

Tomorrow's Railway and Climate Change Adaptation

'TRaCCA'

Research supporting policy and practice

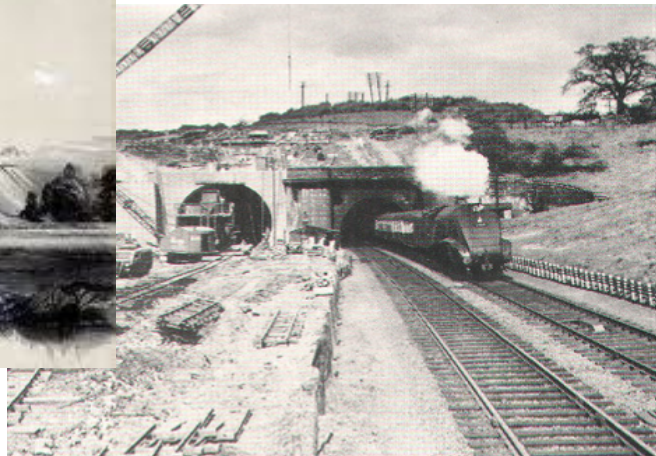
Exploring the challenges, not all the answers!

John Dora, ARCC Assembly 2014

Railway infrastructure

- WCML 1830s
- Potters Bar Tunnel & Earthworks 1850
- St Pancras Station opened 1868
- Forth Bridge complete 1890

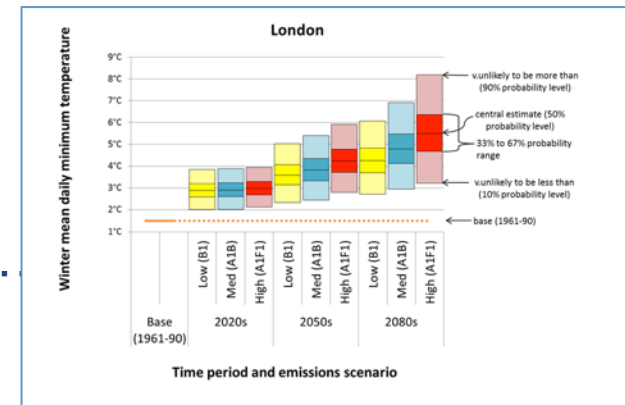
Standards? Records? (I'm not ageist!!)



Images courtesy NR, ICE Library, IPCC, Met Office, CIBSE

Extreme weather v railways

- Past decade
 - “Extreme weather 8, Railways 3” (not verified...)
- Understanding systemic weather impacts is improving
 - From a siloed baseline 15 years ago...
 - Long way to go...
- Finding out how rail performs in the current and future climate?
 - Making strides
 - Complicated
 - Granularity of data required v that available...
- Serious research is required!
 - and has not been ignored



Extreme weather v railways

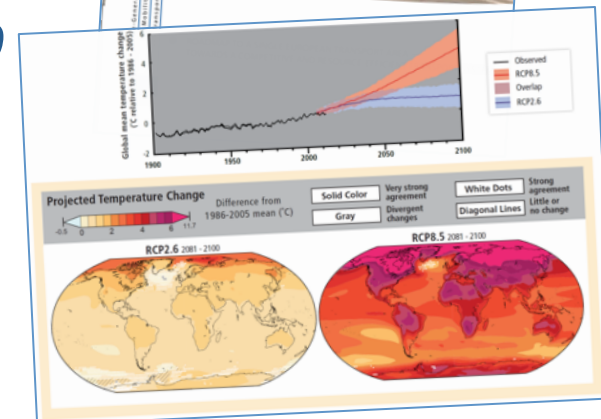
- The Future Railway (Rail Technical Strategy) needs to have:
 - High reliability
 - More capacity
 - Better value for money
 - A 'predict and prevent' ethos



- All against a background of increasing traffic
 - See EU White Paper on transport and modal shift
 - *50% to rail medium and long distance by 2050*

.....and.....

