Risk, resilience and foresight: improved strategic planning for utilities

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www.cranfield.ac.uk
Climate change is a ‘disruptive opportunity’ that should be mainstream to our long term thinking
The green economy landscape

http://www.foundation.org.uk/journal/

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<th>Investment for clean tech</th>
<th>Regulatory design</th>
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<td>Public health &amp; legitimacy</td>
<td>Mainstreaming sustainability</td>
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<td>Resilience &amp; productivity</td>
<td>Infrastructure resilience &amp; big data</td>
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<td>Jobs, export, scale-up circularity</td>
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*Science for the Green Economy*

**Topic: Carbon Capture and Storage**

Chaired by Professor Simon Pollard, Cranfield University and Julie Vaughan, Senior Associate, Herbert Smith Freehills LLP

Increasingly, environmental issues are a nexus around which societal and business agendas are set. Executives and officials need up-to-date understanding of the scientific and technological evidence base for business strategies and environmental policies.

'Science for the Green Economy' seeks to meet this need with timely and accessible seminars supported by authoritative briefing papers. Through this series, we aim to create a dynamic community of senior practitioners in global companies, Governments, NGOs, universities, scientific institutions and consulting firms.

Carbon Capture and Storage (CCS) technologies offer a feasible solution to reducing carbon dioxide emissions from fossil fuels and reducing the impact of climate change, for countries where the continued use of these fuels is necessary to meet electricity demands. UK Government is working with industry to create a new cost-competitive CCS industry in the 2020s, through incentives for research and development and electricity market reforms. However, there remain significant challenges in implementing CCS effectively.

This seminar will discuss the status of CCS technologies and their importance in.
Risk and adaptation challenges

- Emerging risks
- Timescales and uncertainties (e.g. extreme events)
- Barriers and interdependencies
- Policy and regulatory barriers
- Supply chain risks
- Competing business risks
- Adaptation investment challenges
- Concerns regarding maladaptation
- Knowledge and information gaps
- Behavioural change
Changing nature of risk governance: extrinsic, people, accountability, foresight

<table>
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<th>TOP 10 RISKS 2013</th>
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<tr>
<td>Malicious contamination (water)</td>
<td>Accidental contaminated water supply / water quality</td>
<td>Contamination of water supply</td>
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<td>Loss of customer / community satisfaction</td>
<td>Water availability</td>
<td>Environmental discharges (e.g. Sewer overflows)</td>
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<td>Sabotage / terrorism</td>
<td>Drought / diminishing water supplies</td>
<td>Flooding and other natural disasters</td>
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<td>Inadequate financial management</td>
<td>Other regulatory / governance issues</td>
<td>Personnel / HR strategy</td>
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<td>Climate change</td>
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<td>Drought / diminishing water supplies</td>
<td>Change in government policy</td>
<td>Failure of key management systems</td>
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<td>Failure of assets to meet standards</td>
<td>Retention of staff</td>
<td>Wholesaler system failure</td>
</tr>
<tr>
<td>Strategic planning</td>
<td>Flooding and other natural disasters</td>
<td>Other regulatory / governance issues</td>
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A basic need exists for decision capabilities that consider ‘slow burn’ risks.

Organisations do not have a clear baseline understanding of how climate and weather affects their operations.

Risk thresholds, and the spatial distribution of risks are poorly understood.

Adaptive management

If we ‘got better’ at scenarios and at horizon-scanning, we’d take measured risk with fewer regrets, instead of being paralysed by uncertainty.
Tipping points - land use

A change in whether there is sufficient rainfall for reliable crop yield and quality or not could cause sudden, large and localised increases in irrigation water demand by horticultural businesses, threatening supply network capacity, whilst increased demand by upstream water abstractors could threaten resources.

Projected land use suitability for growing potatoes in England and Wales without irrigation, and locations of current rainfed crops (blue dots).

Aggregate potential vulnerability of European drinking water resources

- NE-SW gradient
- Highest vulnerability in Mediterranean and NW European basins
- The importance of socio-economics (especially by 2050s) and therefore need for adaptive capacity

Aggregate vulnerability score:
- 50% from water resources (long term & seasonality)
- 29% from water quality
- 21% from extreme events

Mudgal, S. et al. (2012) Literature review on the potential Climate change effects on drinking water resources across the EU and the identification of priorities among different types of drinking water supplies, for European Commission, DG ENV,
Summary: how we do business in the 21st century

