



INTERNATIONAL UNION
OF RAILWAYS

unity, solidarity, universality

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:

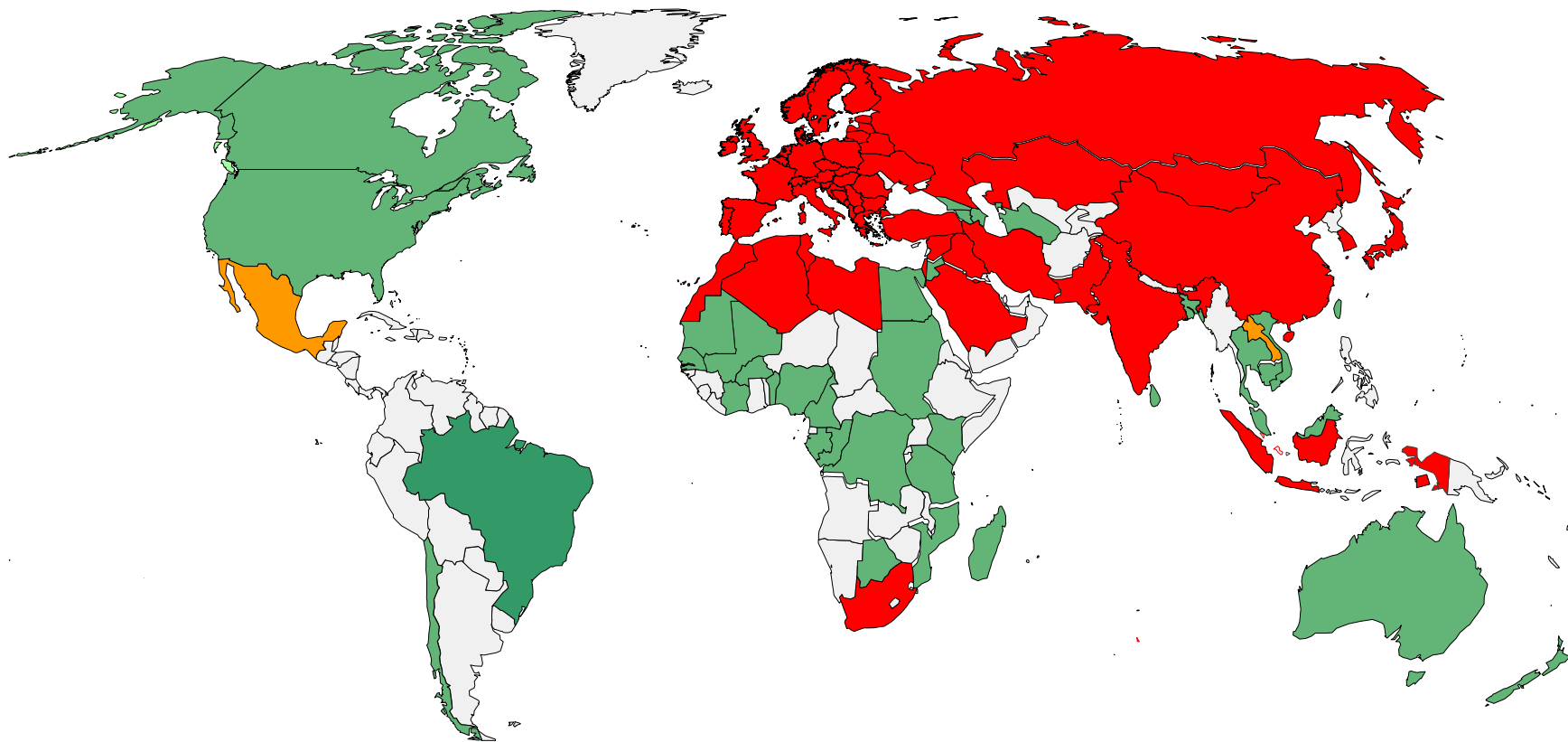
Including railways in Asia, Africa, America, Australia