.... a changing climate

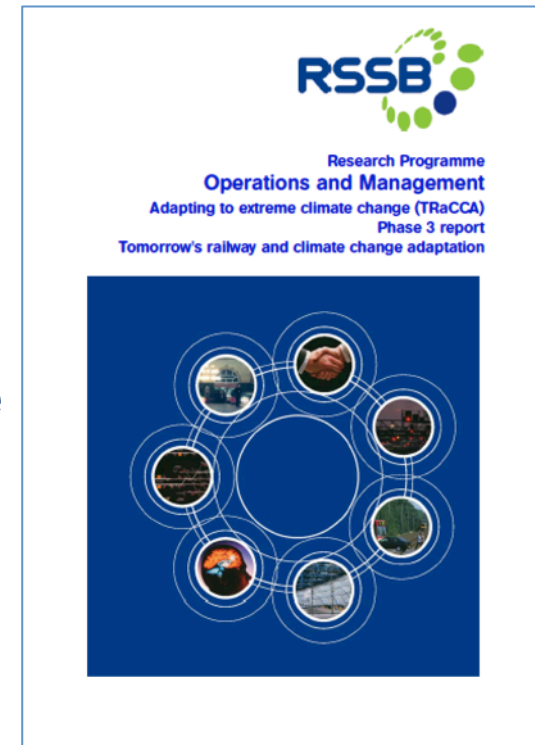


Climate change adaptation

- Adaptation studied by GB railways since 2003
- Catalysts included:
 - Stern review into the economics of climate change, 2006
 - NR dialogue with Government on the Climate Change Bill
 - Climate Change Act 2008
 - ARP 2010
- Government and rail industry desire for improvements in *system resilience*



- 2009 – the RSSB funded T925 TRaCCA was scoped to meet statutory adaptation reporting deadlines
- Aligned to help inform Control Period 5
 - Aimed to provide tools to improve long term reliability
- Utilised the UK's Met Office Hadley Centre expertise
- Detailed climate impact analyses on selected priorities
 - Knowledge needed if we are going to get the tools right
- *Limited in scope and revised to meet ARP schedule*



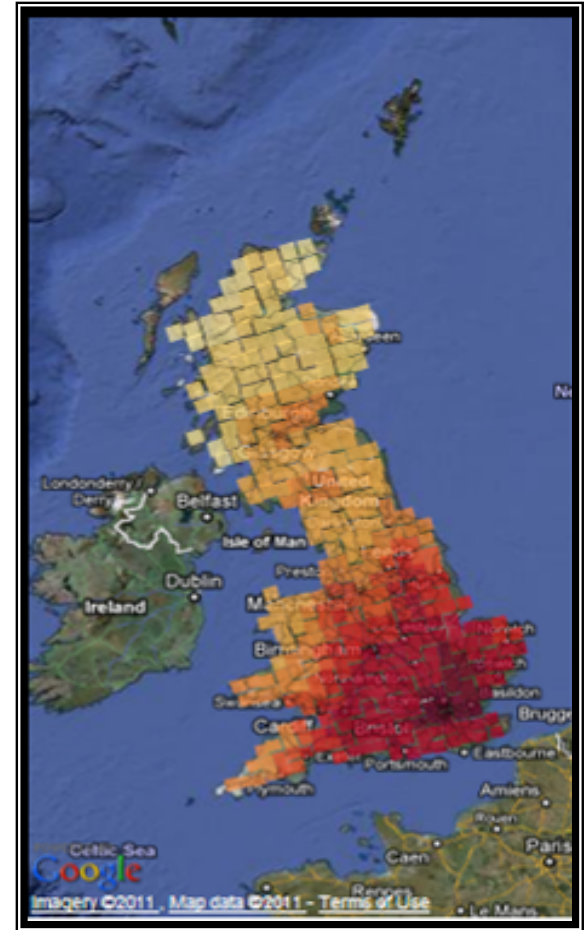
T925 helped to:

