



The Insurance  
Institute of London  
Chartered Insurance Institute

# The Insurance Institute of London

*CII CPD accredited - demonstrates the quality of an event and that it meets  
CII/PFS member CPD scheme requirements.*

*This lecture and podcast count as 45 minutes of CPD and can be included as part  
of your CPD requirement should you consider it relevant to your professional  
development needs. It is recommended that you keep any evidence of the CPD  
activity you have completed and upload copies to the recording tool as the CII  
may ask to see this if your record is selected for review.*



Cambridge Centre for Risk Studies

Scenario Best Practices

# DEVELOPING SCENARIOS TO UNDERSTAND RISK

The Old Library, Lloyd's of London

10<sup>th</sup> March 2020

Centre for  
**Risk Studies**



UNIVERSITY OF  
CAMBRIDGE  
Judge Business School

The logo for The Lighthouse Risk Network, featuring a stylized lighthouse beam and the text "THE LIGHTHILL RISK NETWORK".

THE LIGHTHILL  
RISK NETWORK

# Agenda

<b>Welcome</b> Chair: Andrew Carrier, Director, Willis Towers Watson	13:10
<b>Overview of Work on Scenario Best Practices</b> Dickie Whitaker, Chief Executive, Lighthill Risk Network	13:10
<b>Scenarios: Applications and Impacts</b> Prof Danny Ralph, Academic Director, Cambridge Centre for Risk Studies	13:15
<b>Developing Scenarios to Understand Risk</b> Oliver Carpenter, Lead Environmental Risk Research, Cambridge Centre for Risk Studies	13:25
<b>Q&amp;A and Concluding Remarks</b> End	13:45



Cambridge Centre for Risk Studies

---

Scenario Best Practices

---

# SCENARIOS: APPLICATIONS AND IMPACTS

**Prof Danny Ralph**

Academic Director

Cambridge Centre for Risk Studies

Centre for  
**Risk Studies**



UNIVERSITY OF  
CAMBRIDGE  
Judge Business School

The logo for The Lighthouse Risk Network, featuring a stylized lighthouse beam and the text "THE LIGHTHILL RISK NETWORK".

THE LIGHTHILL  
RISK NETWORK



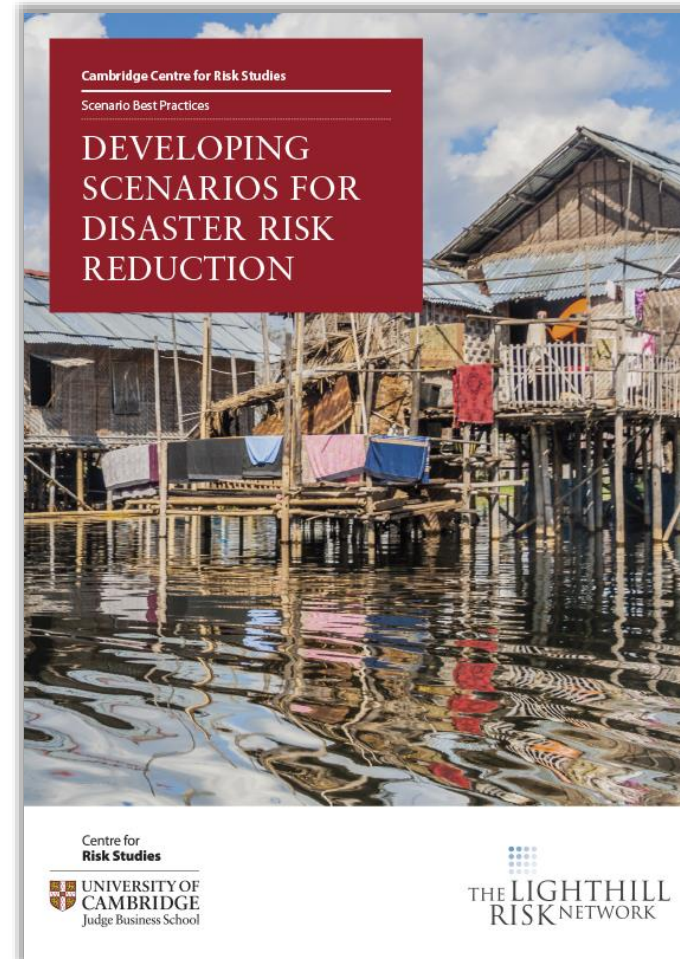
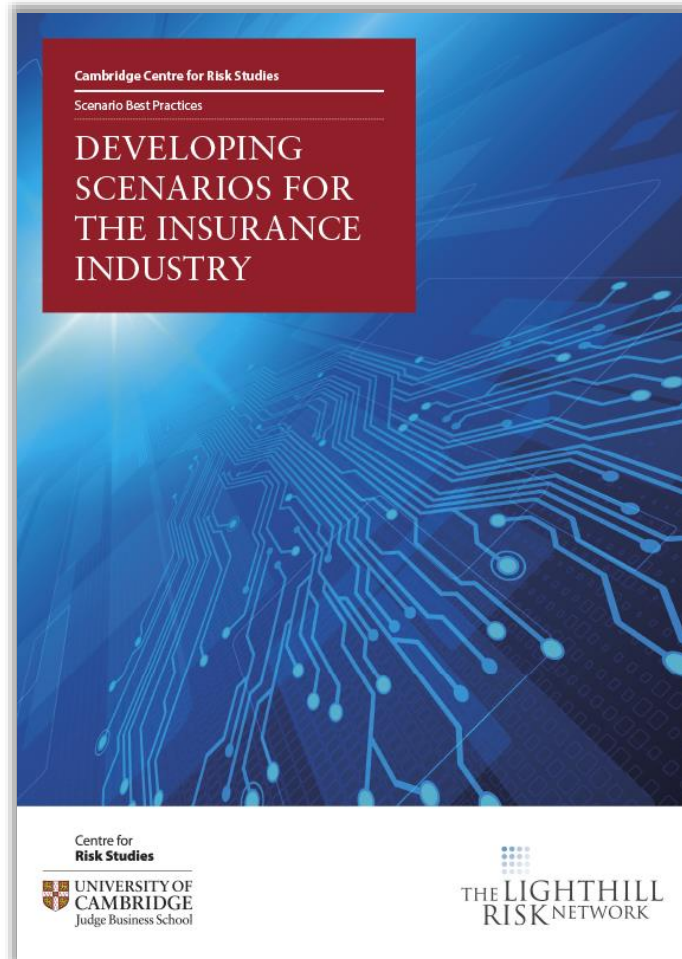
# Cambridge Centre for Risk Studies

