

Climate Adaptation of Railway Infrastructure Maintenance - (ClimRail)

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Content

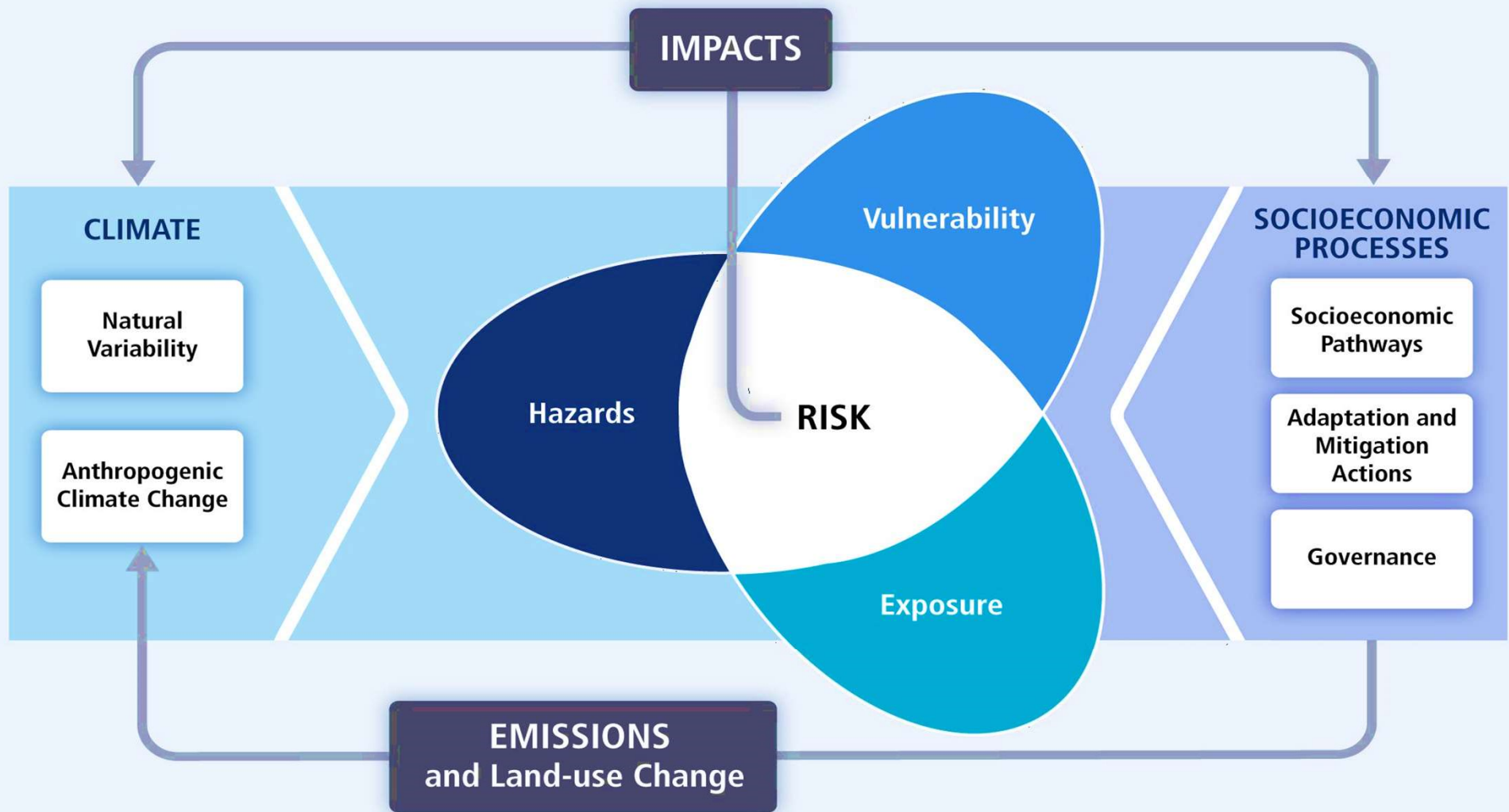
- Aim and objectives
- Work packages
- Risk assessment in IPCC
- Impact of climate change on railway assets reliability
- Adaptation strategies
- Tools for project implementation

Goal

To develop decision-support methodologies based on Reliability-Centered Maintenance (RCM) to adapt railway track maintenance programs to the impacts of climate change.