> 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

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

Energy
Efficiency &
CO2

Noise &
Vibration

Sustainable
Mobility

Diesel and
Local
Emissions

Sustainable
Land Use

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

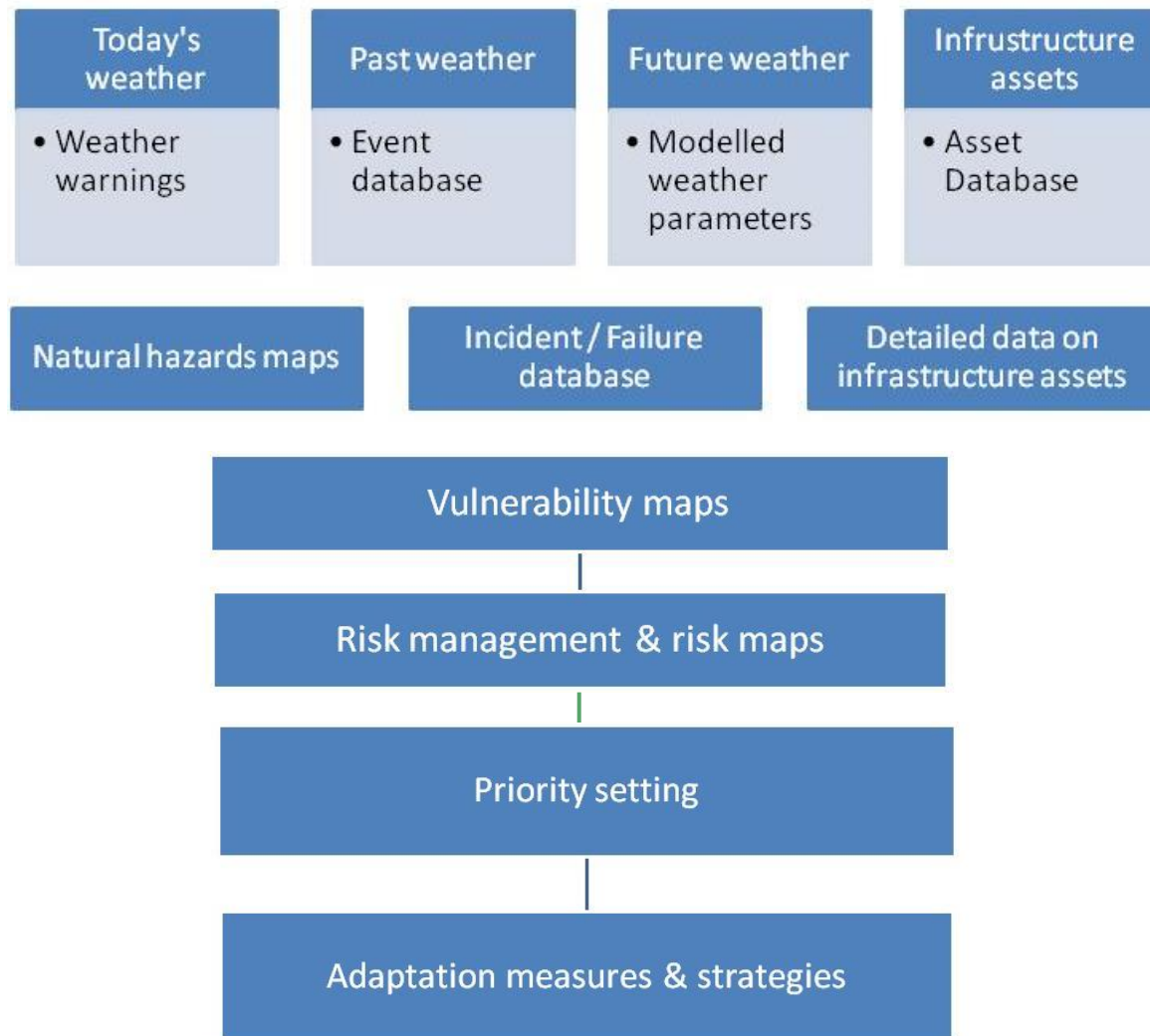
UIC Project

ARISCC
Adaptation of Railway Infrastructure
to Climate Change

Final Report
(6th draft version)