## University of Cambridge Judge Business School



- An academic centre for research into systemic risk in business, the economy, and society
  - Based in the Business School at University of Cambridge
- Engage closely with, & principally supported by, commercial organisations
  - Decade of high business impact from collaborative research

# Scenario Best Practices: Reports Launch





# Science in Scenarios™





# A visible systemic risk

## Apple Extends Store Closures in China Over Coronavirus

By Mark Gurman  
7 February 2020, 20:38 GMT  
Updated on 7 February 2020, 23:29 GMT

- ▶ Apple website says most China stores will reopen Feb. 15
- ▶ Company is facing supply chain, sales concerns in China region



Holding on to Apple Despite Supply Chain Concerns: Crossmark Global



## The New York Times *SARS Stung the Global Economy. The Coronavirus Is a Greater Menace.*

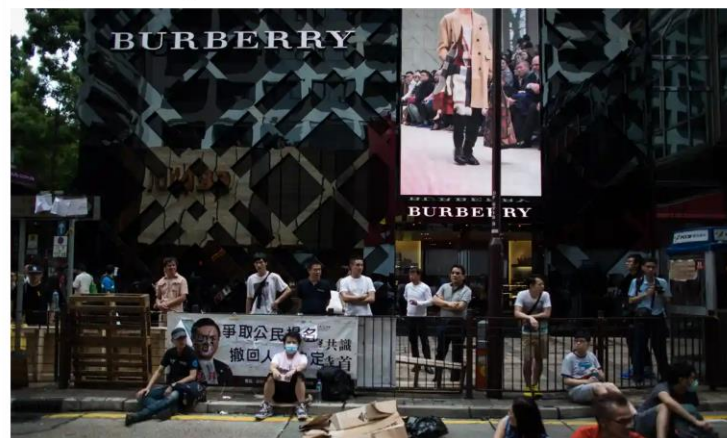
In the nearly 20 years since SARS, China's importance in the global economy has grown exponentially.