- Inform Network Rail's ARP report
- Engage part of the rail industry
- Set a marker for climate change adaptation in the Periodic Review process for CP5
- Set out what we didn't know
- Provided a taster that supported more detailed work - T1009 TRaCCA



T925 TRaCCA - some headlines

- A marked difference in GB climate north/ south
- Cold winters become increasingly rare
- Track buckle risks increase
- Major floods and coastal storms become 6x more frequent by 2080s
- Safety standards mean reduced system reliability (all else being equal)
- Data and science issues
 - Granularity and fitness for analyses



Positive, practical messages

- Climate change and adaptation modelling is an enabler for prioritised, targetted investment => *better vfm*
- Asset lifecycle and a systemic approach important
 - Adapt at equipment renewal stage = a low cost high impact strategy
 - Investment in adaptation measures can improve current railway system resilience and reliability
- Forecasting example: RSSB study into climate change on coastal rail infrastructure
- Led to 36 hour forecasting system for GWML at Dawlish – (qv February 2014!)



T1009 aims to answer some of the questions raised by T925

- T1009 was authorised at TSLG June 2012
- £2.5M budget for 'Foundation Projects' for 2 years
- Size of Industry problem: *in excess of £4.6Bn over 30 years – note that this is mostly flood-related!! (data...!)*
- *Whole Industry, Whole System* approach advocated
- RSSB funded with NR support in kind – expertise, data, much analyses
- Not all the answers expected (it's a *Foundation Phase*)
- Split into two *Work Packages*

Project partners



**British
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL



**UNIVERSITY OF
BIRMINGHAM**



- Stakeholders - Entire railway industry

Awareness has been raised



Recent winters did help!



- NR support vital but wider industry partners benefit:
 - ATOC, RIA, ROSCOs etc actively supporting
 - Stakeholders offering e.g. data, expertise
 - Watch for ‘knee jerk’ responses to recent events!
 - But be amenable to offering ‘quick wins’!
- Dissemination events from mid 2014

