Climate Change Adaptation at UIC

7th Group of Experts on Climate Change impacts and adaptation for international transport networks - UNECE

Andrea Braschi, 04 June 2015
UIC: the International Union of Railways

> 240 members on all continents

> Members are:

- Railways
- Rail operators
- Infrastructure managers
- Railway service providers
- Public transport companies
UIC in 2015: 240 Members on all Continents

> active members:
Railways, railway infrastructure managers, railway operators, from Europe, Russia, the Maghreb, the Middle East, Kazakhstan, India, Pakistan, Japan, China, Korea, South Africa

> associate members:
Including railways in Asia, Africa, America, Australia

> affiliate members:
Companies conducting activities connected with rail transport public transport, sleeping cars, caterers, other railway bodies, …
UIC in 2015: a continuous expansion

Members
- **Active**
- **Associate**
- **Affiliate**

7th Group of Experts on Climate Change impacts and adaptation for international transport networks UNECE
UIC Mission

Promoting the development of rail transport at world level, in order to meet challenges of mobility and sustainable development
How we work with UIC members

EES Platform

Core Group

Working Bodies

<table>
<thead>
<tr>
<th>Energy Efficiency &amp; CO2</th>
<th>Noise &amp; Vibration</th>
<th>Sustainable Mobility</th>
<th>Diesel and Local Emissions</th>
<th>Sustainable Land Use</th>
</tr>
</thead>
</table>
ARISCC Project

- 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

ARISCC
Adaptation of Railway Infrastructure to Climate Change

7th Group of Experts on Climate Change impacts and adaptation for international transport networks UNECE
Natural hazard management approach that can adapt to climate change

- **Today's weather**
  - Weather warnings

- **Past weather**
  - Event database

- **Future weather**
  - Modelled weather parameters

- **Infrastructure assets**
  - Asset Database

**Natural hazards maps**

- **Incident/Failure database**
- **Detailed data on infrastructure assets**

- **Vulnerability maps**
- **Risk management & risk maps**
- **Priority setting**
- **Adaptation measures & strategies**
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 three-stage process
- 1st Level: Screening – Identification of those parts of the network with a high exposure to natural hazards (priority areas)
- 2nd Level: Investigation of priority areas by modelling efforts, development of maps of potential natural hazards
- 3rd Level: Detailed investigation of priority areas by on site inspections and development of high resolution natural hazard maps
Natural hazard management good practice

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

<table>
<thead>
<tr>
<th>Area covered</th>
<th>Number of good practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weather Warning</td>
<td>3</td>
</tr>
<tr>
<td>Event Recording/Database</td>
<td>6</td>
</tr>
<tr>
<td>Impact Assessment</td>
<td>5</td>
</tr>
<tr>
<td>Vulnerability Mapping</td>
<td>5</td>
</tr>
<tr>
<td>Risk Assessment &amp; Risk Management</td>
<td>10</td>
</tr>
<tr>
<td>Asset inventory</td>
<td>4</td>
</tr>
<tr>
<td>Asset Management</td>
<td>3</td>
</tr>
<tr>
<td>Regional Climate Modelling</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk analysis for railway route</th>
<th>Drainage Engineers’ network</th>
<th>UK</th>
<th>Bridge Scour Monitoring System</th>
<th>CH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inventory of Drainage System (culverts)</td>
<td>Network Rail Dedicated Weather Website</td>
<td>UK</td>
<td>Vulnerability maps</td>
<td>CAN</td>
</tr>
<tr>
<td>High Speed Rail Service for Sweden</td>
<td>Track Buckle Risk Management</td>
<td>UK</td>
<td>CC Adaptation for London’s Transport System</td>
<td>UK</td>
</tr>
<tr>
<td>Risk Models &amp; Risk Assessment</td>
<td>Water Risk on Earthworks Assessment</td>
<td>UK</td>
<td>UKCIP2009 – Climate Projections</td>
<td>UK</td>
</tr>
<tr>
<td>Copenhagen-Ringsted CC Impact Assessment</td>
<td>INFRA.wetter</td>
<td>A</td>
<td>FUTURENET</td>
<td>UK</td>
</tr>
<tr>
<td>DB Sud Weather Information &amp; Warning</td>
<td>Event database (incidents and damage)</td>
<td>A</td>
<td>The Financial Risk of Climate Change</td>
<td>UK</td>
</tr>
<tr>
<td>Analysis Delays vs. Extreme Weather Events</td>
<td>Full scale asset inventory</td>
<td>A</td>
<td>Klima Atlas</td>
<td>D</td>
</tr>
<tr>
<td>Dedicated Weather Warning System</td>
<td>Vulnerability maps</td>
<td>A</td>
<td>Paramount</td>
<td>EC</td>
</tr>
<tr>
<td>Online Wind Monitoring at East coast Main Line</td>
<td>Mapping of potential hazards</td>
<td>CH</td>
<td>CALAR</td>
<td>EC</td>
</tr>
<tr>
<td>Assessment of coastal defenses at Dawlish</td>
<td>Natural Hazard Event Maps (per year)</td>
<td>CH</td>
<td>Monitor I</td>
<td>EC</td>
</tr>
<tr>
<td>Drainage integrated policy</td>
<td>Vulnerability Maps</td>
<td>CH</td>
<td>Monitor II</td>
<td>EC</td>
</tr>
<tr>
<td>TraCCa</td>
<td>Event database &amp; evaluation + GIS</td>
<td>CH</td>
<td>RIMADIMA</td>
<td>EC</td>
</tr>
</tbody>
</table>
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
Mitigation: Adapting Rail InfraStructure to Climate Change (ARISCC)