## Burberry says impact of coronavirus worse than Hong Kong protests

British brand closes 24 of its 64 stores in mainland China: shopper numbers plummet

Sign in  
The Guardian



## CNN BUSINESS Global shipping has been hit by the coronavirus. Now goods are getting stranded

By Hanna Ziady, CNN Business

Updated 0457 GMT (1257 HKT) February 6, 2020





## A visible systemic risk



**Business live** / Wall Street and FTSE 100 suffer worst week since 2008 – as it happened



Source: Refinitiv • By The New York Times

9 Mar

MARKETS INSIDER

09:59 PM 10:16 PM 09:59 PM 10:07 PM

# Dow plunges more than 2,000 points, biggest decline since 2008, as coronavirus fuels market turmoil

Ben Winck  
Mar. 9, 2020, 04:15 PM

SHARE

## Case study: Global insurer stress testing its risk appetite

- Emerging Risk Committee in 2013 asked about its exposure to digital, human health, geopolitical risks at global scale
- Cambridge CRS builds Stress Test Scenarios
  - Plausible but extreme events – tail risk
  - Assess insurance claims
  - Assess investment portfolio

Scenario Type	Assess risk to company	Response of company
Human Disease	?	?
Cyber Catastrophe	?	?
Interstate Conflict	?	?



War Scenario



Pandemic Scenario



SITE Cyber Scenario



# SETTING UP A PANDEMIC SCENARIO: SELECT A TYPE OF PANDEMIC



## 1. Highly Infectious Disease – Moderate Virulence

- Eg, influenza pandemic that infects a high % of population, but kills only a tiny fraction
- Scale (no. of people) affected is key to societal impact

**SAO  
PAOLO  
PANDEMIC  
VIRUS**

## 2. Virulent Disease – Low Infection Rate

- Potential for impact at around 1-in-100; eg, SARS, not Ebola
- Kills high percentage of those infected, but spread is limited
- Fear rather than bodily damage is key to societal impact

## 3. New variant of contagious pathogen for which medical science has no initial treatment

- Eg, Lab. gain-of-function H5N1, AIDS, or haemorrhagic virus
- Extremely low probability (well beyond 1-in-100)
- Could combine high virulence with high infection



# An Outbreak of Mystery Illness in Brazil Poultry Farmers

CASSANDRA.com

[Sign up](#) [Log in](#)

[Hypothetical News](#)

[TV & Video](#)

[International](#)

[Business](#)

[Sport](#)

[Entertainment](#)

## Virus warning for Brazil

Mystery virus spreads as government warn citizens to avoid Brazil

Wednesday, Nov 12

Sao Paulo (1048 GMT – 0648 BRT) -  
The UK Foreign & Commonwealth  
Office and US State Department have  
issued a travel advisory warning for  
Brazil following an outbreak of an  
unidentified deadly virus.

Brazilian government officials have  
condemned the moves, calling them a  
"reckless, irresponsible and expensive  
overreaction", but UK officials point to



**WHO specialists arrive in Brazil to  
investigate the mystery virus that  
has caused over 100 deaths.**





The Mystery Virus Kills Many of its Initial Victims

WHO Officials Identify it as 'H8N8'

