

24 January 2017

Research Showcase: Advisory Board Meeting



Benefits of Improving Infrastructure Resilience

Centre for
Risk Studies



UNIVERSITY OF
CAMBRIDGE
Judge Business School

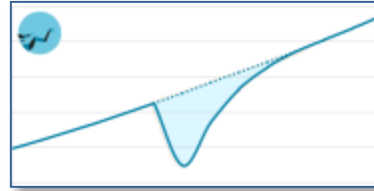
Dr. Edward J. Oughton
Research Associate
Cambridge Centre for Risk Studies

A Toolkit for Risk Science: Quantifying Resilience

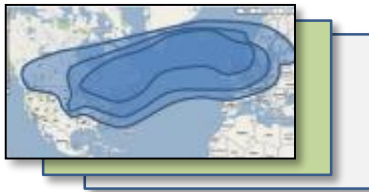
Threat Maps



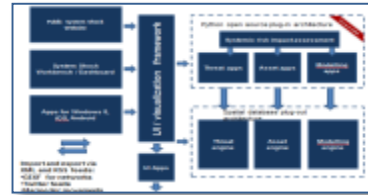
Risk Models & Output Data



Scenarios



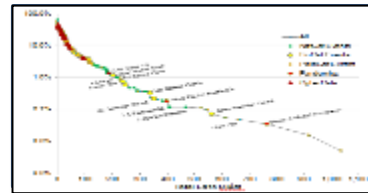
Software Platform (Cambridge Risk Framework)



Exposure Data



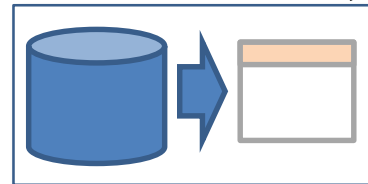
Use Cases – Business Applications



Network Models

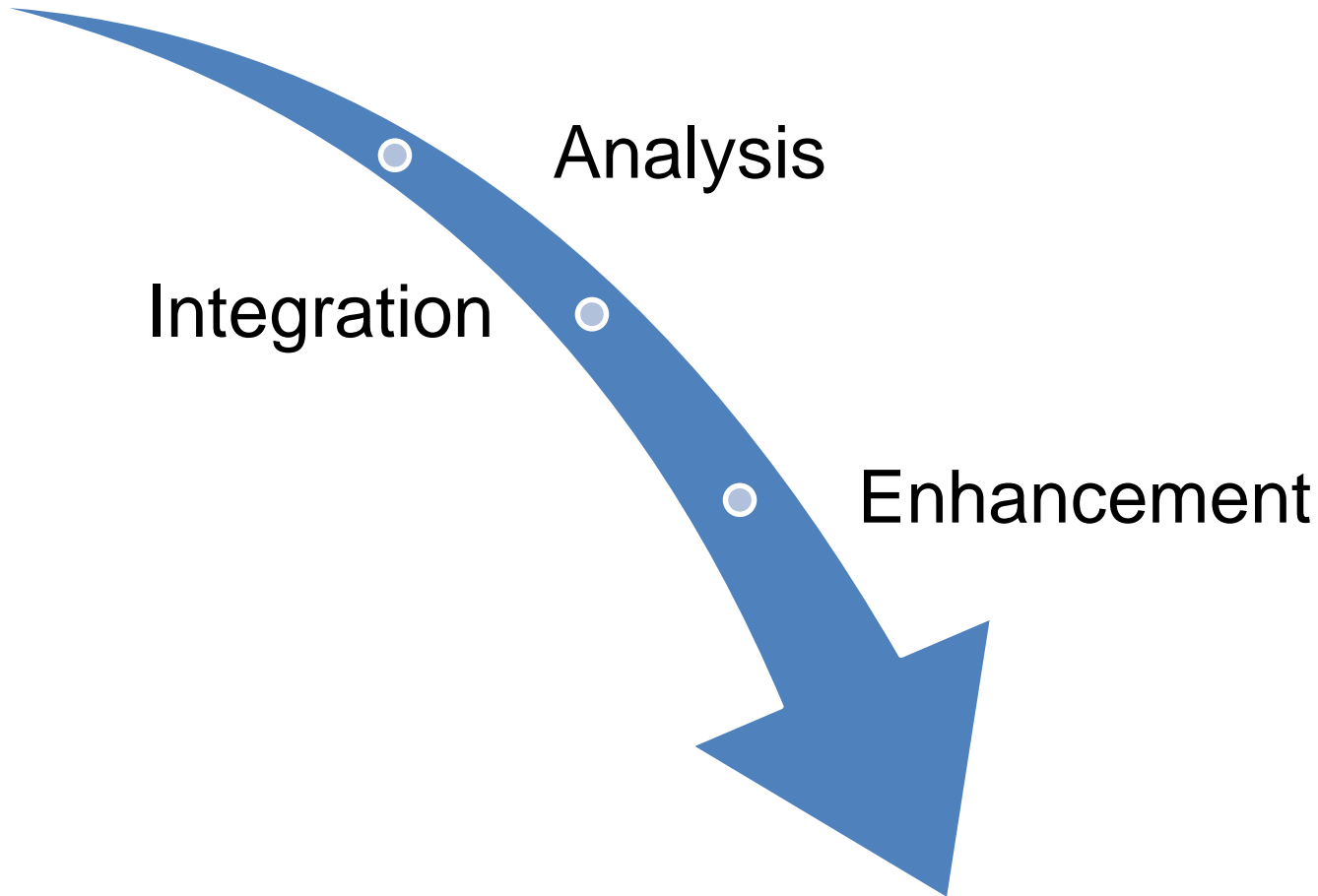


Private Portals, APIs and modelling interfaces



What Do We Mean by 'Use-Cases'?

Engagement



***Enabling Smarter
Decision Making***

Aim 1 – Who Are the Users?



Those with global operations

Aim 1 – Who Are the Users?

*The industries of
CRS Advisory
Board members
is a good start...*

Representatives of supporting organisations



Russell Bean
Head of Financial Institutions Underwriting, Talbot Underwriting
[+ Bio](#)



Steve Coates
Chief Underwriting Officer, PoolRe
[+ Bio](#)



Siddhartha Dalal
Chief Data Scientist and Senior VP of Advanced Research and Technology, Science, AIG
Property Casualty
[+ Bio](#)



Rowan Douglas CBE
CEO Capital Science & Policy Practice, Willis Towers Watson & Willis Research Network
[+ Bio](#)



Anna-Marie Greenaway
VP Science and Technology, BP
[+ Bio](#)



Sven Heiligtag
Partner McKinsey & Company
[+ Bio](#)

Aim 2 – What Do They Need?