A comprehensive knowledge review

- *Over 600 records logged*

An analysis of operational weather thresholds

- *Based upon railway standards and procedures*

A summary of knowledge and knowledge gaps

- *The unknowns!*

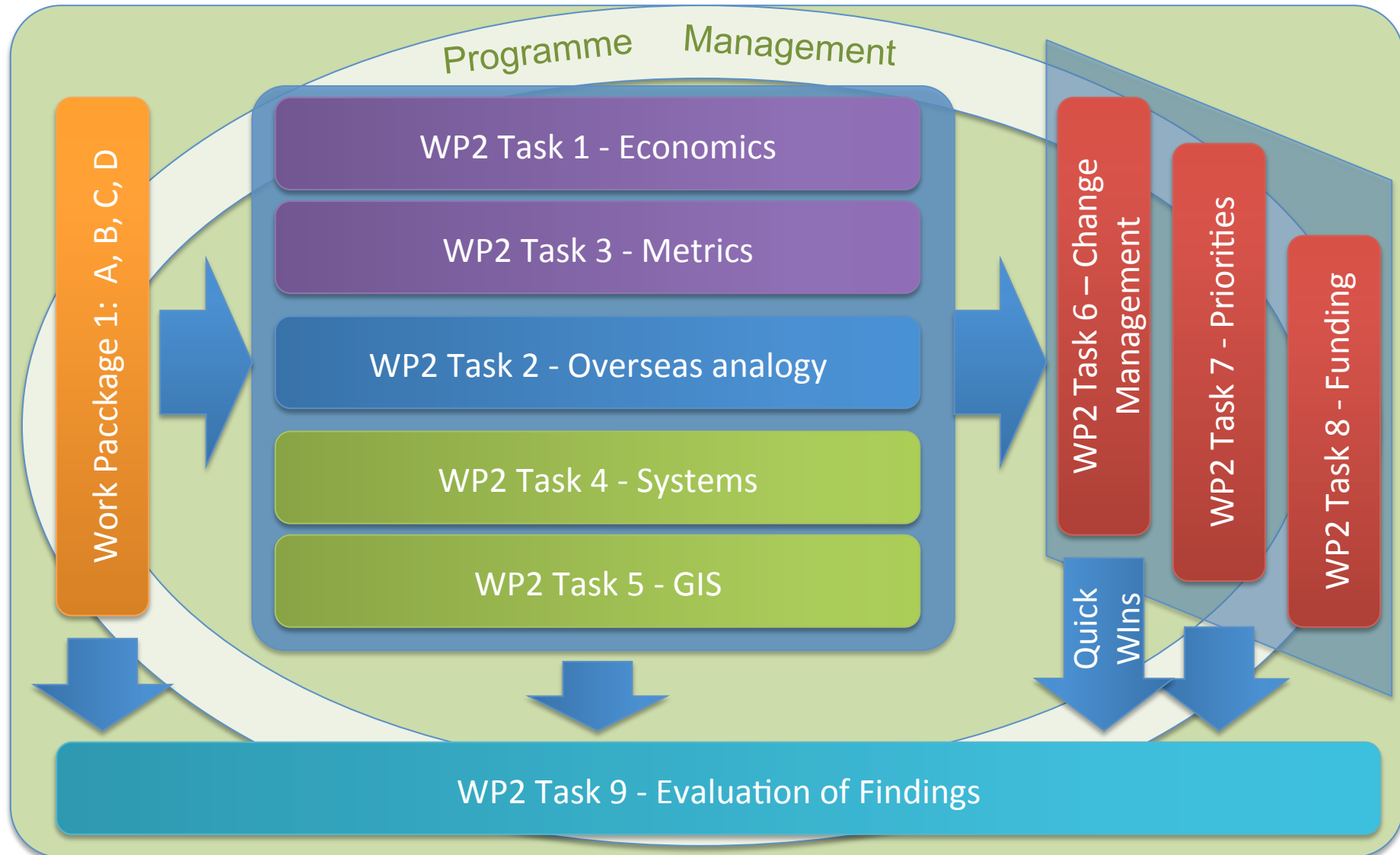