Stockmarkets React

Regional Tourism Impacted

■ Brazil Soccer World Cup 2014 is



Sick Travellers Spread the Infection Worldwide

CASSANDRA.com

Sign up Log in

Hypothetical News

TV & Video

International

Business

Sport

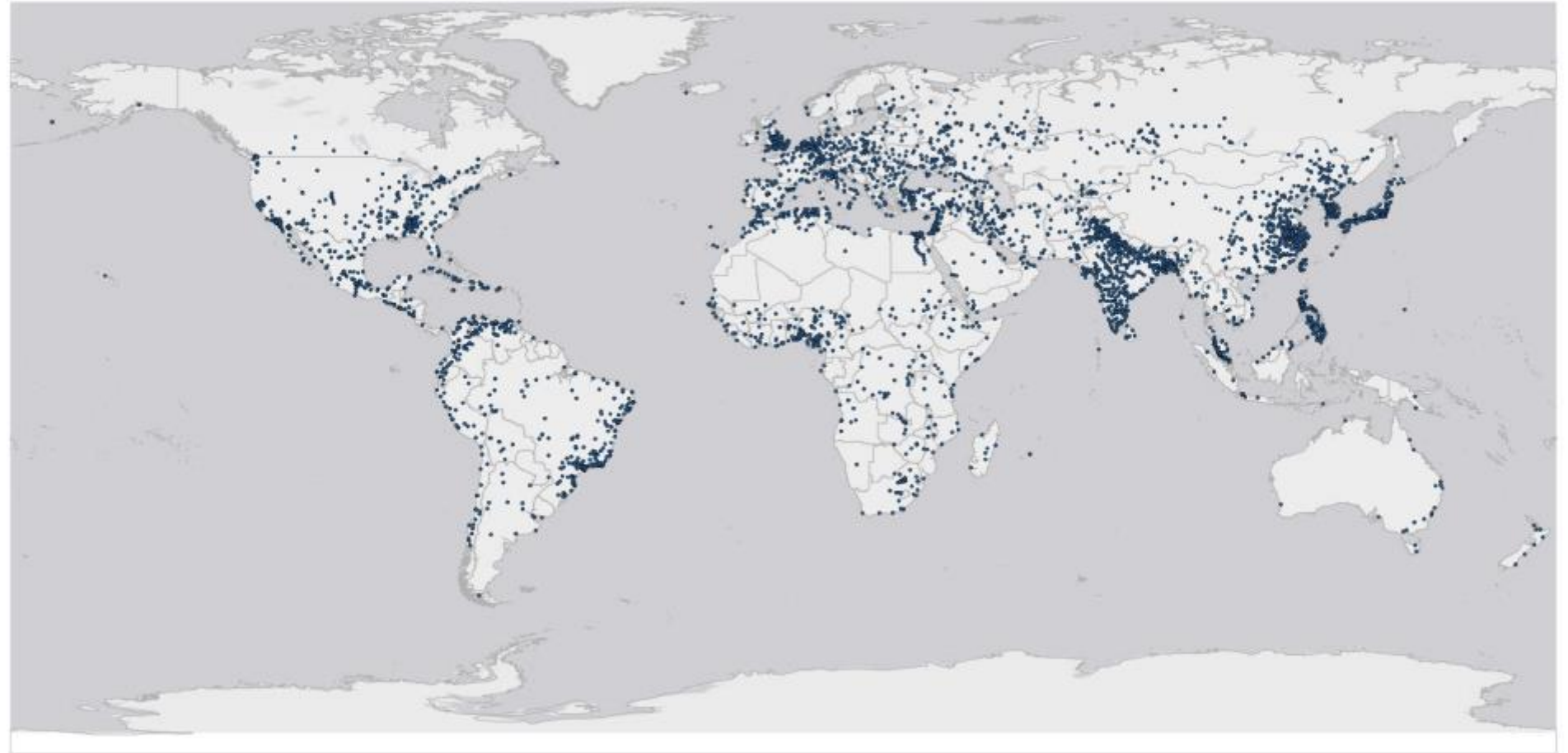
Entertainment

Sao Paulo Virus sweeps across globe



# SÃO PAULO Pandemic spread

Acknowledgement:  
Risk Management Solution's  
LifeRisks Infectious Disease model



Week

0

Number of People Infected in City







## Schools Close in Response to Pandemic

Healthcare Resources Are Overwhelmed  
Sickness Levels Increase in the Workplace

UK

Total  
Norm  
Pand

Total  
Norm  
Pand

- Absenteeism comes from
  - Illness
  - caring for dependents
  - fear of becoming infected
- At absenteeism levels above 10%, productivity is hit harder
- At 20% absenteeism, many businesses cannot operate ...



## Pandemic: Global GDP impact of scenario variants

Scenario Variant	Infection Rate	Global Death Toll	Duration of Wave	GDP@Risk
<b>S1:</b> Standard Scenario	43%	19 million	7 months	<b>\$7 Trillion</b>
<b>S2:</b> Poor government response	43%	22 million	8 months	<b>\$10 Trillion</b>
<b>S3:</b> Vaccine failure	43%	24 million	9 months	<b>\$14 Trillion</b>
<b>X1:</b> Poor gov. response & vaccine failure	43%	25 million	12 months	<b>\$23 Trillion</b>
2007-2012 Great Financial Crisis				\$18 Trillion
<b>Great Financial Crisis</b> as if at 2014				<b>\$20 Trillion</b>



## Case study: Global insurer stress testing its risk appetite




- Emerging Risk Committee in 2013 asked about its exposure to digital, human health, geopolitical risks at global scale
- Cambridge CRS builds Stress Test Scenarios
  - Plausible but extreme events – tail risk
  - Assess insurance claims
  - Assess investment portfolio



War Scenario



Pandemic Scenario

Scenario Type	Assess risk to company	Response of company
Human Disease	↑	
Cyber Catastrophe	↑	
Interstate Conflict	↓	