Aim 3 – Why Do They Need These Analytics?

Financial Shock



FinCat



Asset Bubble



Financial Irregularity



Market Crash

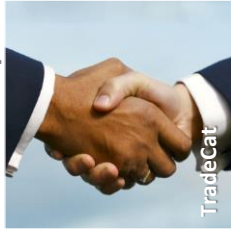


Sovereign Default



Bank Run

Trade Dispute



TradeCat



Labour Dispute



Trade Sanctions



Cartel Pressure



Nationalization



Tariff War

Geopolitical Conflict



WarCat



Conventional War



Asymmetric War



External Force



Civil War



Nuclear War

Political Violence



HateCat



Terrorism



Separatism



Organized Crime



Assassination



Social Unrest

Natural Catastrophe



NatCat



Earthquake



Windstorm



Volcanic Eruption



Flood



Tsunami

Climatic Catastrophe



WeatherCat



Drought



Freeze



Tornado & Hail

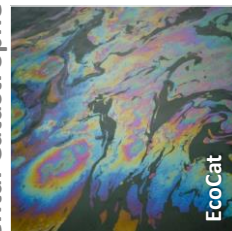


Electric Storm



Heatwave

Environmental Catastrophe



EcoCat



Sea Level Rise



Ocean System Change



Wildfire



Pollution Event



Atmospheric System Change

Technological Catastrophe



TechCat



Nuclear Meltdown



Industrial Accident



Cyber Catastrophe

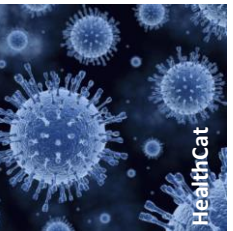


Technological Accident



Infrastructure Failure

Disease Outbreak



HealthCat



Human Epidemic



Animal Epidemic



Waterborne Epidemic



Zoonosis



Plant Epidemic

Humanitarian Crisis



AidCat



Famine



Water Supply Failure



Child Poverty



Welfare System Failure



Refugee Crisis

Externality



SpaceCat



Meteorite



Solar Storm



Space Threat



Ozone Layer Collapse



Satellite System Failure

Other



NextCat



Who Are the Users?



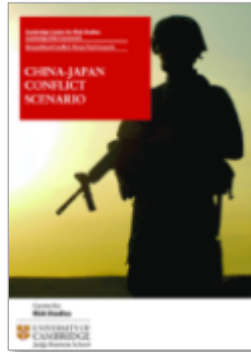
Who Are the Users?



CRS Research - Infrastructure



Taxonomy of Threats



Geopolitical Conflict
Emerging Risk Scenario



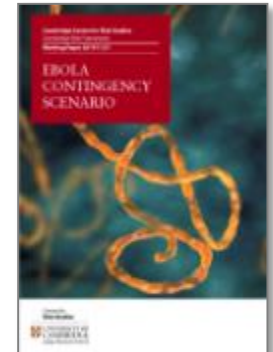
Pandemic
Emerging Risk Scenario



Cyber Catastrophe
Emerging Risk Scenario



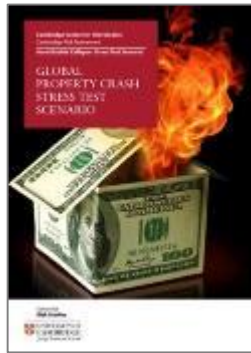
Social Unrest
Emerging Risk Scenario



Ebola
Emerging Risk Scenario



Financial Catastrophes



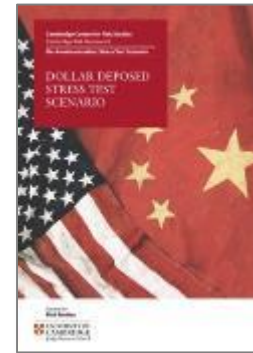
Global Property Crash
Financial Risk Scenario



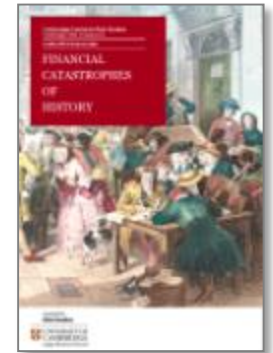
Eurozone Meltdown
Financial Risk Scenario



High Inflation
Financial Risk Scenario



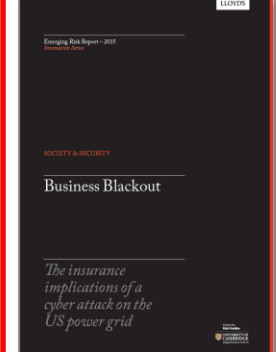
Dollar Dethroned
Financial Risk Scenario



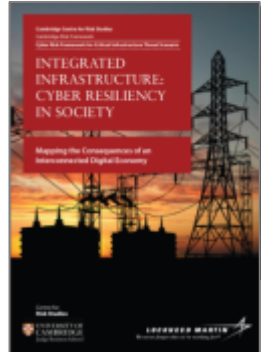
Historical Crises
Financial Risk



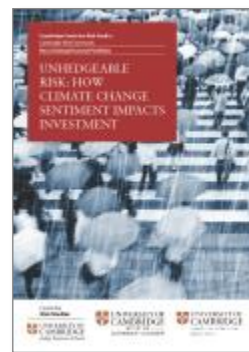
Cyber Accumulation
Insurance Risk Report



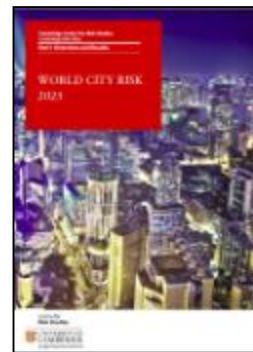
Business Blackout
Lloyds Emerging Risk Report



