



The future of modelling in support of infrastructure decisions

Prof Jim Hall University of Oxford

Issues facing infrastructure systems Modelling to support infrastructure decisions The role of DAFNI The future









The future of infrastructure globally: Decarbonization



The future of infrastructure globally: Resilience



The Commission found that the overall rate of return on investments in improved resilience is very high, with benefit-cost ratios ranging from 2:1 to 10:1, and in some cases even higher (see Figure ES.1).



According to *Lifelines*, a new report from by the World Bank and the Global Facility for Disaster Reduction and Recovery, the net benefit of building more resilient infrastructure in low- and middle-income countries would be \$4.2 trillion, with \$4 in benefit for each \$1 invested.



Issues facing infrastructure in the UK

THE SECOND NATIONAL INFRASTRUCTURE ASSESSMENT: BASELINE REPORT



NATIONAL INFRASTRUCTURE COMMISSION

November 2021

Since the first Assessment, there has been progress on some issues:

These include full fibre rollout, electricity decarbonisation, drought resilience, infrastructure financing – through the creation of the UK Infrastructure Bank – and design.

However, in other areas, there is more to be done:

- greenhouse gas emissions from economic infrastructure must reduce further, fast
- asset maintenance issues undermine performance in some sectors.
- more than three million properties in England are at risk from surface water flooding
- serious pollution incidents from water and sewerage are unacceptably high
- urban transport connectivity varies and is poor in many places.

Future trends and government commitments will bring new challenges:

- climate change will make it harder to make and keep infrastructure resilience
- nature is declining at unprecedented rates
- the Covid-19 pandemic may lead to long term changes in where people live and work

UNIVERSITY OF

• new and emerging technologies will offer opportunities across sectors.

Delivering on these challenges will require **bold action**, **stable plans** and **long term funding**.

Priorities for the second National Infrastructure Assessment







Number of Taps by Day and Station Type



Station Type Airport O City Inner Suburb O Outer Suburb Shopping - Terminus Tourist



Delivering on these challenges will require bold action, stable plans and long term funding

... and difficult choices



"What I cannot create, I do not understand" Richard Feynman



1. Real-time forecasting and control



1. Real-time forecasting and control

2. Asset management



- 1. Real-time forecasting and control
- 2. Asset management
 3. Long-term planning



The role of DAFNI

- 1. Curated models and datasets
- 2. Reproducible workflows
- 3. Compute
- 4. Visualisation
- 5. Managed access for practitioners



Geospatial data from tech giants

Microsoft releases new and updated building footprints data

by Pradeep 🏼 🕊 @pradeepviswav

O Jan 12, 2022 at 12:42 GMT





- Geospatial data from tech giants
- Machine learning

TECHNOLOGY NEWS 30 September 2015

Earthquake artificial intelligence knows where damage is worst

Algorithms can use seismic data and structural knowledge of buildings to judge which parts of a city will be most at risk and prioritise rescue efforts



- Geospatial data from tech giants
- Machine learning
- Real-time data integration

PortWatch

Monitoring Disaster-Related Trade

- Geospatial data from tech giants?
- Machine learning
- Real-time data
- Crowd sourcing





Concluding remarks

- Speed of innovation
- Persistent issues:
 - Model/data integration
 - Responding to rapidly evolving user needs
- Urgency of finding solutions



Thanks to:

Raghav Pant Tom Russell Gordon Glasgow Tim Fowler Jasper Verschuur Olivia Becher Elco Koks Ed Byers Simon Dadson Rob Lamb Scott Thacker Conrad Zorn EPSRC
NERC
FCDO
Department for Transport
Network Rail
Environment Agency
National Infrastructure Commission
World Bank
Coalition for Climate Resilient Investments
Coalition for Disaster Resilient Infrastructure
Insurance for Development Forum
Global Commission on Adaptation