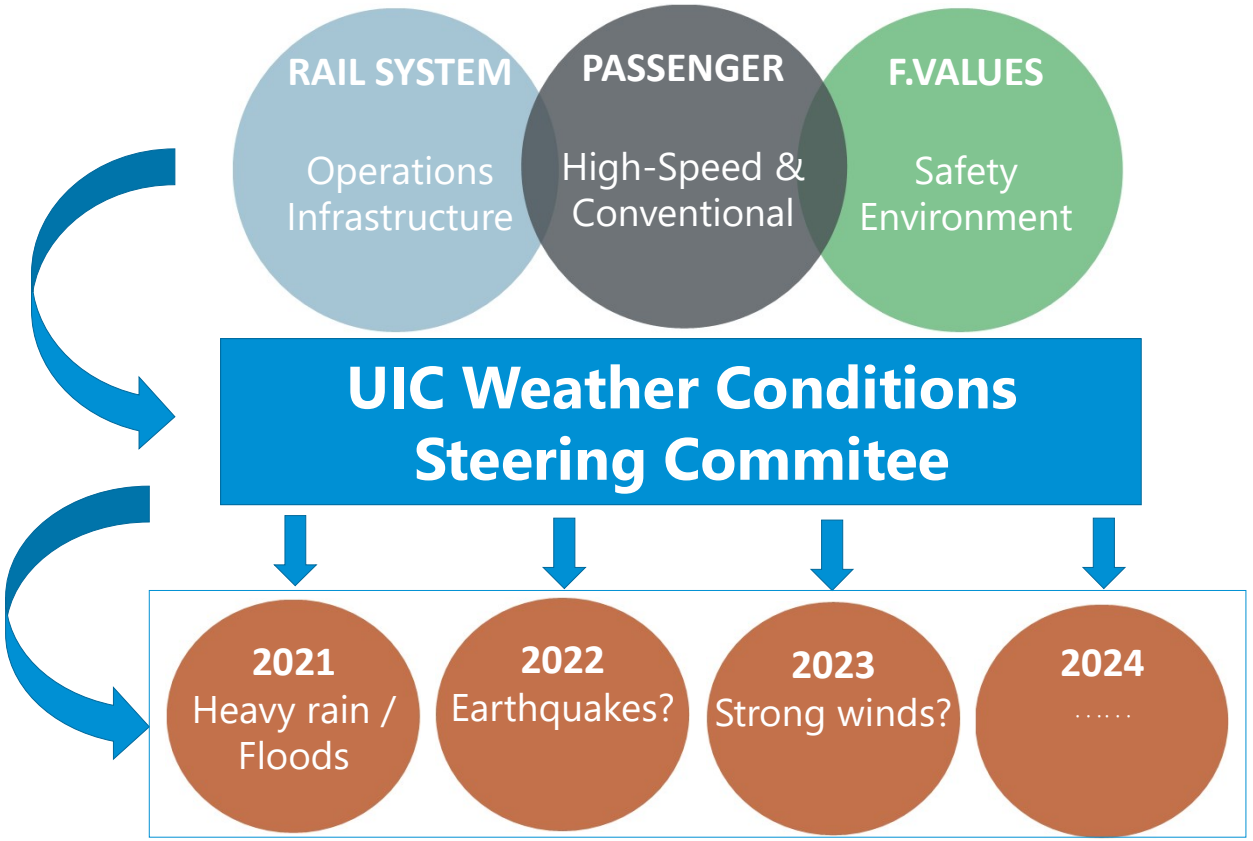
- Monitoring of assets and operations
- Business resilience
- Predictive activities / innovating means



Both scopes to be covered by phase 1+2

- Proactive / Predictive Measures
- Mitigation Measures (Ops scope)

UIC new Weather Task Force




Stay in touch
with UIC!
Mercedes GUTIERREZ
gutierrez@uic.org
www.uic.org
YouTube
#UICrail
Thank you for your kind attention!