Integrated Infrastructure
Lockheed Martin



Climate Change
Investor Sentiment Shock



World City Risk 2025
Lloyds Co-Branded Report



Solar Storm
Emerging Risk Scenario

CRS Research – Common Themes

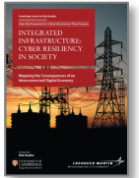
Social Unrest



Climate Change



Cyber



Economic

Financial

Spatial

Historical

Space



Financial



Geo political



Natural Hazards

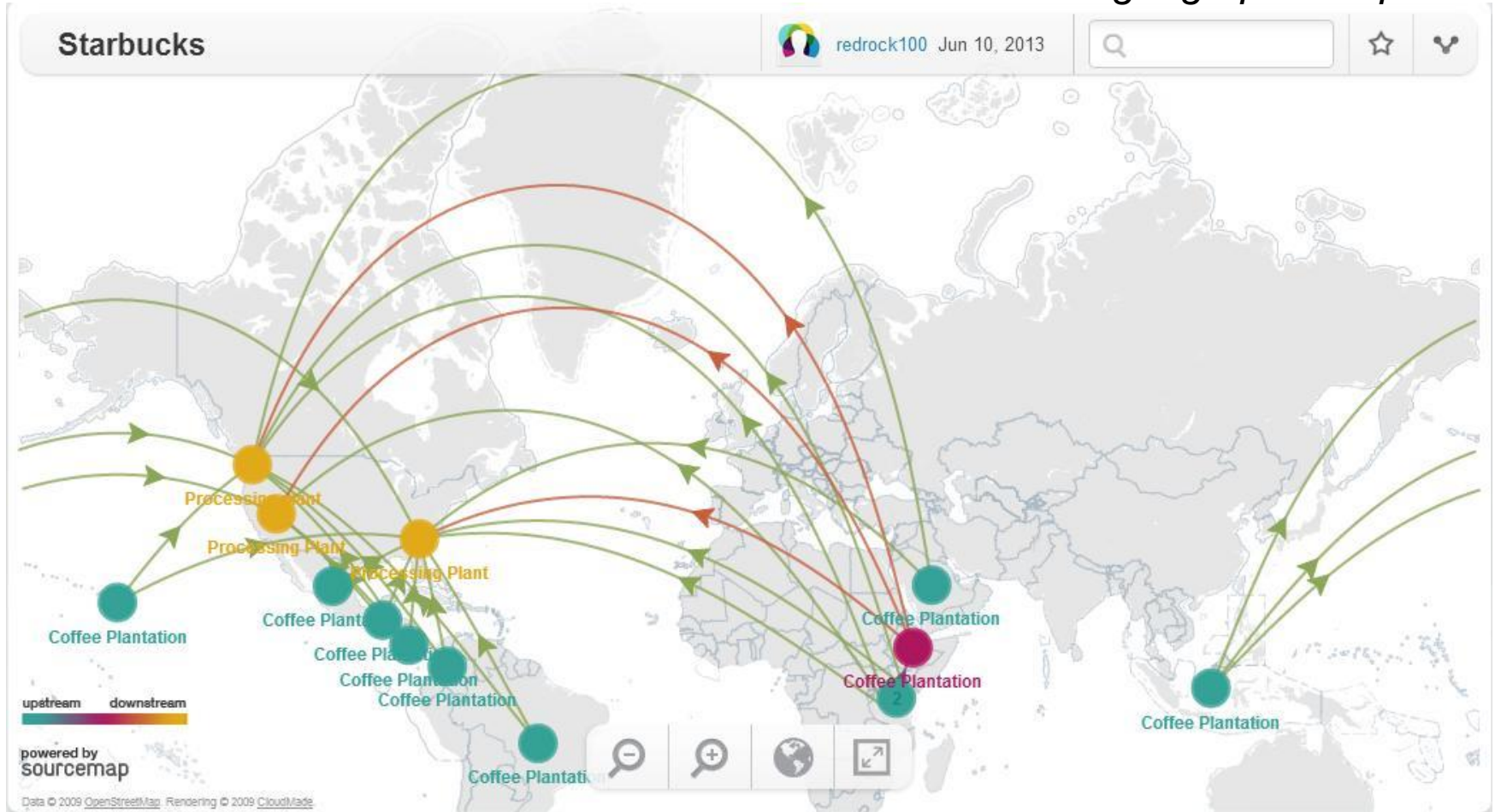


Pandemic



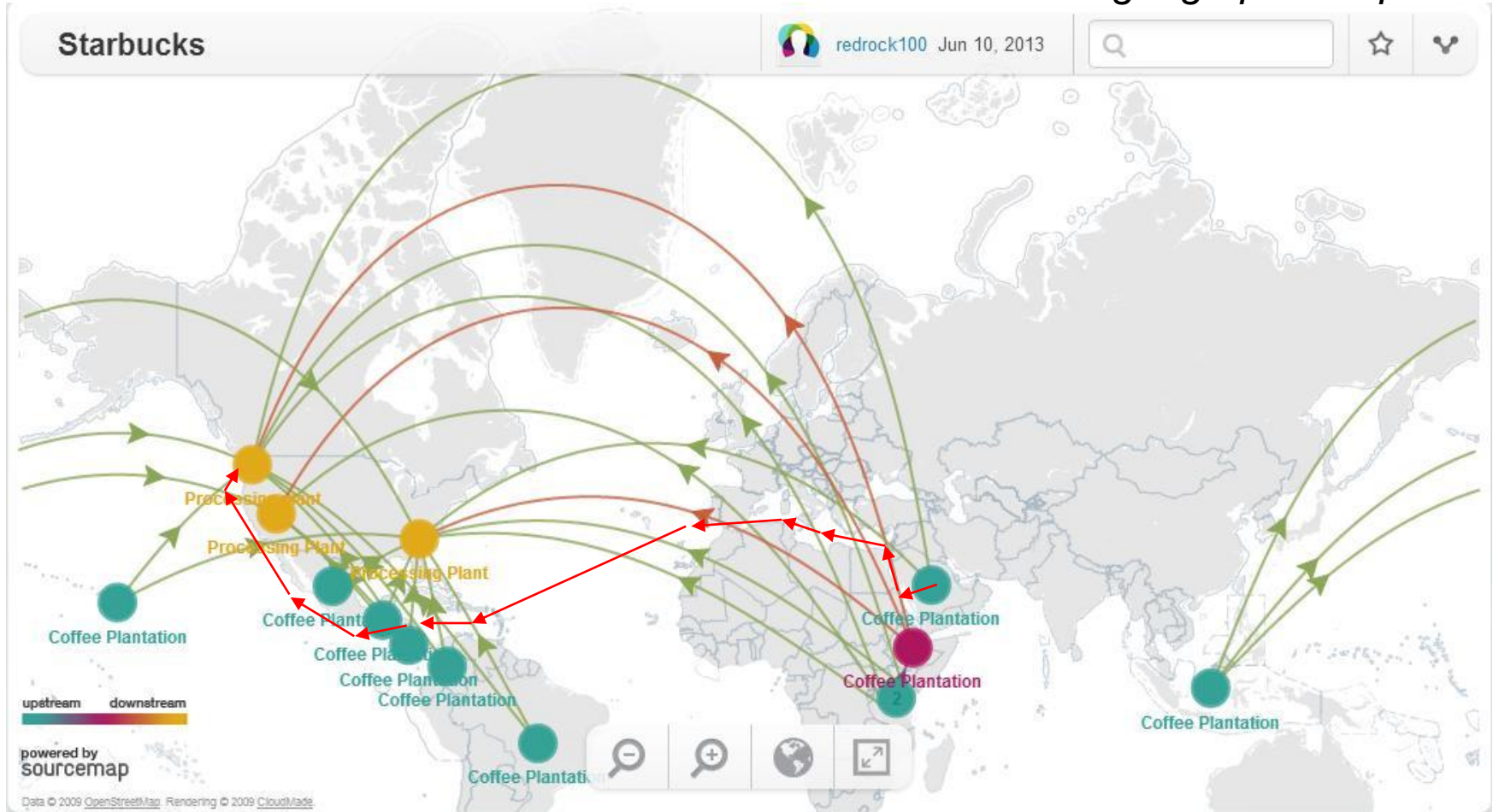
Source Map - Starbucks

Shows links in abstract geographical space



Source Map - Starbucks

Shows links in abstract geographical space



Most probable actual route

The CRS Added-Value

Finance, Economics and Trade



Market
Crash



Sovereign
Crisis



Commodity
Prices

Geopolitics and Security



Interstate
Conflict



Terrorism



Separatism
Conflict



Social
Unrest

Natural Catastrophe and Climate



Earthquake



Tropical
Windstorm



Temperate
Windstorm



Tsunami