A knowledge dissemination platform

- *As part of RSSB's 'SPARK' platform*

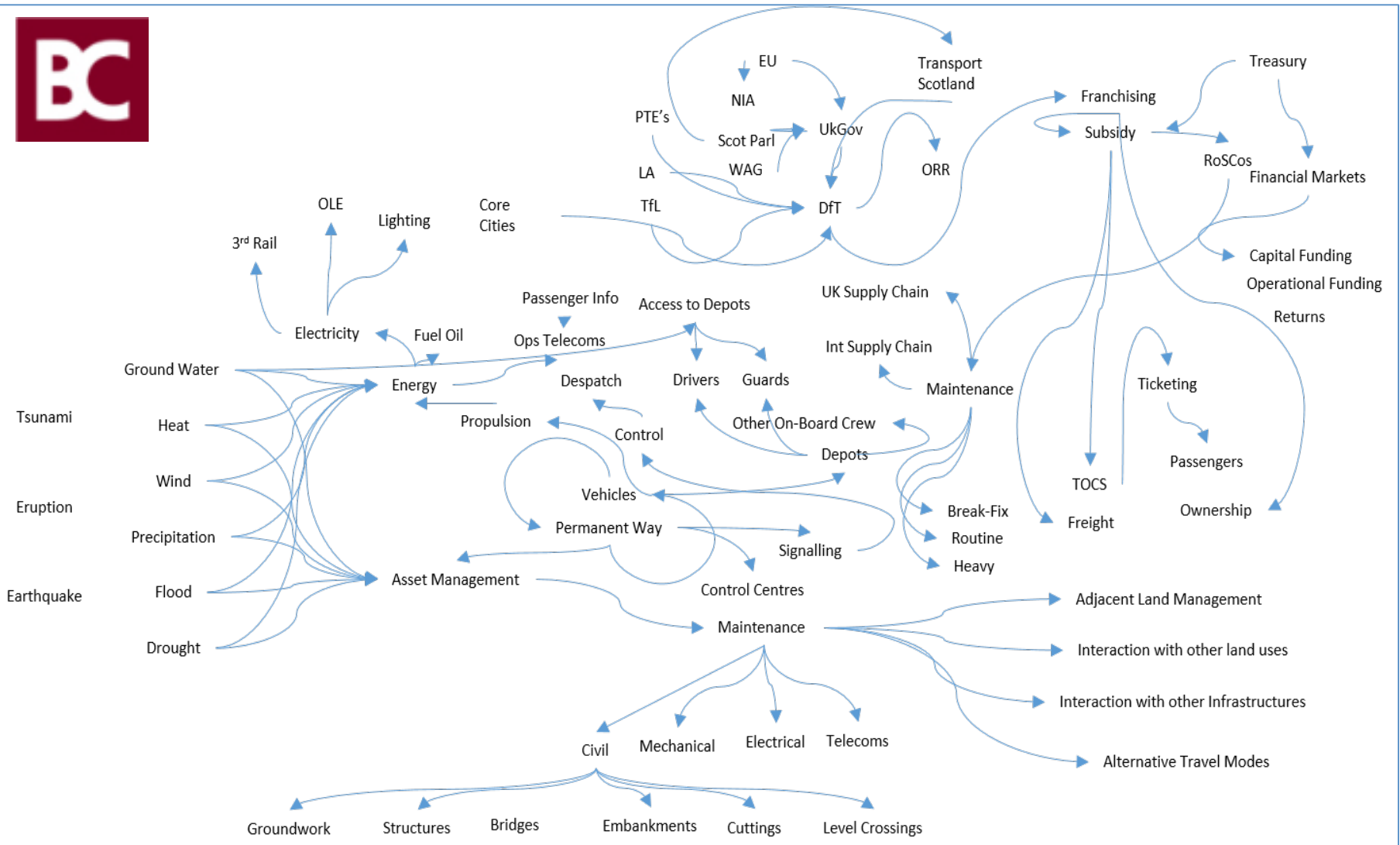
Prioritisation for future work

Dissemination events





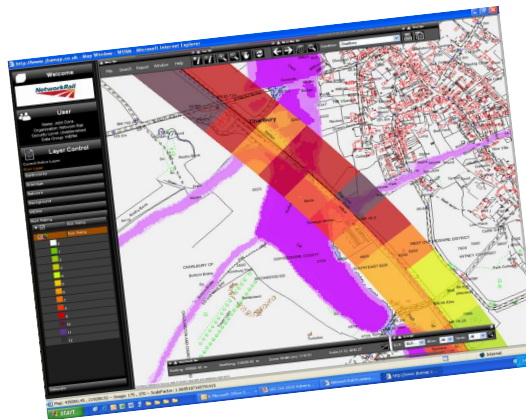
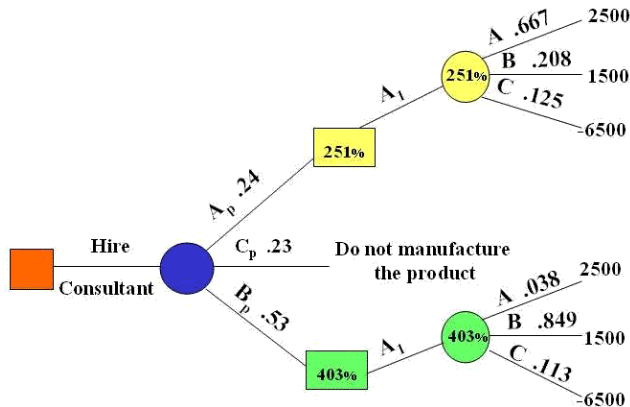
Railway as a system of systems...