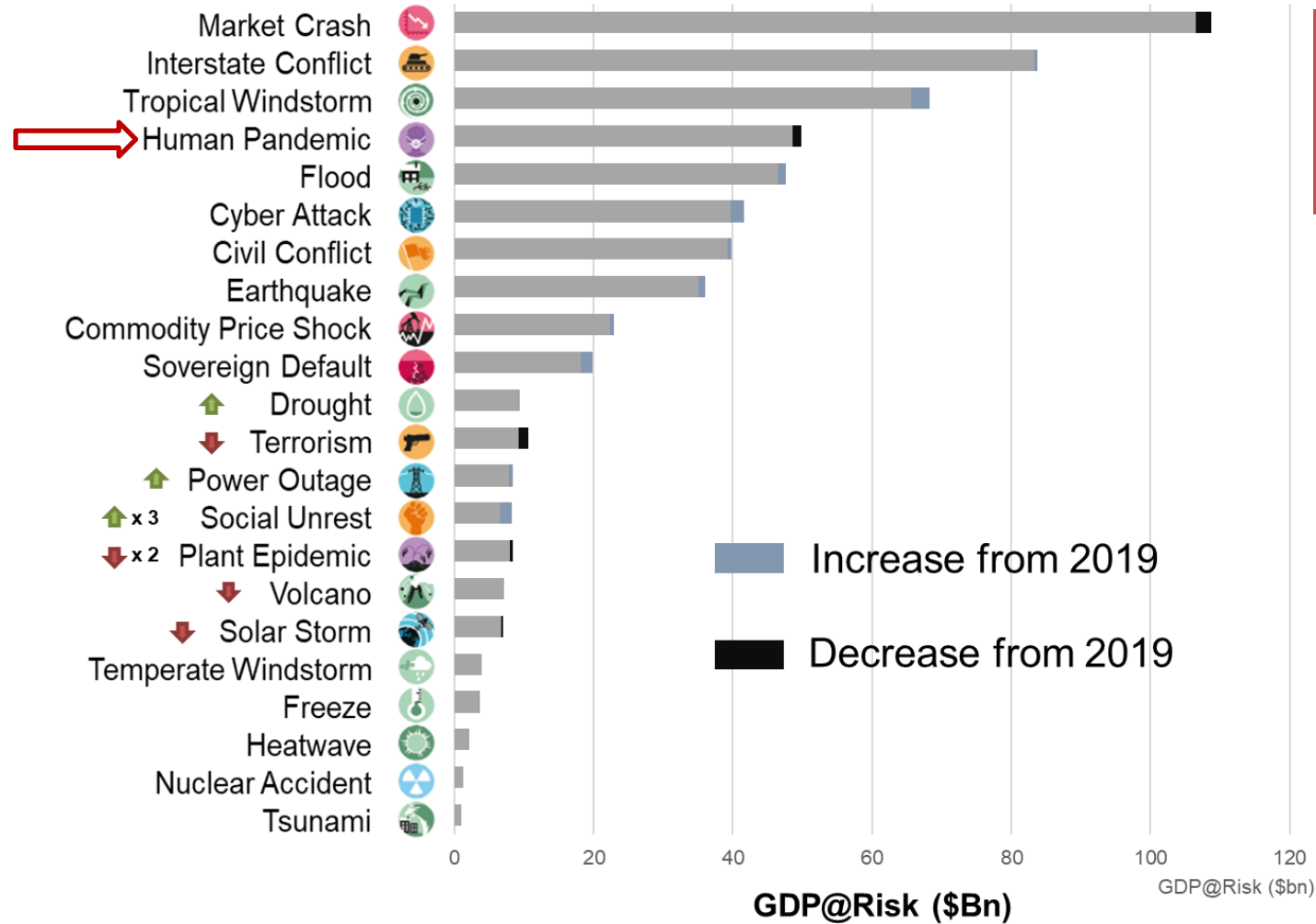


SITE Cyber Scenario

Now, make the leap to analytics!

## 2018 Lloyd's City Risk Index

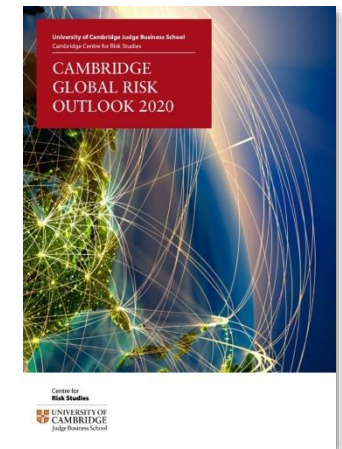
## 2020 Cambridge Global Risk Index



“Remarkably prescient”



Today programme  
10 Feb 2020



<https://cambridgebusinessriskhub.com>



Cambridge Centre for Risk Studies

---

Scenario Best Practices

---

# DEVELOPING SCENARIOS TO UNDERSTAND RISK

**Oliver Carpenter**

Lead Environmental Risk Research

Cambridge Centre for Risk Studies

Centre for  
**Risk Studies**



UNIVERSITY OF  
CAMBRIDGE  
Judge Business School

The logo for The Lighthouse Risk Network, featuring a stylized lighthouse icon above the text.

