

# CSIC Workshop

## Futureproofing and Asset Management

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John Dora CEng FICE FRMetS

# Civils assets

2

## 💧 Railways:

- 💧 Bridges and culverts
- 💧 Earthworks
- 💧 Coastal defences
- 💧 Tunnels
- 💧 Station structures

## 💧 Flood defence

- 💧 Earthworks
- 💧 Weirs
- 💧 Walls

## 💧 Navigation

- 💧 Locks
- 💧 Quays
- 💧 Weirs

## 💧 Legacy

- 💧 Disused railways
- 💧 Watermills
- 💧 Watermeadows
- 💧 River engineering



# Challenges

3

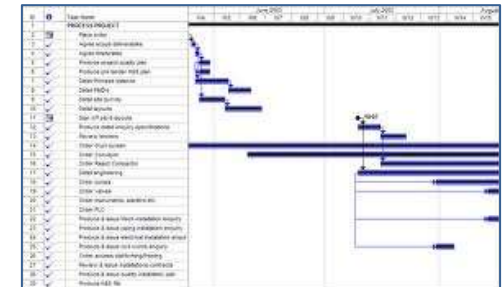
- Age of infrastructure assets:
  - NR bridges from 1820s
  - River earthworks precede 19th century!



- Design Standards
  - What standards??
  - Based upon the historic
- Capacity of system?
  - Adding more - see Churchman 1967 'Wicked Problem'

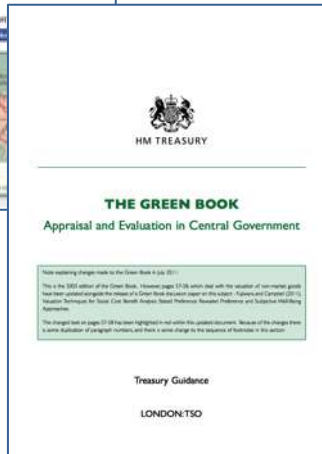


- Value Engineering
  - The “*project delivery*” culture



# Challenges

4



## 💧 Planning cycles

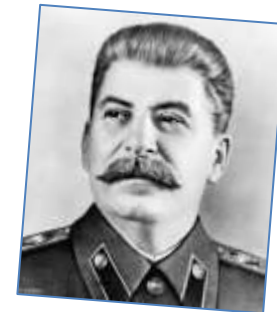
- 💧 Too long!

## 💧 Economics

- 💧 Current theories don't help long term investment

## 💧 Party politics

- 💧 Do I need to explain?

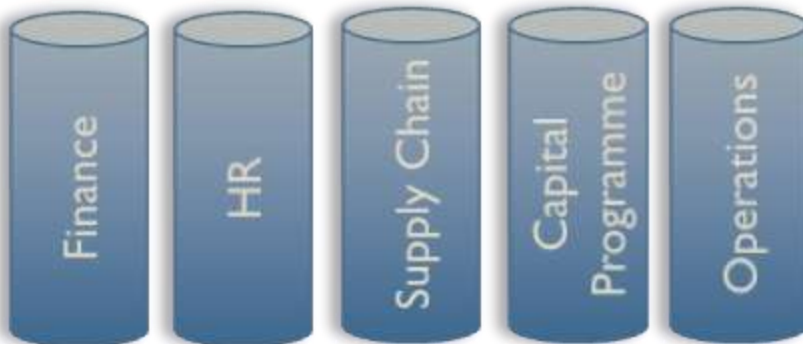


## 💧 Terminology

- 💧 Language across disciplines

## 💧 Silo thinking!

- 💧 Systemic interdependencies?



# Challenges

5

## 💧 Governance

- 💧 Short termism - regulatory control periods, good or bad?

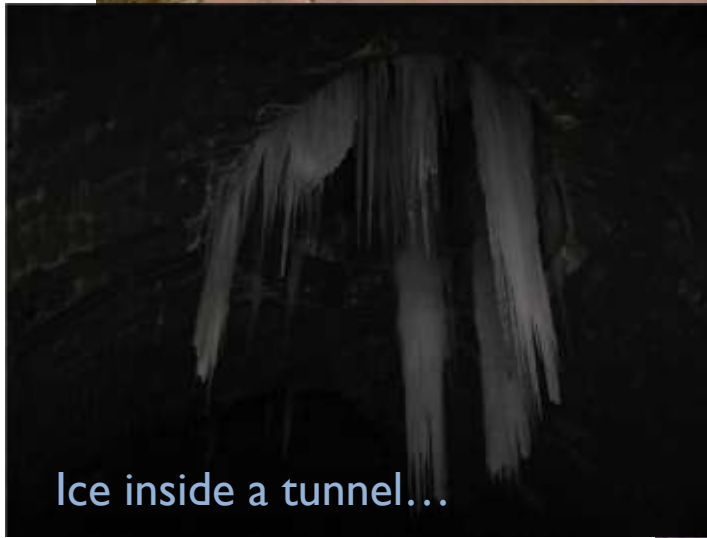
## 💧 Weather, and climate change

- 💧 (They're not the same!)