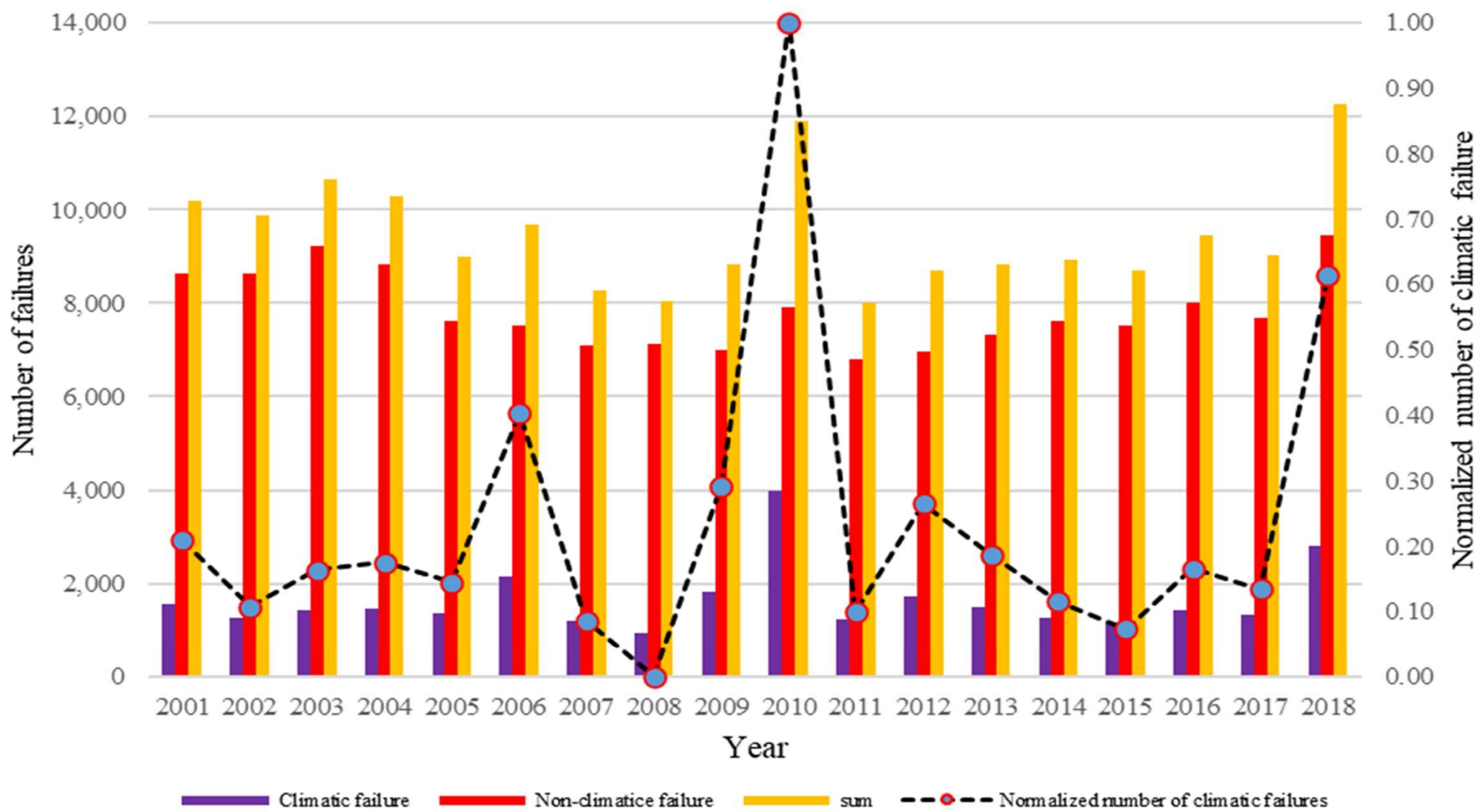
Work packages

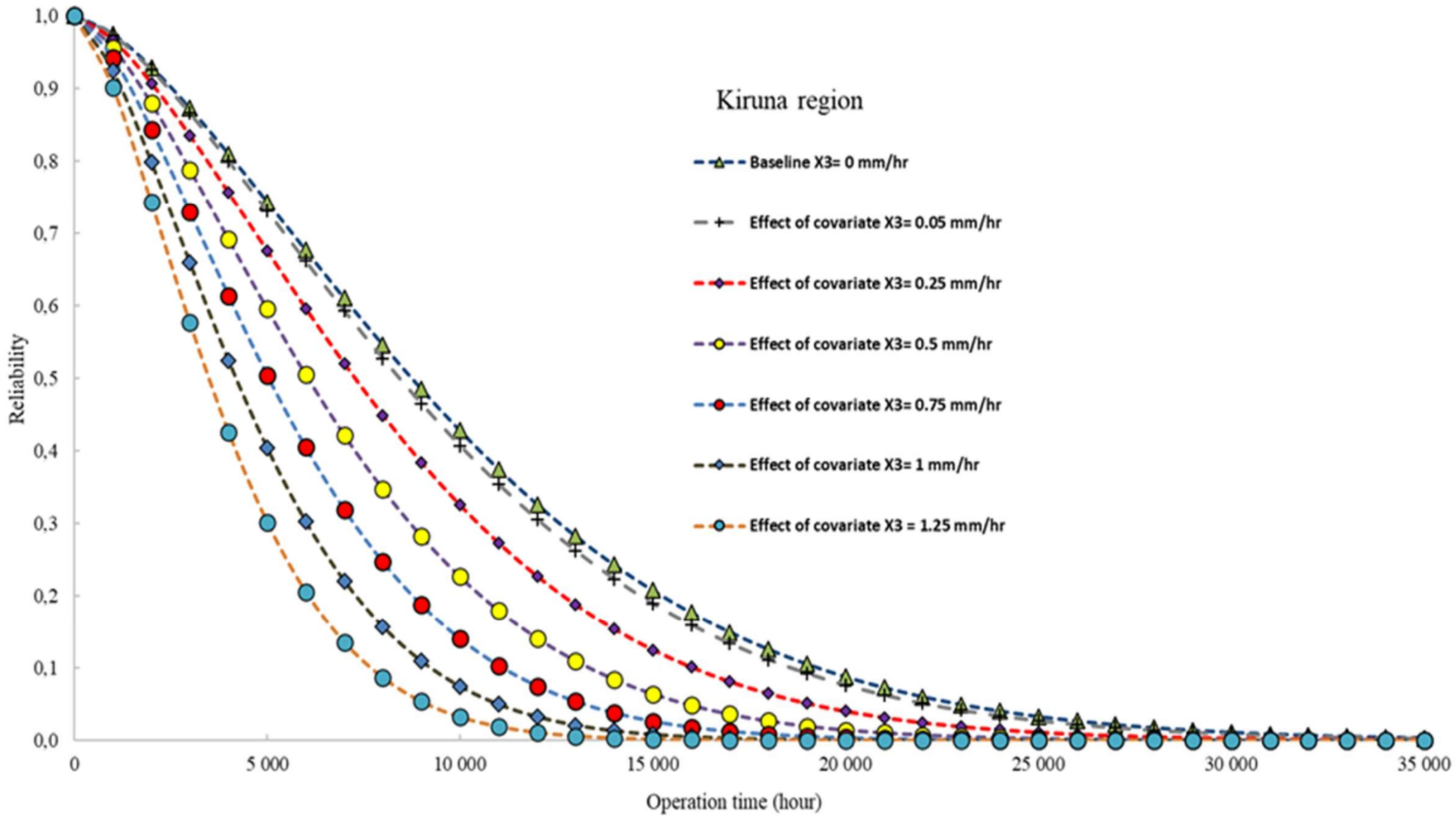
- Work Package No. 1 Project management
- Work Package No. 2 Risk Assessment of Track Functionality
- Work Package No. 3 Development of a Reliability-Centered Maintenance framework for climate adaptation of railway track
- Work Package No. 4 Project Dissemination plan and exploitation strategy