> **ARISCC targets:**
  Readiness
  Resilience/resistance
  Recovery

> **Deliverables:**
  Web site
  Establish network for experience exchange
  Collection of good practise
  Guidance for existing & new infrastructure

> **Next steps:**
  Exploration of cooperation with international Institutions
  Invite more UIC members to join

ARISCC is about preparing rail infrastructure for when ‘today’s extreme weather becomes tomorrow’s normal weather’!

If the right measures are taken at the right time, the risk will be bearable!
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
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!
An ad hoc dedicated adaptation working group

Climate Change & Standardisation

A Sector Position Paper (2012)

Conclusion:
No changes in the present regulatory framework are considered necessary to deal with foreseeable climate changes

Short Term suggested activities:
Good practices exchange to be intensified.
Benchmarking studies within and across sector

Medium Term activities:
No new climate standard but standardisation to be adapted
Any adaptation of the Standardisation landscape needs to be based upon a well focused research and development activities

Shift to Rail, H2020
STIG

Smart Transport Infrastructure Governance

> In response to the Call ‘Mobility for Growth’

> MG 8.4 Smart Governance, network resilience and streamlined delivery of infrastructure innovation

• 3 Mio € Funding by EU

• 17 European partners from railway and road operators, universities, consultancies, meteo service providers.

• 2 Years project starting in first semester 2016
STIG
Smart Transport Infrastructure Governance

> Objective is to establish improved coordination between 2 3 4 5, Delivery and Optimisation of the European Transport Infrastructure (to enhance productivity)

> Climate Change Adaptation: UIC (Opportunity to get involved)!

> System Planning: EFRTC

> Procurement: Civity Management Consultants

> Capacity Planning: Systra

> Asset Management: Network Rail

> Project Management, Dissemination: UIC
STIG
Smart Transport Infrastructure Governance

> Climate Change Adaptation: UIC (Opportunity to get involved)

> Objective:

> To provide a common framework for risk assessment and accelerated decision making to improve transport infrastructure and resilience against environmental impacts including climate change.

> Climate risk is an important variable that needs to be addressed in: System Planning, Asset Management, Procurement...
> **Scenario Building**

> **Method for assessing network resilience**
  
  (method and case study for mapping climate risk hot spots)

> **Assessment method for impacts of climate risk on transport network**
  
  Tool to overcome the interruption of service (road rail)

> **Toolkit for climate change adaptation**
  
  Decision tool for assessing cross-modal capacity resilience
RailTopoModel & GRIDS

A railway model standardized to solve transport issues connected to railways
RailTopoModel: a standardized model and structure of railway network description

An open source standardized exchange format: RailML®

INTERNATIONAL RAILWAY STANDARD IN 2015
GRIDS: geographical application based on RailTopoModel

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Change</th>
<th>Select new attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clearance gauge</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Rail length</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Thank you for your attention

Andrea Braschi
braschi@uic.org

Advisor environment, UIC