Further ahead– years 3 to 5 (6?)

Tackle the 'known unknowns'

- Years 3 to 5 to try and answer the 'too difficult' questions*
- Provide better tools with the better knowledge:*
 - A system-wide vulnerability tool*
 - Sub-system vulnerability tools*
 - Decision support tools for local/ policy managers*



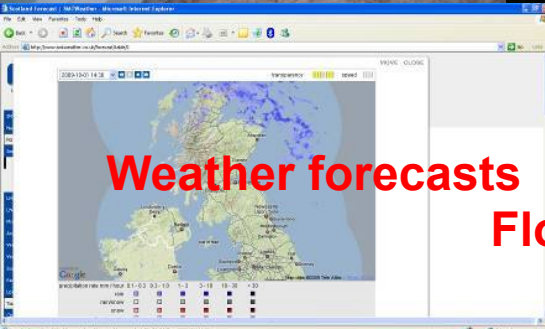
Affordable, targeted solutions..



New drainage



Remediated earthworks



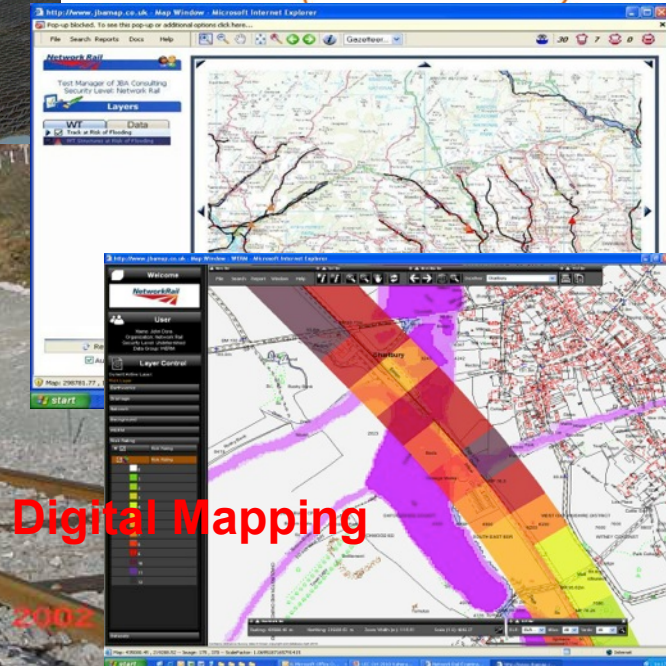
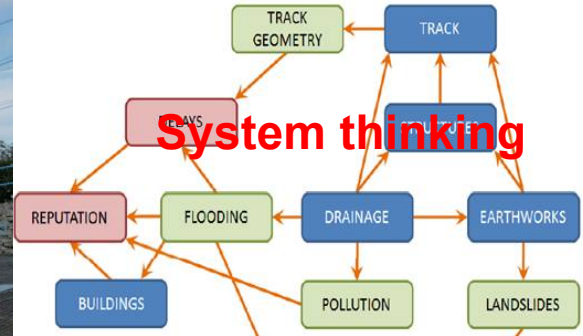
Weather forecasts