SMHI projection of climate change impact under RCPs

- ✓ Hot temperatures (max daily greater than +25-degree) will increase, especially in the south (largest difference in the north),
- ✓ Zero-Crossing will decrease in the south & increase in the north during winter,
- ✓ The north will experience more rain and more snow at temperatures close to 0°C,
- ✓ Rain will increase within the whole country.





Climate change adaptation strategies



Protect

- ✓ reactive strategy
- ✓ protecting railway infrastructure, the impacts of natural phenomena



Accommodate

- ✓ adaptive strategy
- ✓ making suitable adjustments



Retreat

- ✓ withdraw, relocate, or abandon private or public assets
- ✓ discourage development in areas prone to environmental changes

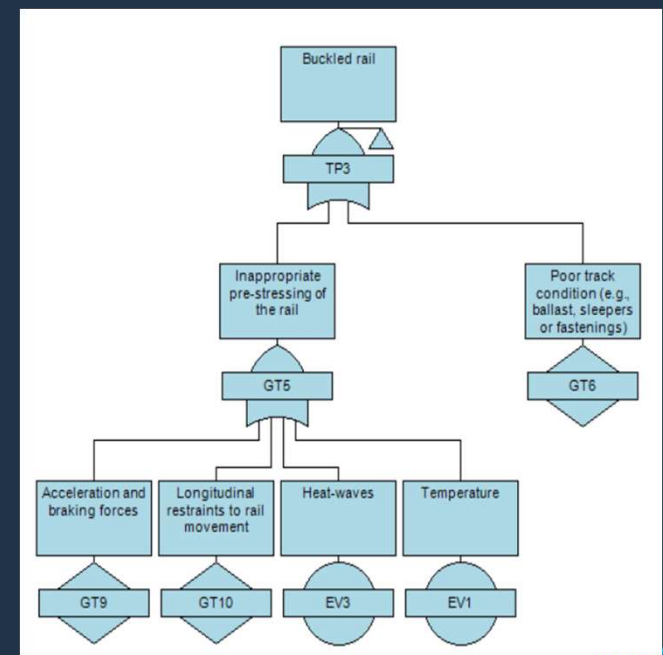
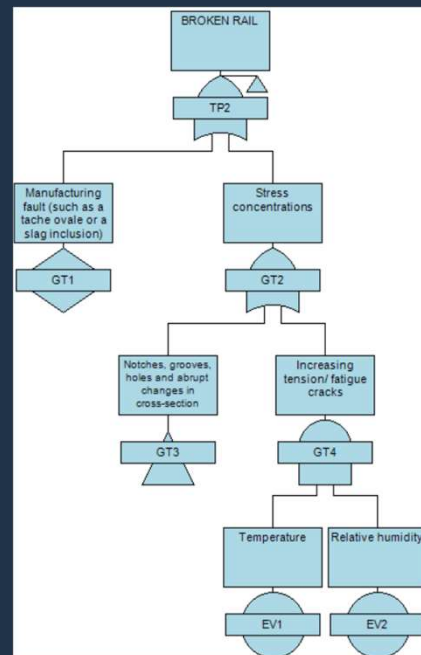
Climate change adaptation actions