Flood



Volcanic
Eruption



Drought



Freeze



Heatwave

Technology and Space



Nuclear
Accident



Power
Outage



Cyber
Attack



Solar
Storm

Health and Humanity



Human
Pandemic



Plant
Epidemic

Focus on trillion dollar scenarios

The CRS Added-Value

Finance, Economics and Trade



Geopolitics and Security



***Multi-threat is great,
but how do we anchor
it from global to local?***

Technology and Space



Nuclear
Accident

Power
Outage

Cyber
Attack

Solar
Storm

Health and Humanity



Human
Pandemic

Plant
Epidemic

Focus on trillion dollar scenarios

Infrastructure

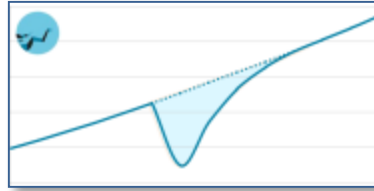


A Toolkit for Risk Science: Quantifying Resilience

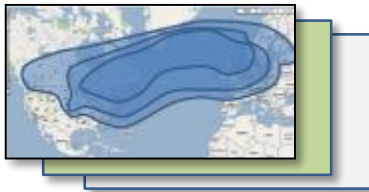
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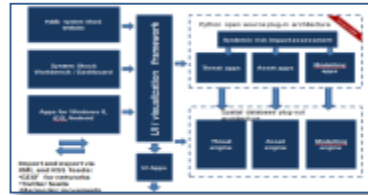
Risk Models & Output Data



Scenarios



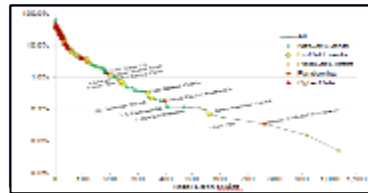
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Exposure Data