Reconstructed hillside

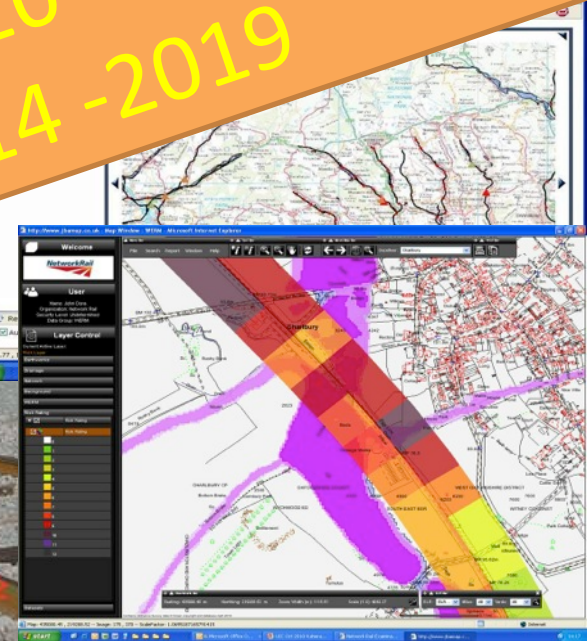
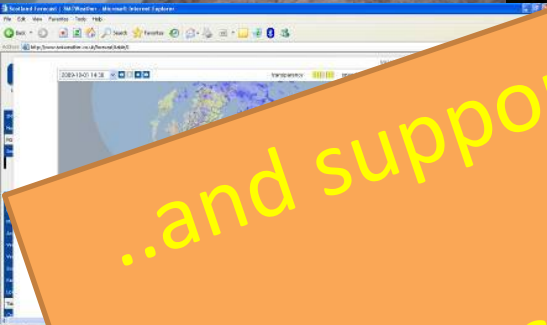


Emergency kit



Digital Mapping

..within a 30 year timeframe...

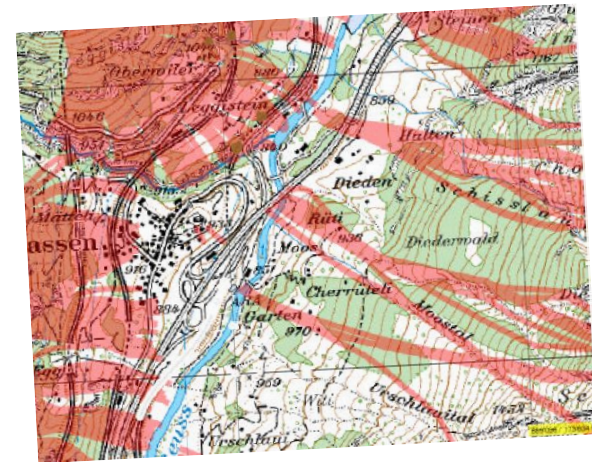
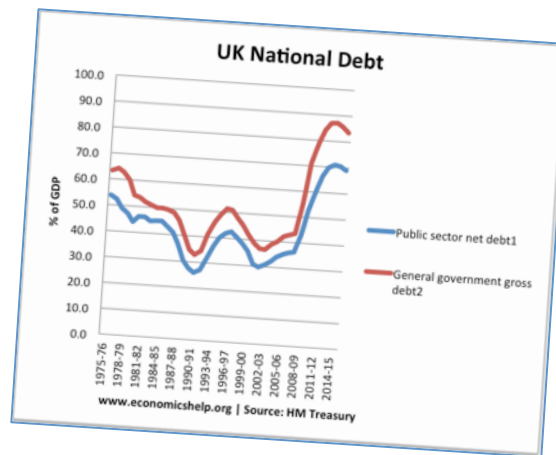


..and supports New Policies, New Standards,
New Skills.
Investment in delivery 2020 - 2050
Preparation in 'CP5' 2014 -2019

....and finally...(almost)

Ideas going forward include linking across themes:

- Systems thinking
- Overseas analogies
- Economics
- GIS tools



Plan to link these themes with and engage with ARCC projects and others e.g. iBuild, ICIF, ITRC...

....and finally.

Vision:

- Provide support for long term policy and strategy development, with new knowledge and skills
- Inform NAP2/ ARP 2/ CCRA 2
- A 30 year Adaptation Programme from 2020

Many challenges....



....not all the answers!