Actions	Strategies		
	Protect	Accommodate	Retreat
Snow gallery	✓		
Embankment	✓		
Protective walls	✓		
Painting rails white	✓		
improving/increasing drainage assets		✓	
Increasing altitude		✓	

Fault Tree Analysis (FTA)

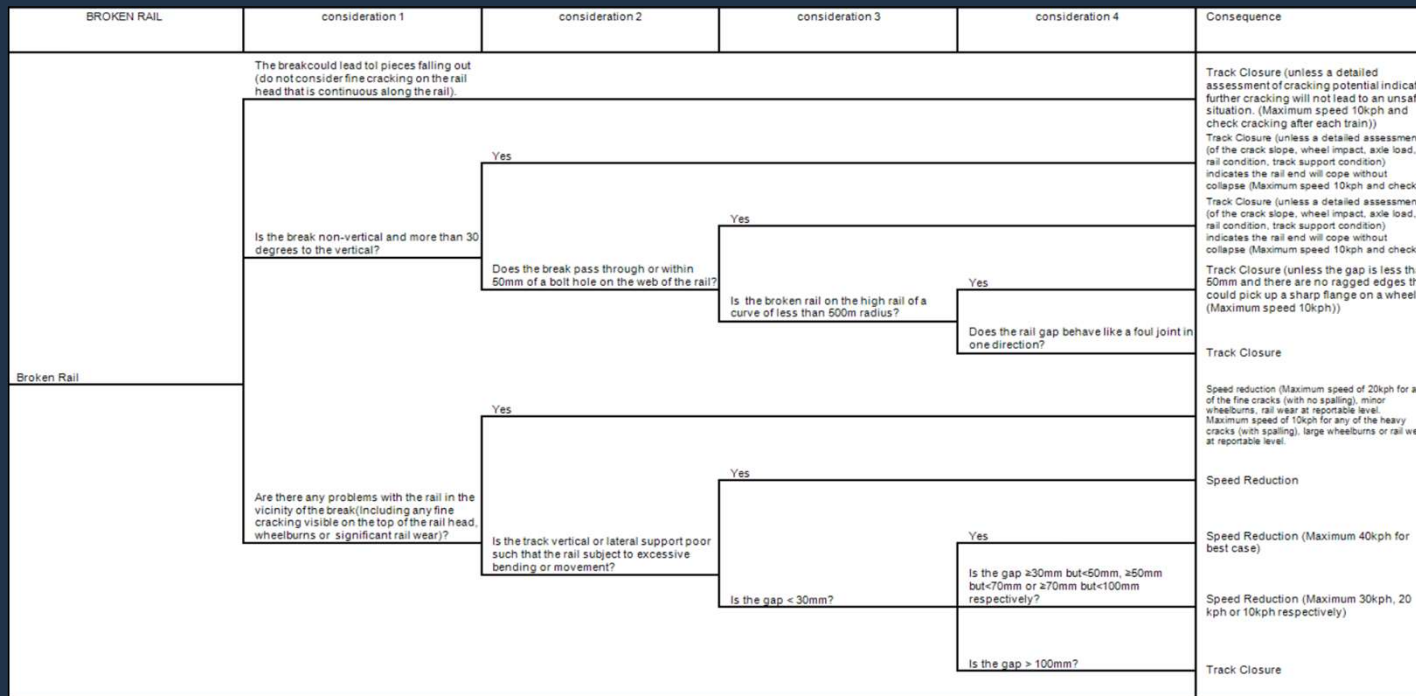
Identification of the potential causes of railway track failures due to the effects of climate change.

- **Broken rail**
- **Buckled rail**
- **Concrete sleeper defect**
- **Progressive shear failure**
- **Landslide and rockfall**
- **Cumulative plastic deformation**
- **Massive shear failure**
- **Slope erosion**
- **Subgrade collapse**



Event tree analysis (ETA)

- To explore the potential outcomes of the failures identified in the FTA and to assess the impact of irregularities or failures on railway track performance.



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