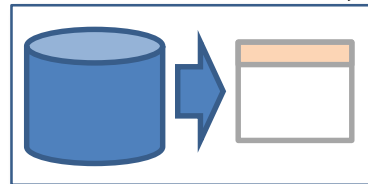
Use Cases – Business Applications



Network Models



Private Portals, APIs and modeling interfaces

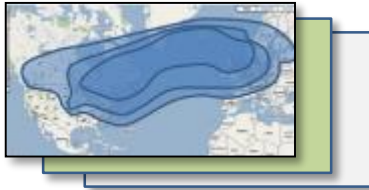


A Toolkit for Risk Science: Quantifying Resilience

Threat Maps



Scenarios



Exposure Data

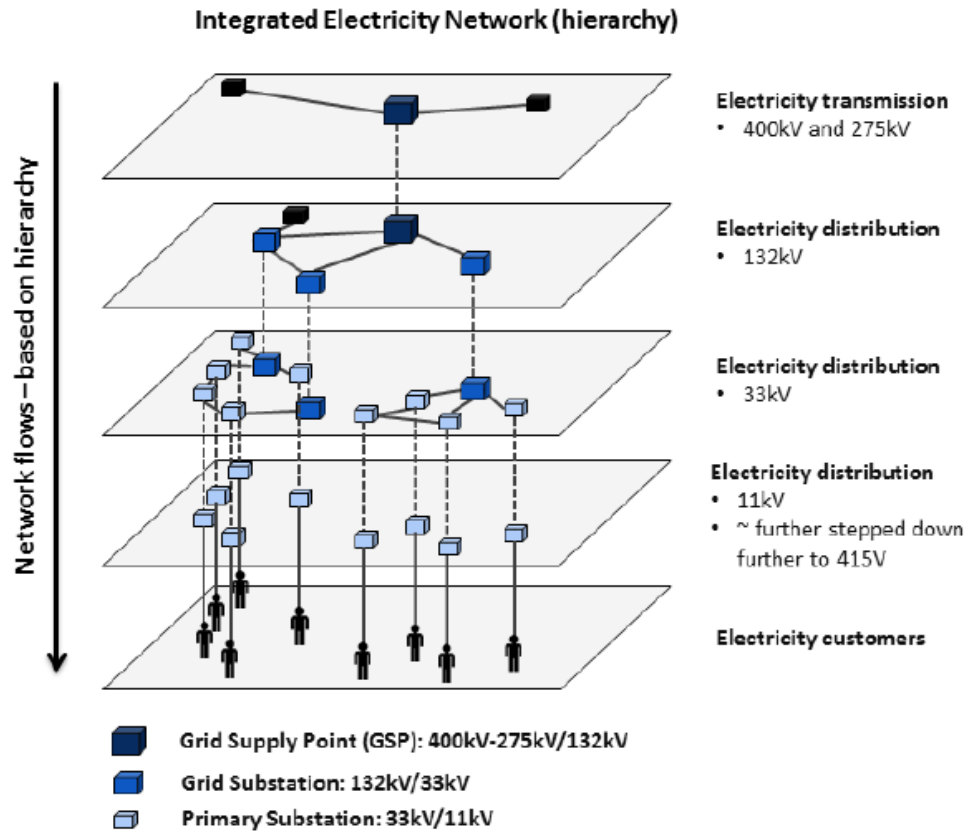


Network Models

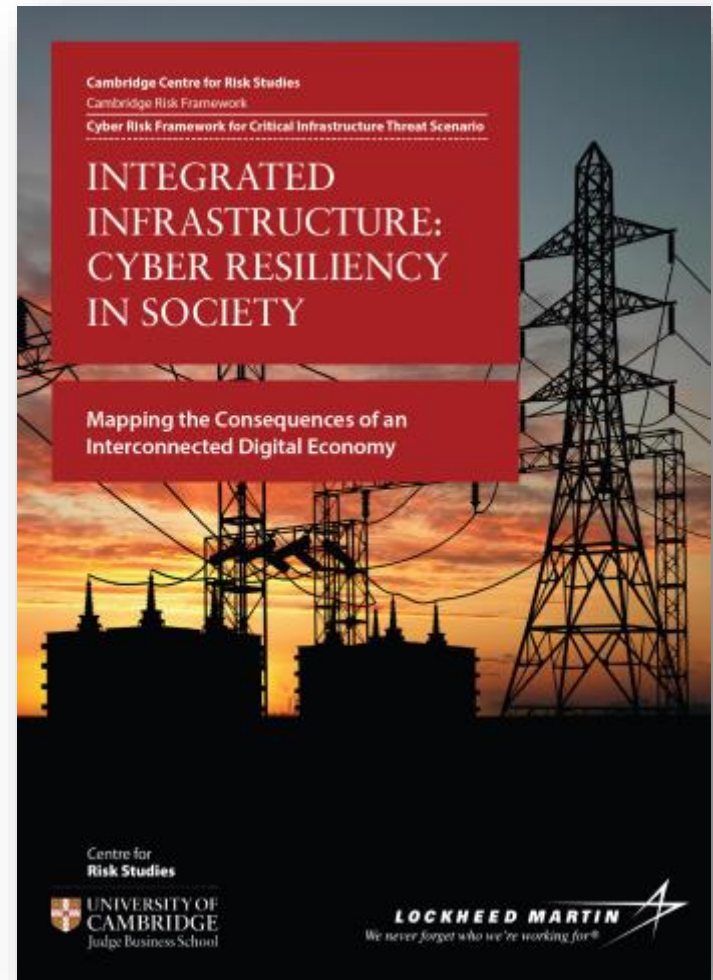


Towards a functional understanding of physical infrastructure, supply chains and value flows