THE LIGHTHILL  
RISK NETWORK

# Scenarios to Understand Risk

- Scenarios have a wide and varied and wide range of uses
- To better understand the characteristics and consequences of unknown, uncertain, or unexpected future events
- Explore interconnectivities and complexities in systems
- Increasingly used by underwriters, analysts, risk managers, actuaries, and other stakeholders in the (re)insurance community
- But wide usage in insurance applications is immature
- Opportunity to make better use of scenarios to explore a range of risk dimensions





# The benefits of scenarios

- **Support decision making**
  - Stress test the efficacy of decisions and validate risk management and resource allocation
- **Address uncertainty**
  - Explore range of plausible outcomes and understand drivers of change
- **Aid communication**
  - A tool to share ideas through both the development and delivery process
- **Demonstrate due diligence**
  - Expose vulnerabilities within an organisation
- **Identify Bias**
  - Identify potential partialities towards certain situations and decisions
- **Sensitivity Analysis**
  - Test variability and uncertainties in model or system outputs
- **Systems thinking**
  - Capture interconnectivities and causal relationships in complex 'systems of systems'

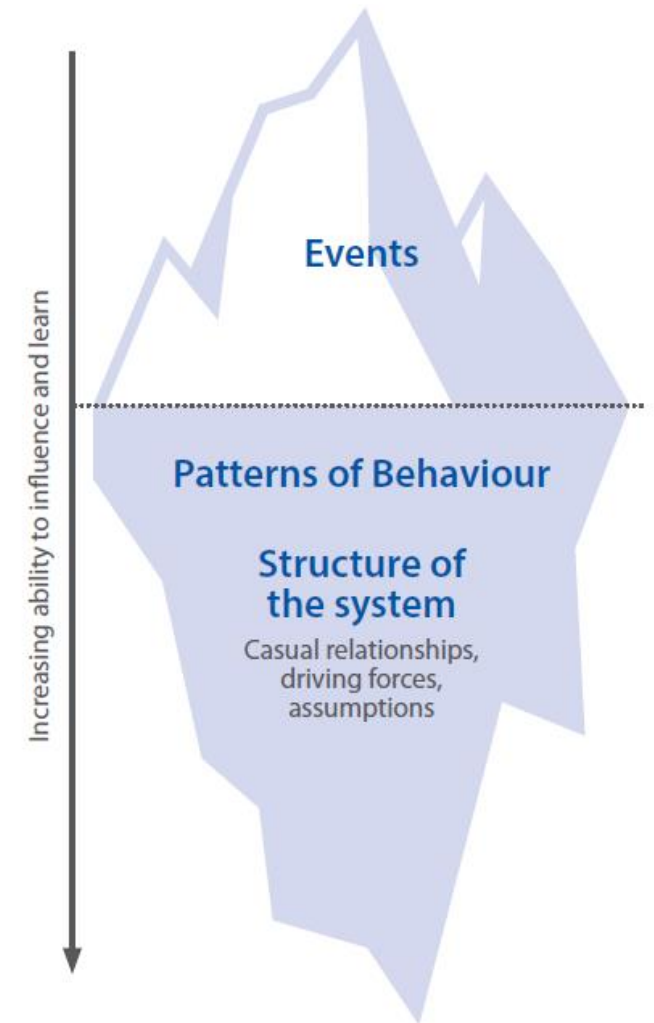


Figure 3: Systems thinking – the iceberg analogy  
(adapted from Senge, 1990; Van der Merwe, 2008)

# Scenario Development Framework for the Insurance Industry



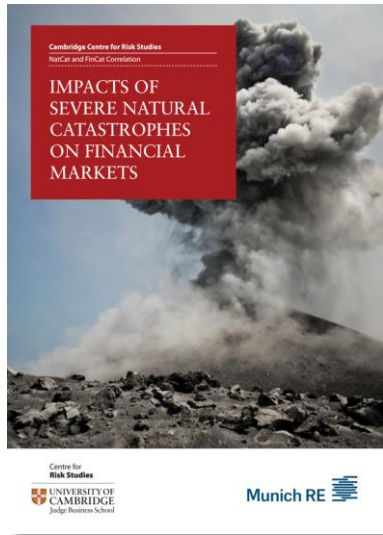


# Scenarios Applications in Insurance

## Understanding Tail Risks

To identify and understand extreme, low probability risks

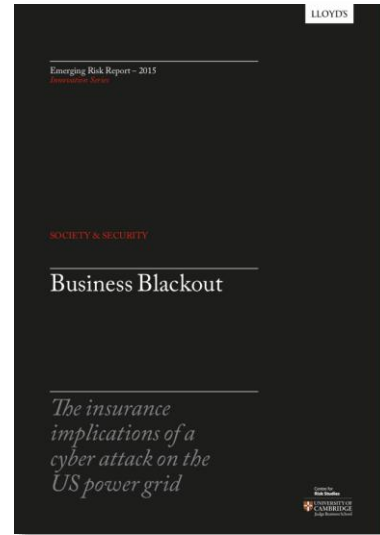
- Reinsurance purchasing
- Counterfactual analysis



