The impact of climate hazards related to water, wind and solid masses on rolling stock

epsf – établissement public de sécurité ferroviaire

IMPACT STUDY

Key to climate hazards

Temperature

- Drought – Increasing periods of drought
- Extreme temperature – Increase in extreme temperature values
- Heatwave – Heatwave/prolonged high temperatures
- Fire – Forest fires in the vicinity of tracks
- Cold/frost – Cold snap/frost
- Thunderstorm/lightning – Lightning

Water

- Rain/snow/hail – Increasing periods of drought
- Flooding – Increasing periods of drought
- Marine submersion – Rise in sea level

Wind

- Strong wind – High winds, cyclones, tornadoes
- Snowstorm – High winds, snow and ice
- Sandstorm – High winds and sand

Solid mass movement

- Solid mass movement – Avalanches, landslides, landslips, mudslides, rockfalls, subsidence

Couplings (pneumatic, data)

- Malfunction due to humidity
- Coupling failure
- Equipment malfunctions

Braking system

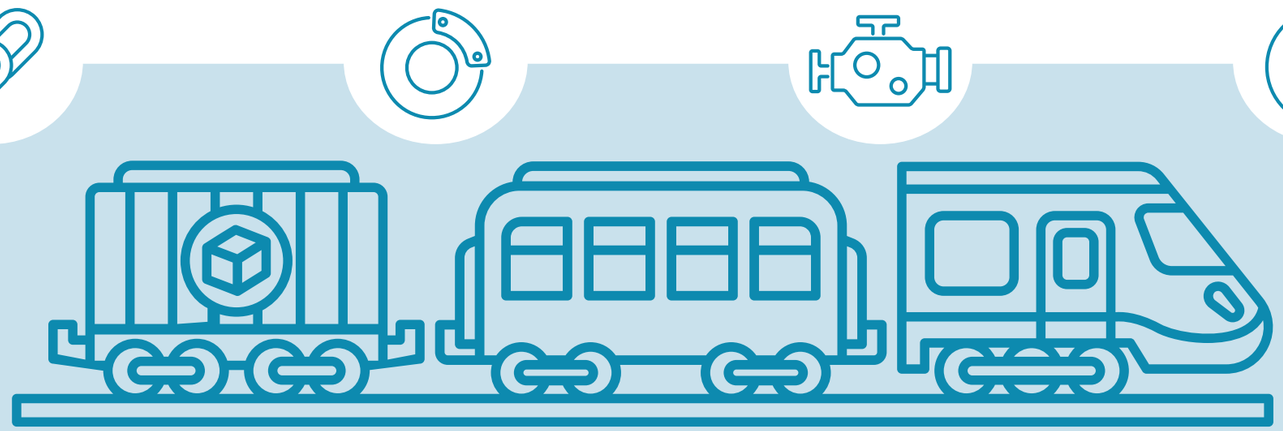
- Skidding, Lack of grip, Derailment
- Equipment malfunctions

Traction system

- Malfunction due to damp or frost, Material damage
- Equipment malfunctions, Breakage
- Slippage, Loss of grip
- Equipment malfunctions

Electrical system

- Malfunction due to damp or frost, Material damage
- Equipment malfunctions, Power supply failure
- Equipment malfunctions



Train (locomotive + carriages/wagons)

- Malfunction due to humidity, Loss of grip, Water accumulation in pantographs
- Leaks, Derailment
- Collision with obstacles, Damage to equipment, Skidding, Loss of train detection (leaves), Derailment
- Inability to function, Inability to travel
- Equipment malfunctions
- Collision with obstacles, Derailment

Air conditioning system

- Malfunction due to humidity
- Equipment malfunctions

Dangerous goods

- Destruction of containers, DG leak (emergency DG plan)
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Driving

- Poor visibility conditions

Hydraulic system

- Equipment malfunctions

Electronic system

- Malfunction due to humidity
- Malfunction, Breakage
- Equipment malfunctions

Type of impact

- Impact with **LONG-TERM CONSEQUENCES**
- Impact with **MEDIUM-TERM CONSEQUENCES** on network operations: adaptive measures needed to keep trains running (e.g. TSR), and if nothing is done, traffic will inevitably come to a halt
- Impact with **IMMEDIATE MAJOR CONSEQUENCES** for network operations (e.g. stopping traffic)

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