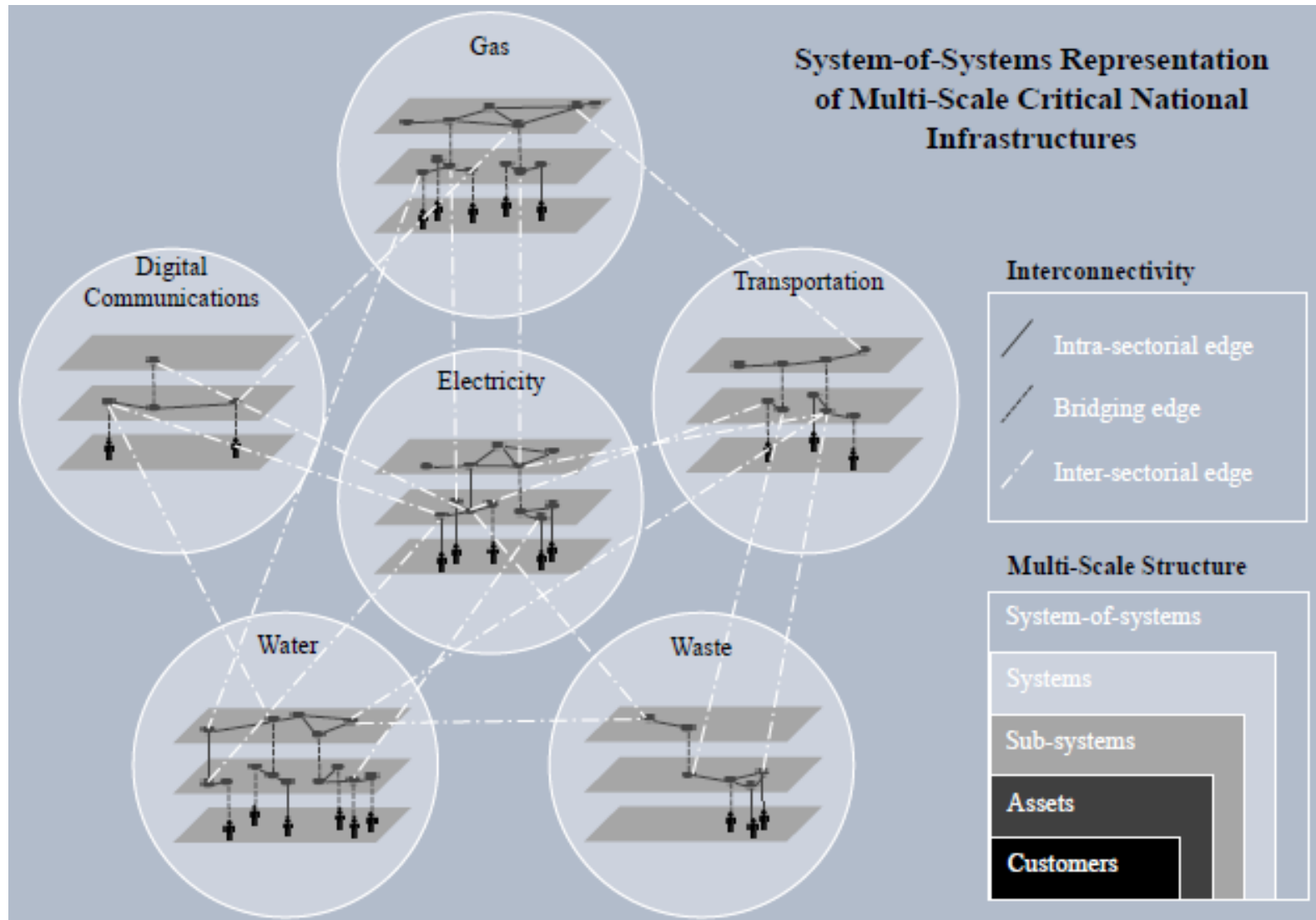
Integrated Infrastructure Scenario



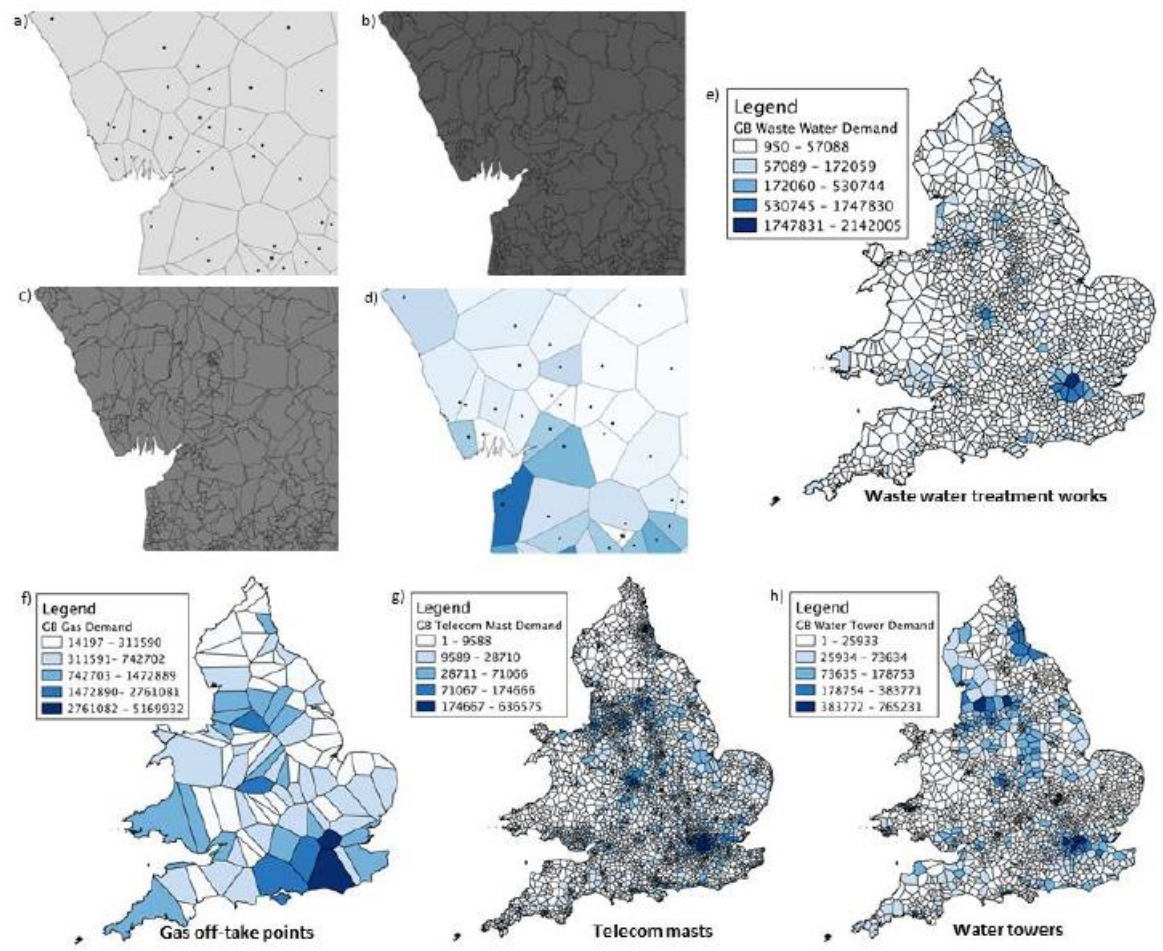
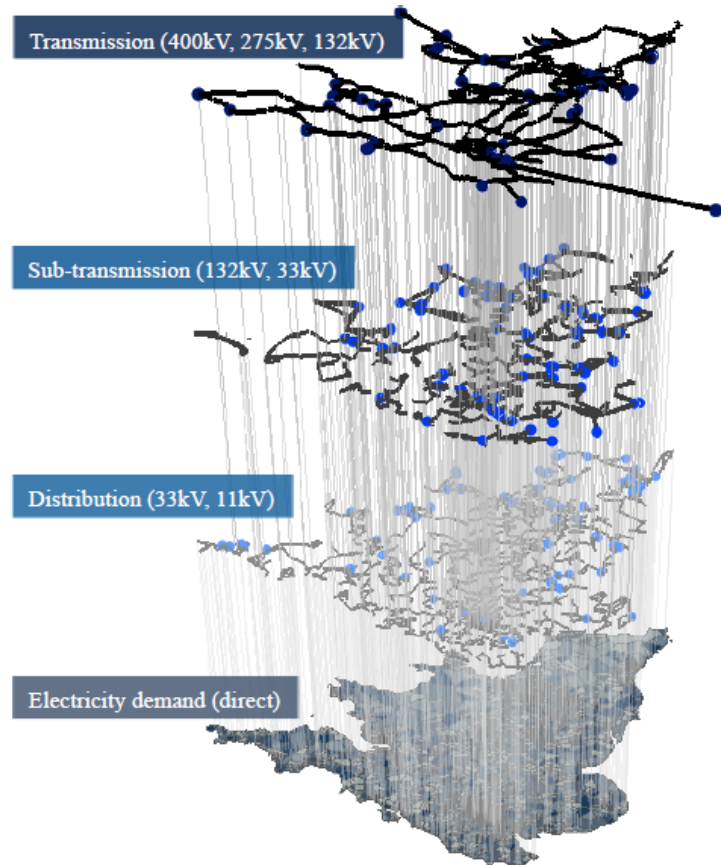
Slide credit: Scott Thacker of ITRC