## Understanding Emerging Risks

To imagine and comprehend new and evolving risks

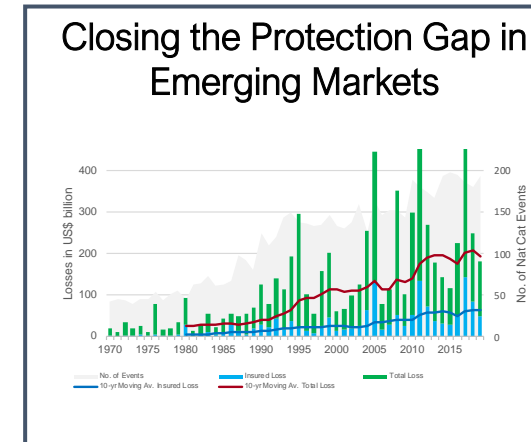
- Policy wording
- Trialing insurance concepts
- Problem verification



## Strategic Planning

To define a resilient strategy for the future that alleviates risks

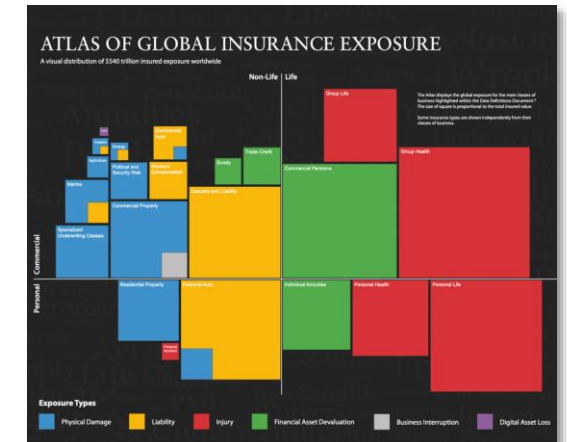
- Respond to risk and opportunity



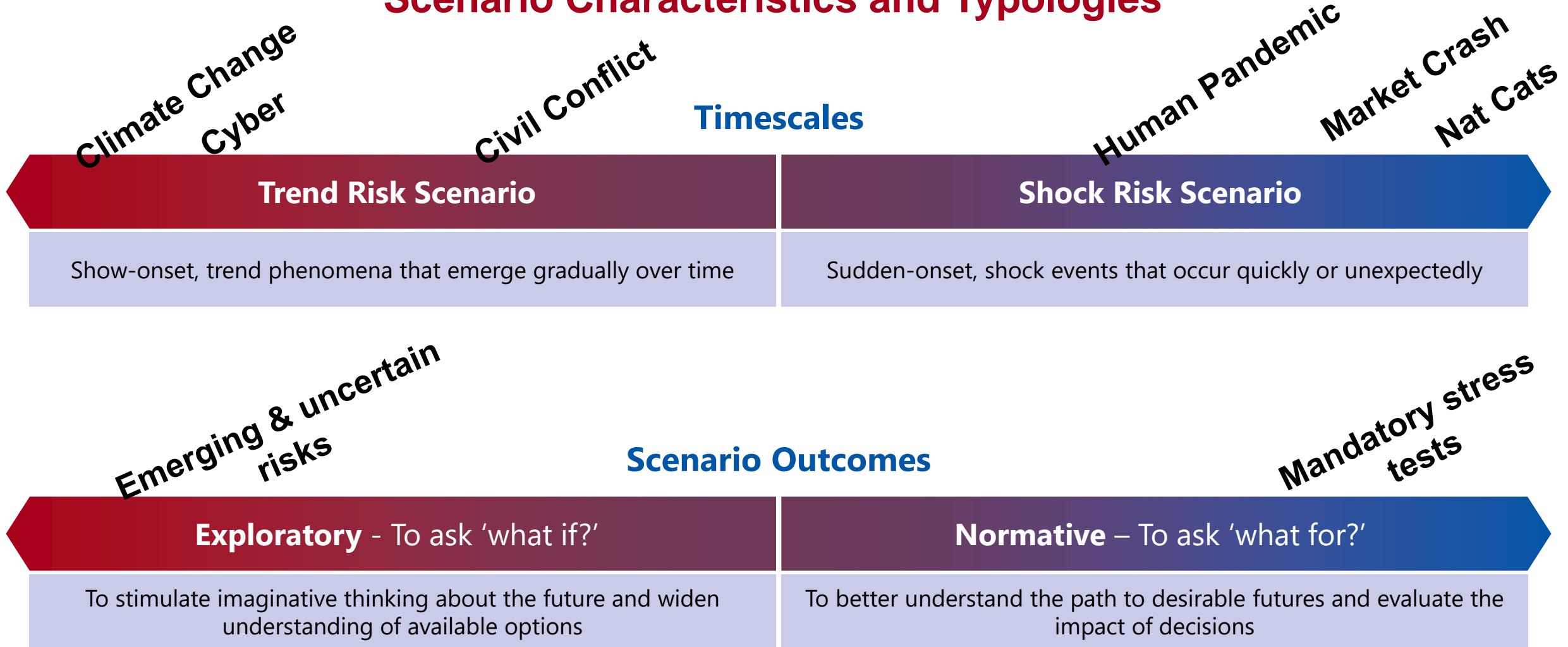
## Accumulation Management

To explore possible extreme or maximal correlated losses to insurance portfolios

- Quantify probable maximum loss
- Clash scenarios



# Scenario Characteristics and Typologies





# Scenario Characteristics and Typologies

## Ownership and Participation

**Participatory** – Bottom-up, co-production of knowledge

To incorporate stakeholder culture, knowledge, and experience in the process and end product

**Expert-Driven** – Top-down, analytical

To deliver rigorous scientific descriptions of plausible futures to decision makers

