Climate Change Adaptation and Transport – UK and Rail

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UNECE Expert Group November 2011
The talk…

- Network Rail in UK context
- UK Government context
- Rail context
- CCA NR engagement
- Rail CCA studies – TRaCCA
- Going forward

Hyperlinks are shown at the end of the presentation
Network Rail in the UK

- Network Rail in UK
  - GB Rail Infrastructure owner
  - Regulated
  - 5-year Control Periods
  - 30-year Technical Strategy

Currently working towards CP5 (2014 -2019)
## Infrastructure portfolio

<table>
<thead>
<tr>
<th>31,000 km track</th>
<th>¾ Earth’s Circumference</th>
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<tbody>
<tr>
<td>12,000 km electrified railway</td>
<td>2/3 Overhead line – 1/3 third rail</td>
</tr>
<tr>
<td>38,000 bridges</td>
<td>Largest single bridge owner in UK</td>
</tr>
<tr>
<td>700 tunnels</td>
<td>200 miles of railway in tunnel</td>
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<tr>
<td>23,000 culverts</td>
<td>250 miles of subterranean water courses</td>
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<tr>
<td>300 coastal and estuarine defences</td>
<td>150 miles of coastal railway</td>
</tr>
<tr>
<td>2500 stations</td>
<td>Large property portfolio</td>
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<tr>
<td>25,000 km of major earthworks</td>
<td>Twice the length of UK’s entire motorway and trunk road network</td>
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“*Maintain, enhance and renew the existing network*” (GB Rail Regulator)
Government context

- Nick Stern ‘Economics of Climate Change’ report, 2006
- Climate Change Act 2008 requires:
  - 5 yearly *Climate Change Risk Assessments*
  - National Adaptation Plan (both ‘work in progress’)
- Act has a Power to require organisations to report on Adaptation
- Power invoked on Network Rail early 2010
  - Over 90 organisations reporting
Rail context

- Past studies by GB Rail (RSSB, NR), and the Environment Agency show ‘business as usual’ is not an option
- Flooding costs £50M pa – this could be £500M by 2040s
- The rail industry appetite for:
  - a safe, affordable and highly reliable railway with increased capacity – better system resilience
  - Now and into long term
- TRaCCA* study initiated

*Tomorrow’s Railway and Climate Change Adaptation
CCA – NR engagement

Government

• Adaptation Report
• Climate Change Risk Assessment
• National Adaptation Plan
• UKCIP and Environment Agency

Network Rail

• Weather resilience, Climate resilience
• Reorganisation – Systems
CCA engagement

Industry

• CP5 - Business Plan for Rail includes CCA provision
• Rail Research and Adaptation Network
  – R&D Projects’ synergies, incl. FP7
• TRaCCA

International activity

• CER
• UIC
• UNFCCC
Rail CCA studies - TRaCCA

- TRaCCA aimed to provide tools and knowledge to improve the reliability for the railway network – **solutions not problems**

- Phase 1 sanctioned by Rail Research Leadership group (TSAG) in November 2009:
  - UK Met Office Hadley Centre expertise
  - a prioritisation and scoping exercise to meet statutory reporting deadlines and aligned to CP5 work
  - covering 2020s, 2030s, 2040s

- Continued funding agreed May 2010 for Phases 2 and 3 for:
  - detailed climate impact analyses on the selected priorities
What we’ve learned – some Headlines

- A marked difference in climate north/south is likely
- Cold winters will become increasingly rare
- Track buckle risks increase
  - Today’s processes mean reduced System Reliability
- NR budget for c500,000 minutes for weather-related delays pa = £37M
- Adaptation has wider benefits

Heat related non-work days – 2040s
Learning points

• TRaCCA is a unique amalgam of MO Hadley Centre Science with Rail expertise
• Infrastructure life-cycle important – what will be affected?
• Timing for Adaptation Action - £70M identified for CP5….
• Heightened level of awareness in Rail regarding weather resilience now, and adaptation investment for longer term resilience
• Much interest wider than Rail
• Research is key
• Technical solutions approach is good – think ‘how do we fix this’
Some ‘Positives’

- Investment in adaptation measures can improve railway system resilience and system reliability
  - Investment can be prioritised - phased at Asset Renewal
- Differentiated standards can reduce costs
- Climate change and adaptation modelling can help to prioritise and target investment to the right place
  - Engineering solutions, Forecasting tools

(Example: RSSB study *T643 Impact of climate change on coastal rail infrastructure*)
Some limitations

- Engagement at outset was patchy
- TRaCCA worked to timescales set by Government - this limited the scope
- The available data were not ideally suited to modelling:
  - Delay minutes developed for delay attribution
  - Rolling stock, human factors – no data
- There are limits to what current science can predict:
  - cf: wind, humidity, urban heat island
Visualisation tool

http://www.metoffice.gov.uk/premium/discoverclimate/tracca4rail/
Interest in TRaCCA

Government
- DfT, Transport Scotland, Defra, SEPA
- Infrastructure UK

Academia
- Oxford University (ITRC)
- Birmingham University (Futurenet)

Infrastructure Owners
- TfL, National Grid, EA

International
- UIC
- OeBB, DB, SNCF
- United Nations

Network Rail:
- IIP/ SBP CP5 Strategy
- Systems Engineering
- Systems Analysts
- Reliability Team
Going forward…

- TRaCCA was a defined project and has led the way
- Many benefits in being more ambitious:
  - Broader scope (in terms of participation, activities and time, with a systems approach)
  - Build on external R&D and Science
  - Improvement the data/invent new metrics
  - ‘Fast-track’ packages to bring early benefits (especially in ‘local weather management’)
  - Bring other countries’ experiences now to help show the future for the UK and vice-versa
Current proposal

Estimated Cost to Rail: £5M
Timeline: 5 Years
Expect UK Research to match funding – £10M possible
Links

Network Rail:  [www.networkrail.co.uk](http://www.networkrail.co.uk)

Rail Industry CP5 Plan:  [www.networkrail.co.uk/iip.aspx](http://www.networkrail.co.uk/iip.aspx)  [C:\Documents and Settings\Jdora\Local Settings\Temp\wz4c20\Buckled track.jpg](C:\Documents and Settings\Jdora\Local Settings\Temp\wz4c20\Buckled track.jpg)

RSSB Research:  [www.rssb.co.uk/RESEARCH/Pages/main.aspx](http://www.rssb.co.uk/RESEARCH/Pages/main.aspx);  [www.rssb.co.uk/SiteCollectionDocuments/pdf/reports/Research/T643_rb_final.pdf](http://www.rssb.co.uk/SiteCollectionDocuments/pdf/reports/Research/T643_rb_final.pdf)

TRaCCA:  [www.rssb.co.uk/SiteCollectionDocuments/pdf/reports/Research/T925_rb_final.pdf](http://www.rssb.co.uk/SiteCollectionDocuments/pdf/reports/Research/T925_rb_final.pdf)

Adaptation and Resilience Research  [www.ukcip-arcc.org.uk](http://www.ukcip-arcc.org.uk);  [www.arcc-futurenet.org](http://www.arcc-futurenet.org);  [www.itrc.org.uk](http://www.itrc.org.uk)


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Problems??

Ice

Wind

Rain

Heat

Snow

Coastal storms
Some solutions!

New Drainage

Remediated Bank

System thinking

Targetted weather forecasts

Flood monitoring

Reconstructed hillside

Digital Mapping

Emergency kit
Last slide.

THANK YOU