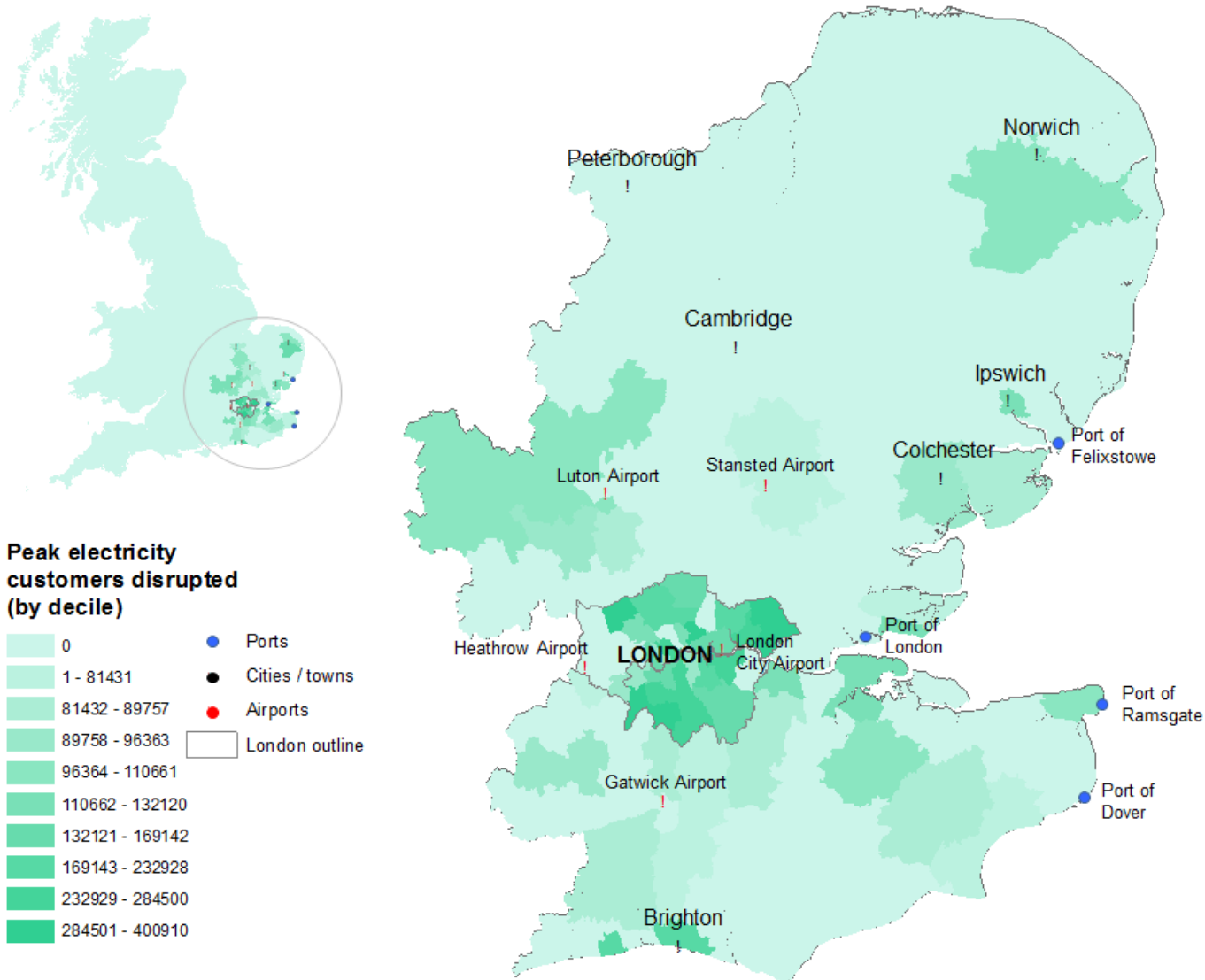
Quantifying Cascading Failure in Interdependent Infrastructure Systems



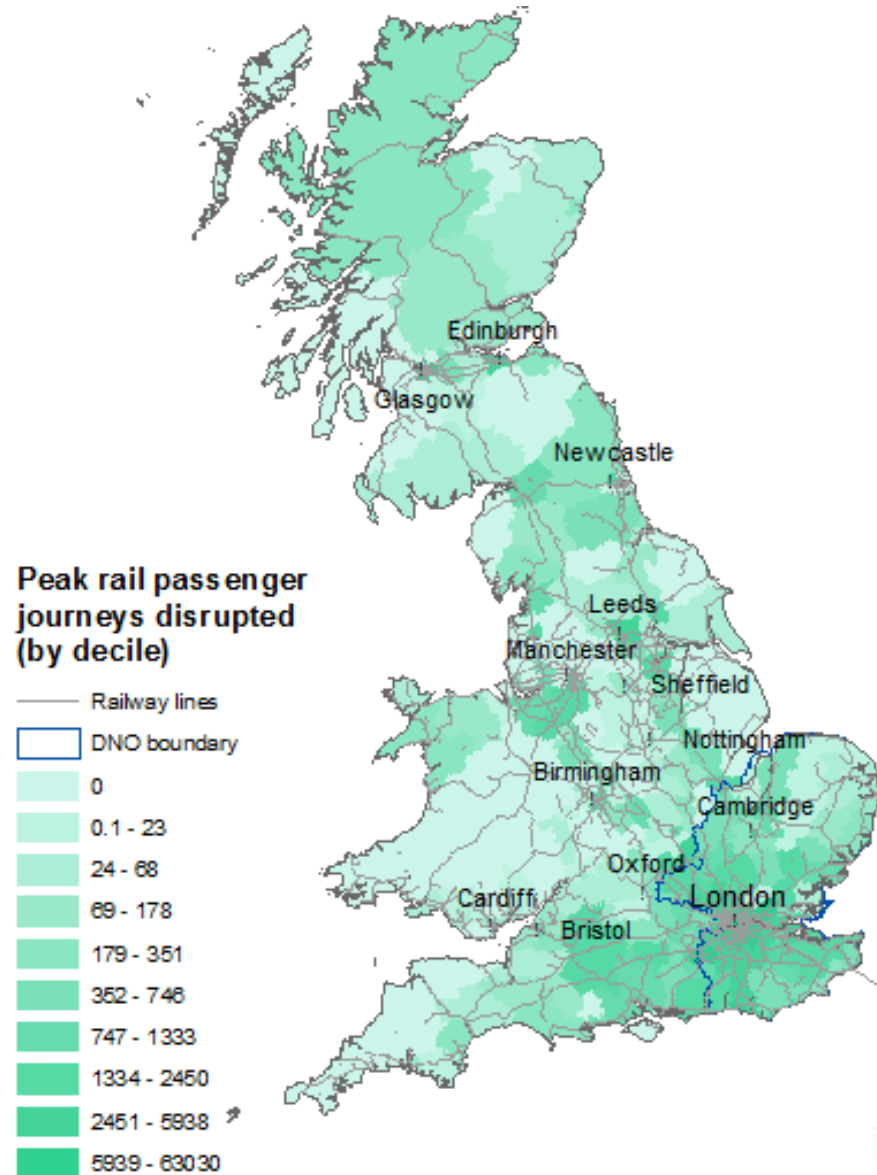
Quantifying Cascading Failure in Interdependent Infrastructure Systems