- Environmental governance
- Beyond compliance, self-regulation, sharing risk and cost
- Global, sustainable value chains, materials security
- Risk, resilience, adaptation
- Single-issue advocates, social media
- Self reliance for insurance, capital, energy
- Ethical standards and the well-being agenda
- Technology, innovation and futures
- Resource efficiency, material criticality, circularity
- Sustainability leadership
From risk analysis to the creation of strategic value

Fraser, J. (2005) Presented at the AwwaRF international workshop “Risk analysis strategies for better and more credible decision-making”, Banff Centre, 6-8th April, 2005, Banff, Alberta, Canada.
Sector–level appraisal under the Climate Act (2008) adaptation reporting power


• Climate risks alongside other business risks
• Most organisations had to build capability
• Majority of reports produced in-house
• Use of existing corporate risk assessment methods
• Common failings – e.g. likelihood and consequence descriptors
• Lack of methodological detail – e.g. risk prioritisation and use of climate projections
• Difficulty identifying sector-level key risks
Resilience in the water sector will come from a fusion of innovation, risk and foresight - so long as we keep some ‘slack’ in the systems familiar to us
Utility-level appraisal for improved strategic planning


Integration of two fields (risk and futures):

- what are the plausible scenarios that provide a wide range of situations to test my risks against?
- the scale to evaluate consequences, related to the strategic objectives which are set for the long-term;
- the dynamic evolution of strategic risks forward in time.

Under financial scarcity
Know your system


Figure 12.

The bow tie approach recognizes the multiple causes of incidents and consequences that might arise from the simultaneous failure of barriers through a common cause with a much higher probability than estimated for the simultaneous failure of all individual barriers. Barrier integrity (denoted as red, amber or green to represent various states of integrity) is essential to managing risk. Latent flaws in the function of barriers must be recognized and eliminated or managed so that they are not allowed to align in a disaster scenario leading to an overall failure (Carter, 2012).
Taking stock: adapt, mitigate, evolve

- Climate change, as a driver of change, is with us
- Uncertainty ought not be a basis for delayed decisions
- Knowledge about the direction of change can be a stimulus for foresight
- Extreme events prompt reflection on robustness, resilience, adaptation, foresight and emerging risks
- Systems, governance, accountability, cooperation, opportunity, foresight
- Can you state which of your utility’s business risks that climate change will augment?
Reputational credit, political capital and competitive advantage

‘The nature of climate change dictates that all businesses take ownership of climate change risks. Those that are most resilient will have an implicit lead over their competitors’
Confederation of British Industry

‘Individuals, businesses, local authorities and community organisations are responsible for how climate change will affect them’
Department for Environment, Food and Rural Affairs
Acknowledgements

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- PhD students: Brian MacGillivray, Roland Bradshaw, Daniel Jalba, Craig Mauelshagen
- Postdocs: Paul Hamilton, Jeff Charrois, Craig Mauelshagen
Managing the ‘risk pyramid’ in the water sector

**Risk governance and culture**
- Mauelsshagen et al. (2013) *J. Risk Research* 16(9): 1187

**Long-term planning and strategy**

**Policy and regulatory climate**
- Allan et al. (2013) *Water Policy* 15: 458

**Futures and adaptation**

**Risk management**
- Summerill et al. (2010) *J. Water Health* 8(2): 387
- Parker & Summerill (2013) *Waterlines* 32: 11

**Water safety plans**
- Summerill et al. (2010) *J. Water Health* 8(2): 387
- Parker & Summerill (2013) *Waterlines* 32: 11

**Asset management**
- Tang et al. (2013) *J. Cleaner Prod.* 57: 228

**Behavioural & human factors**

**Tools and techniques**

**Emerging contaminants**
- Eduok et al. (2013) *Ecotox. & Env. Safety* 95: 1

**Decisions about corporate strategy and the direction of the business**

**Tactical decisions transferring strategy into action across the business**

**Front line operational decisions for implementing strategy and tactics**
Research solutions for resilient earth and infrastructure systems

Real time geohazard risk mitigation and response
- Observation & monitoring.
- Forecasting.
- CAT models.
- Evacuation models.
- Mitigation strategies.
- Decision support.

Avoiding systemic failure of critical infrastructure systems
- Environmental data.
- Multi-hazard models.
- Fragility analysis.
- Coupled failure modelling.
- Design and Reanalysis.
- Finance evaluation.

Long-term protection of geobiophysical systems
- Biophysical measurement.
- Climate ensembles.
- Environmental models.
- Risk analysis/modelling.
- Mitigation/policy testing.
- Cost-benefit analysis.

http://www.dream-cdt.ac.uk/