# Challenge - weather impacts



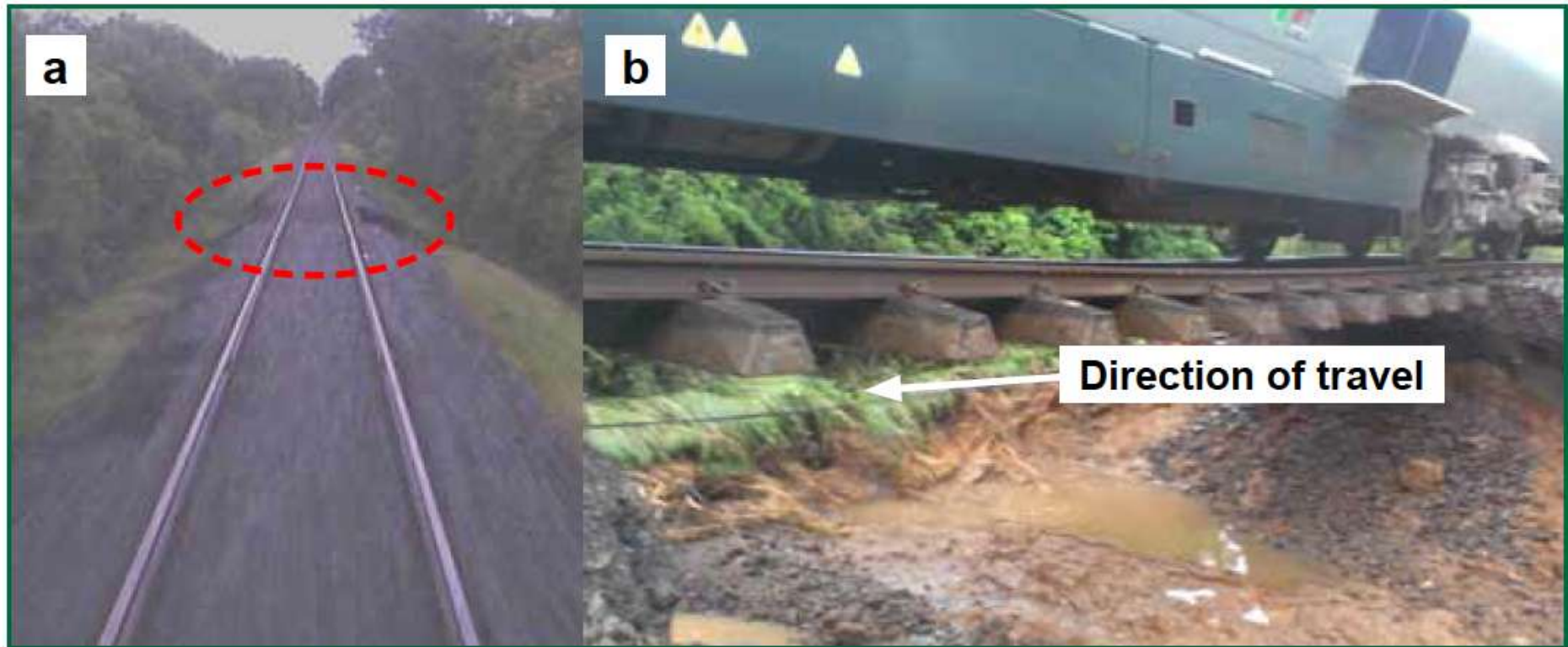
Pictures from Network Rail

# Challenge – wider ‘system’





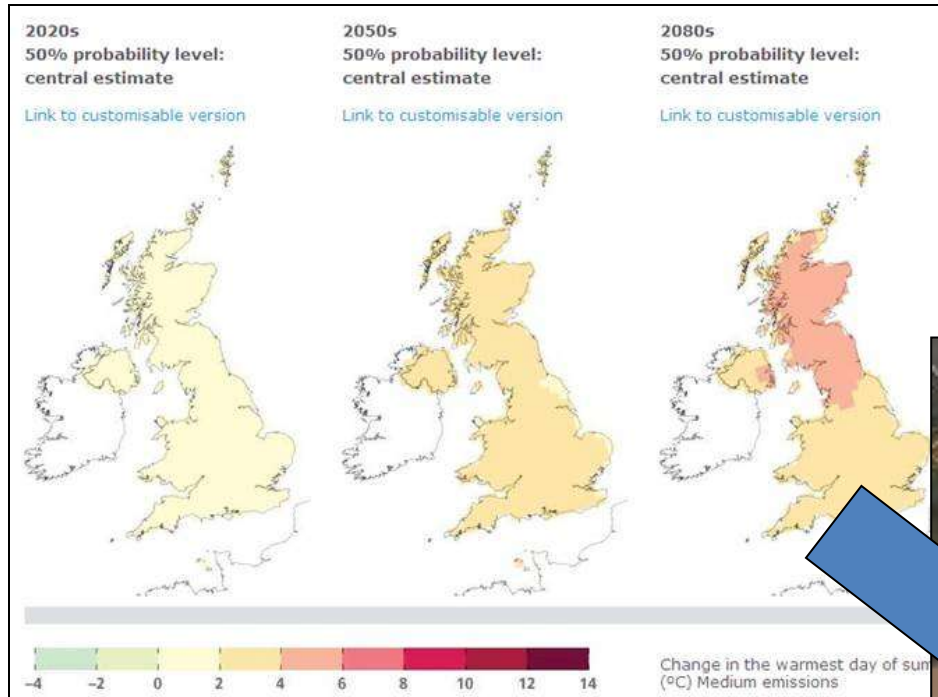
# How do you prevent this?



