ARISCC
Adapting Rail Infrastructure to a Changing Climate

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Environment Unit
UIC: The International Union of Railways

200 members worldwide
UIC environment unit

- Promote environmental benefits of rail to international audiences e.g. United Nations, World Bank, UNEP
- Develop and manage carbon footprint tools: EcoPassenger and EcoTransIT
- Developed targets for environment for European railways, together with CER
- Manage various research projects including
  - Noise
  - Energy Efficiency
  - Pollution
  - Sustainability Indicators and Reporting
  - Roadmaps to meet environmental targets
  - Climate adaptation
- Organise workshops, conferences and events to disseminate research
- Website: www.uic-environment.org
ARISCC

- Two-year project funded by UIC members
- European scope
- Aims
  - Find and disseminate good practice for weather event / natural hazard management
  - Find good examples of how railways are assessing infrastructure vulnerability
  - Understand how railways can incorporate longer term climate predictions into infrastructure management and planning process
  - Propose new management approaches to bring these issues together
  - Disseminate results

Geneva, 24 April
Natural hazard management approach that can adapt to climate change
Weather – now and past

- Today’s weather: Generic weather warnings are insufficient. OBB have invested in more detailed weather warning systems.

- Past weather: It is useful to catalogue extreme weather events & impact on rail, e.g. SBB “DERI NR” database

- This data can be used to create hazard maps showing impact on rail infrastructure
Mapping natural hazards

- ARISCC team recommend a three-stage process

  1\textsuperscript{st} Level: Screening – Identification of those parts of the network with a high exposure to natural hazards (priority areas)

  2\textsuperscript{nd} Level: Investigation of priority areas by modelling efforts, development of maps of potential natural hazards

  3\textsuperscript{rd} Level: Detailed investigation of priority areas by on site inspections and development of high resolution natural hazard maps

Geneva, 24 April
Natural hazard management good practice

- ARISCC provides a broad collection of good practice examples for integrated natural hazard management.

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<td>Asset Management</td>
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Geneva, 24 April
Climate models – predicting future weather

- Regional climate models can provide indications of likely weather patterns

- Models for the Rhine Valley and West Coast Main Line predict:
  - Higher average temperatures and increased likelihood of heat waves
  - More rain particularly in winter. Increased chance of flooding.
  - Storms and gales – more difficult and controversial but significant increases in frequency and intensity of storms are possible
Developing adaptation strategies

- The analysis summarized above can be used to develop an approach to adaptation. The ARISCC team recommend the following:

- Produce Vulnerability and Risk Maps
  - Risks to asset integrity, environment, operation, safety

- Priority setting
  - Risk classes, cost/benefit assessment, cost scenarios

- Adaptation measures & strategies
  - Alarm systems
  - Monitoring systems
  - Protective measures
  - Change of standards
  - Relocation of assets
Case Study: West Coast Main Line

- **Identifying vulnerabilities**
  Expert workshops to identify main weather and climate factors and their impact on rail infrastructure. This resulted in a table of risks structured by type of climate impact.

- **Analysis of current and future vulnerabilities**
  Investigate the impact of climate change on performance and safety in more detail. Model most important hazards e.g. heat waves, river and surface flooding, landslips and storm throw.

- **Vulnerability maps** for the West Coast Main Line will be developed. Other outputs will include:
  - Recommendations for “quick wins” for adaptation, and procurement options for dealing with current weather impacts
  - Preliminary recommendations for asset management policy up to 2040s
  - Specification for a tool to evaluate policy options for adaptation and weather resilience

*NB: This work is funded by TRaCCA – Tomorrow’s Railway and Climate Change Adaptation (Network Rail / RSSB)*
Case Study: Rhine Valley

- **Vulnerability screening process**
  Identify parts of Rhine Valley Route that are in areas with increased likelihood of natural hazards

- **Analysis of vulnerable sections**
  Analyze vulnerable parts of the route identified by the screening process including data base for delay minutes, focusing on weather related delays

- **Analysis of current and future vulnerabilities**
  - Interviews with people responsible for the route segments
  - Analysis of status of infrastructure assets.
  - Discussion of how future climate loads can impact the local railway infrastructure.
  - Identify especially vulnerable assets

- **Measures for the improvement of infrastructure robustness**
  will be identified and discussed in detail.
Concluding thoughts

- ARISCC has produced a comprehensive survey of how European railways manage weather information (past and present) and natural hazards. It has picked out some good practice examples which others can learn from.

- ARISCC has also explored the ways in which future climate models can be used to assist with infrastructure planning and maintenance in the future. There are uncertainties with climate models, particularly storms and gales, but modelling experts seem confident about temperature and precipitation predictions.

- Question – does the railway sector have close enough links with the climate forecasting community? Are future climate changes being considered for new infrastructure projects, and maintenance programs?

- It is easier to plan for new infrastructure (new standards and so on) to account for a changing climate, than it is to modify existing assets. There is a clear business case for “climate-proofing” new infrastructure!