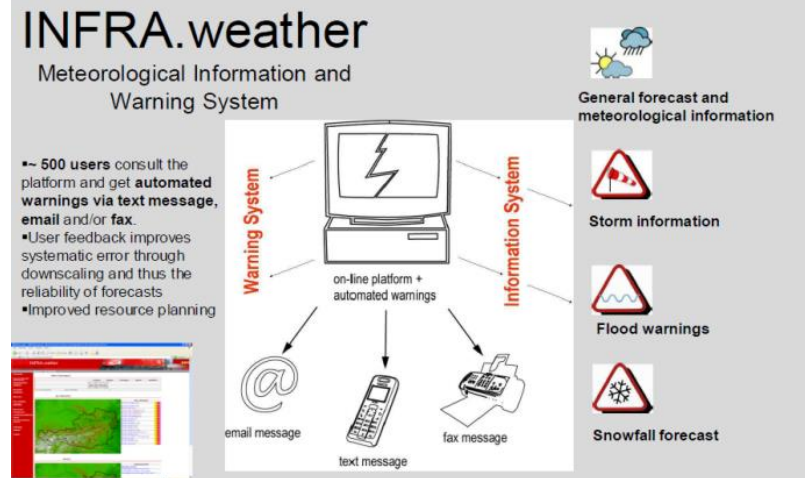
Roland Nolte
Christian Kamburow
Johannes Rupp
IZT – Institute for Futures Studies and Technology Assessment,
Berlin, July 2011

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 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



Figure 9: Example for a hazard map: Flooding hazard in Canton Zug in Switzerland for a return period of 30-100 years.

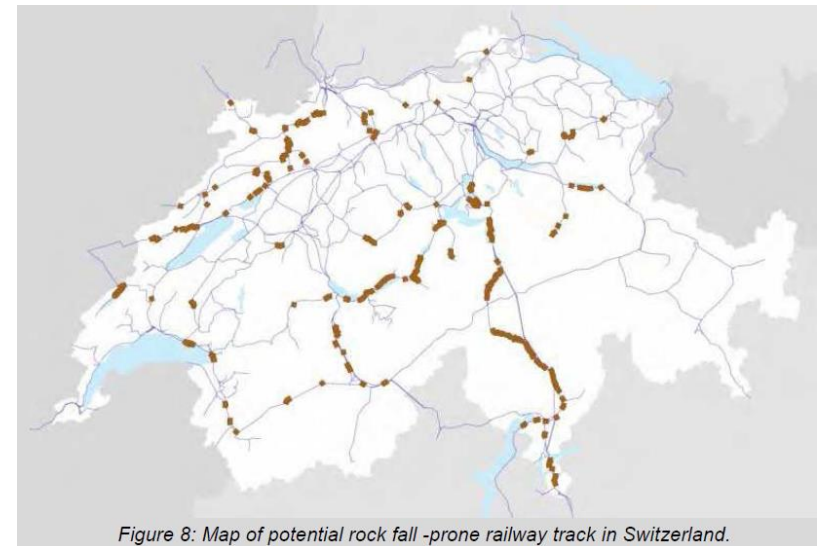


Figure 8: Map of potential rock fall -prone railway track in Switzerland.