- June 2012 Knockmore NI: Driver's view and ~~roller-coaster~~ train suspended over washout



# Challenge – climate change



© UK Climate Projections 2009



# Challenge – resistance?



# ...or resilience and recovery?



...from January workshop...



# Key criteria for futureproofing

**Self-reinforcing**

**Self-reinforcing** – works with, rather than against, natural processes

**Passive** – not reliant on operator intervention

**Resilient**

**Resilient** – able to withstand shocks and recover quickly

**Adaptive**

**Flexible/Adaptive/Reconfigurable** – can be readily adapted/reconfigured if understanding of risks/requirements change

**Robust** – not overly sensitive to design assumptions

**“No regrets”** – won't close-off potentially attractive alternatives

**Replaceable**

**Replaceable** – can be replaceable during or at the end of life/use

**Reusable**

**Reusable/Extendable** – can be reused/ extended if deteriorated/ failed

**“Fail soft”/ Fail safe** – won't fail catastrophically / won't make situation worse if it fails

**Recyclable/ Demolishable** – can be recycled/ demolished at the end of life/use

# Examples

14



## Heathrow

Master planning for runway, stand and terminal capacities, surface access and infrastructure



## Lend Lease

The Elephant & Castle regeneration project by incorporating key sustainability elements



## Network Rail

Guiding R&D (e.g. TRACCA,) Operators' adaptation forum – challenging the status quo



## Arup/ATKINS

Having foresight and innovation / futures teams e.g. Arup's foresight and innovation team, ATKINS' futures team

From January Workshop

# Examples

15



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Will these all work with the 'Key Criteria'?

# Rail example – ‘TRaCCA’

## Tomorrow’s Railway and Climate Change Adaptation

- Knowledge review and gap assessment
- Overseas analogy study
- Assessing GIS-based evaluations of vulnerability
- System and sub- system modelling and vulnerability tool feasibility studies
- Change management programme
- Evaluation of metrics
- Study into the economics of the benefits of adaptation



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- Knowledge review and gap assessment
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# Is new guidance needed?

- 💧 Deal with uncertainty in climate projections
  - 💧 Engineers good at problem solving!
- 💧 Limited information on future extreme weather events
  - 💧 A lot on averages!
- 💧 Data availability from external sources
  - 💧 Cost, understanding, language!
- 💧 New design philosophy needed?
  - 💧 Knowledge transfer initiatives...
  - 💧 Design philosophy from other disciplines...
- 💧 *New Economic Rules?*

# Climate change adaptation

- TRaCCA: GIS-based assessments; think:
  - Asset criticality – *for operations*
  - Asset sensitivity, – *is it understood?*
  - Asset location *conceptual design??*
  - All this – *now, in future*
  - Costs – *now, in future*
- Prioritise on *criticality to service*
  - Early payback through better resilience?
- Use renewal cycle to advantage
  - Design for climate change – change Spec'ns
  - Low cost solutions – drainage example
  - Use of language – Resilience yes, Climate *no!*

Will these all work with the 'Key Criteria'?

Self-reinforcing

Resilient

Adaptive

Replaceable

Reusable

# Futureproofing: success criteria?

Suggested future proofing success criteria for use in options identification and appraisal:

- 💧 **Resilient** - able to withstand shocks and recover quickly;
- 💧 **Passive** – not reliant on operator intervention;
- 💧 **“Fail soft”** - won't fail catastrophically;
- 💧 **Fail safe** - won't make situation worse if it fails to operate;
- 💧 **Flexible & Adaptive** – can be readily adapted if understanding of risks change;
- 💧 **Robust** - not overly sensitive to design assumptions;
- 💧 **“No regrets”** - won't close-off potentially attractive alternatives;
- 💧 **Self-reinforcing** - works with, rather than against, natural processes.