Electricity Customers Disrupted

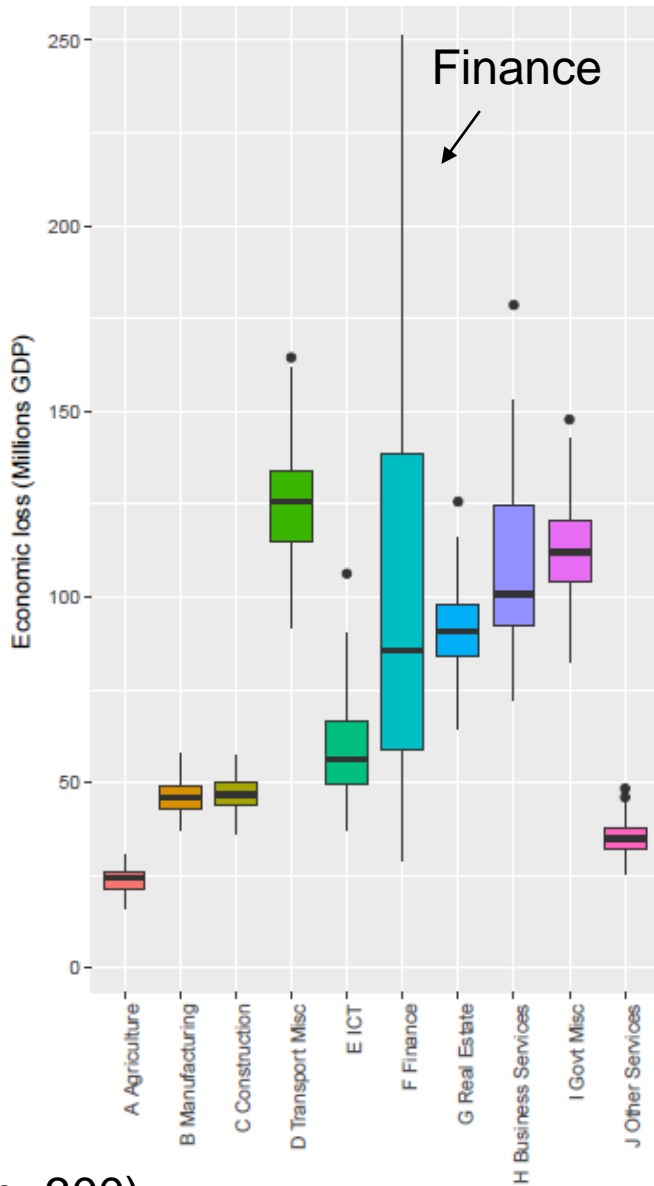


Railway Customers Disrupted

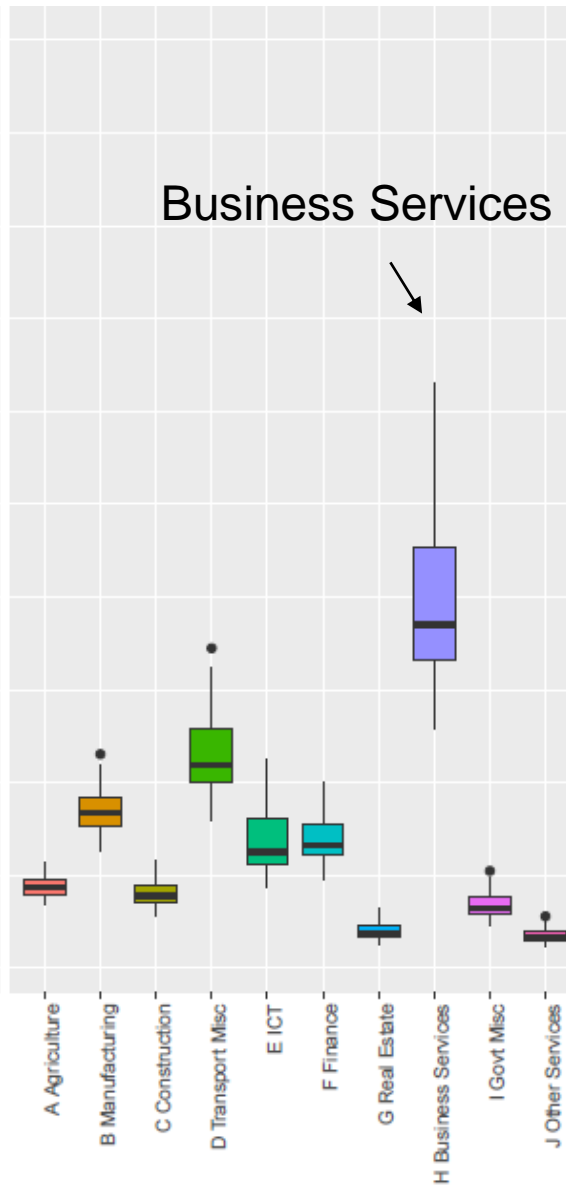


Results: Domestic Loss by Sector (S1)

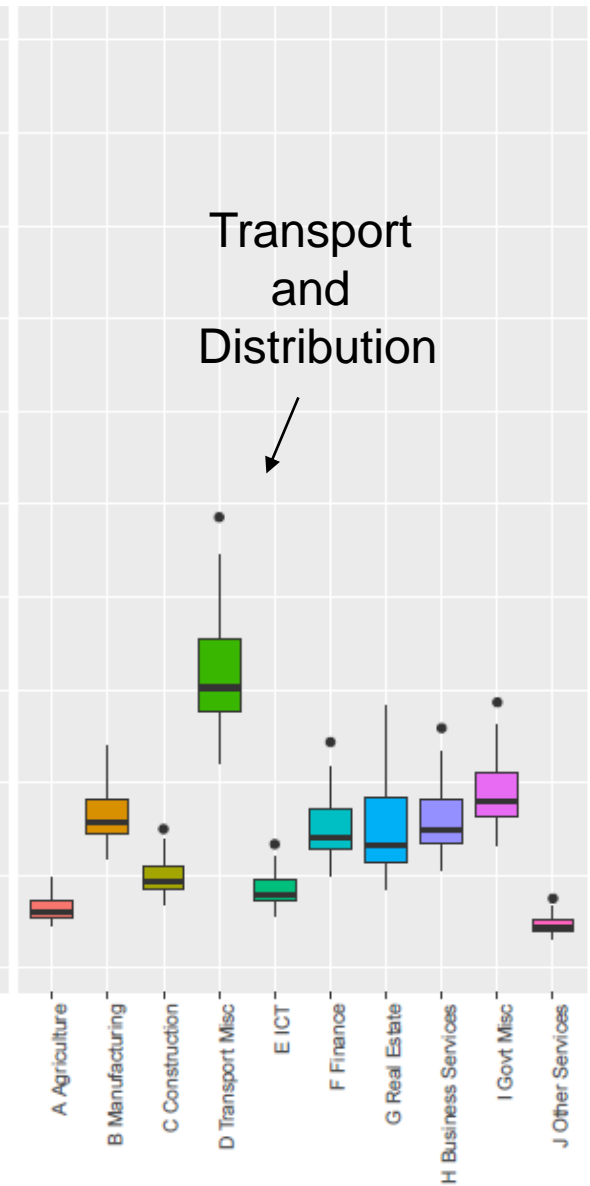
Direct Economic Loss



Indirect Downstream Loss



Indirect Upstream Loss



(n=300)

ONS Sector

Conclusions

- **Who** are the users?
 - *Big players who need the global picture*
- **What** do they need?
 - *Risk metrics, options and comparative analytics*
- **Why** do they need it?
 - *Directing limited resources to where they are most needed*

Centre for **Risk Studies**



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