Natural hazard management good practice

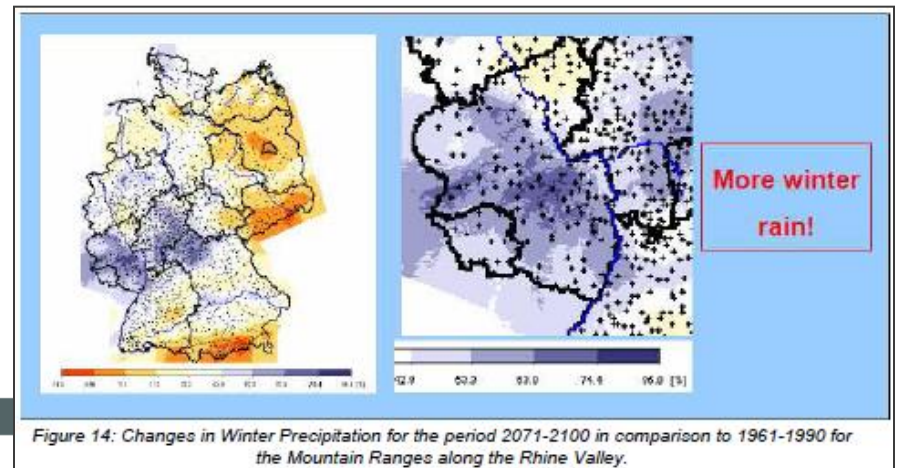
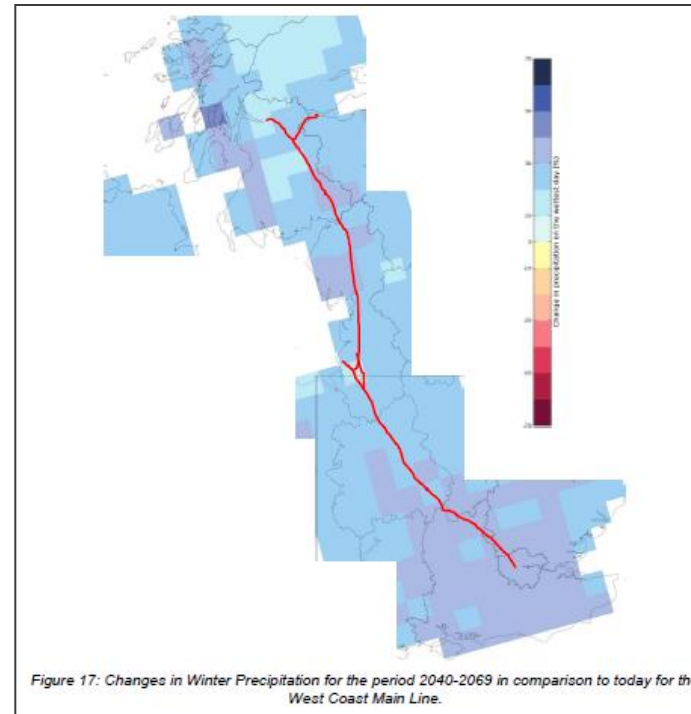
- ARISCC provides a broad collection of good practice examples for integrated natural hazard management

Area covered	Number of good practice
Weather Warning	3
Event Recording/Database	6
Impact Assessment	5
Vulnerability Mapping	5
Risc Assessment & Risk Management	10
Asset inventory	4
Asset Management	3
Regional Climate Modelling	2

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

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

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

> Deliverables:

- Web site
- Establish network for experience exchange
- Collection of good practise
- Guidance for existing & new infrastructure

If the right measures are taken at the right time, the risk will be bearable!

> Next steps:

- Exploration of cooperation with international Institutions
- Invite more UIC members to join



UIC	
European Union of Railway Infrastructures	
Climate Change (ARISCC)	
Climate Change "Wavelength and Winter"	
Draft agenda	
Workshop on Adaptation of Railway Infrastructure to Climate Change (ARISCC) with contribution from "Wavelength and Winter"	
When: 10 th and 11 th October 2010	
Where: UIC Brussels	
Chairman: ...	
Members: ...	
Guests: ...	
Agenda: ...	
Objectives: ...	
Expected results: ...	
Responsible: ...	
Contact: ...	



Vulnerability mapping

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

MediumTerm 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 operator 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...**



STIG

Smart Transport Infrastructure Governance

- > **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



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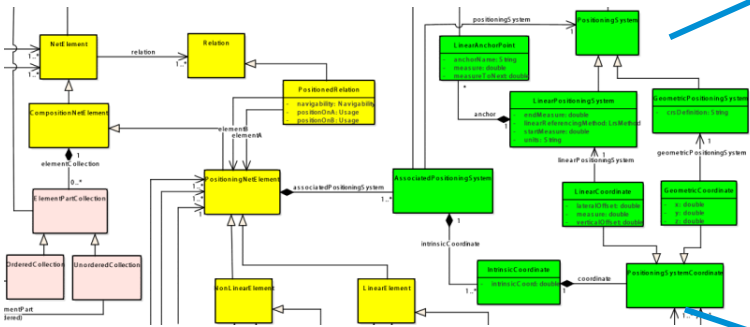
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RailTopoModel & GRIDS

A railway model standardized to solve transport issues connected to railways

RailTopoModel : a standardized model and structure of railway network description

Topological model via Unified Modeling language (UML)



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An open source standardized exchange format : **RailML®**



- Asset management
- PRM accessibility
- Impact studies
- Link to other transport model (IFOPT...)

INTERNATIONAL RAILWAY STANDARD IN 2015

GRIDS : geographical application based on RailTopoModel

Characteristic	Change	Select new attributes
Power supply	<input type="checkbox"/>	Attributes GA GB GC P400
Clearance gauge	<input checked="" type="checkbox"/>	
Rail length	<input type="checkbox"/>	

Thank you for your attention

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