## Definition of Probability

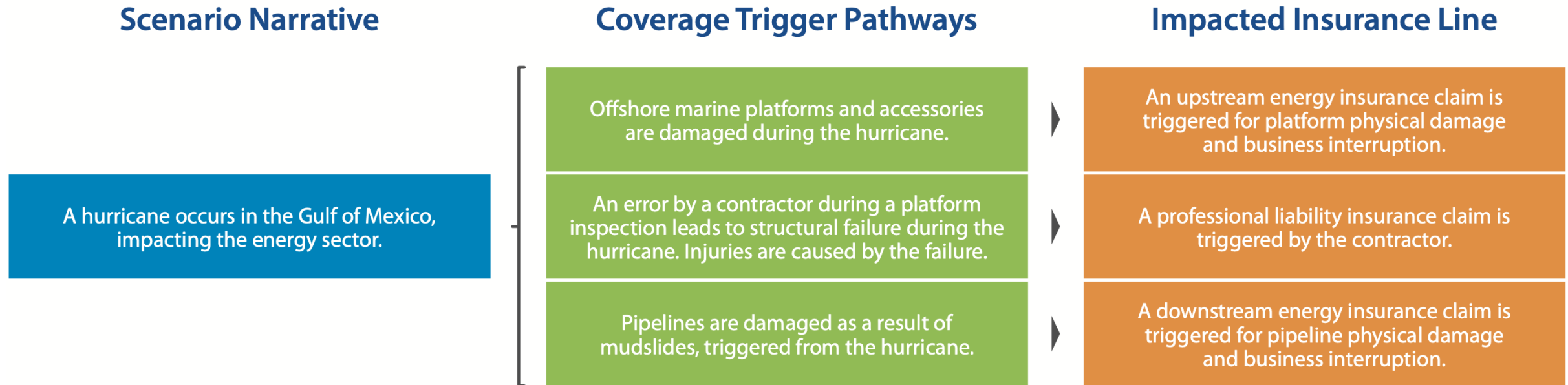
**Probabilistic**

To estimate the likelihood of occurrence based on the variance of quantified causal parameters

**Deterministic**

To speculatively explore phenomena that involve a high degree of uncertainty

# Insurance Scenario Coverage Trigger Pathways



- More generally ‘consequence’ trigger pathways – translating narrative to impact
- To stress a specific type of insurance by impacting insured (tangible or intangible) assets
- To view all the business classes insured in the event footprint that could be stressed



# Opportunities for Disaster Resilience

- Society and industry (incl. insurers and corporates) still learning to recognise and manage risk
- Similarly, in domain of disaster risk there is opportunity for proactive approach to risk reduction rather than ex-post recovery
- Disaster risk reduction (DRR) is cost effective and generates sizeable returns
  - E.g. Average global DRR benefits of about 4 times the costs in terms of reduced losses (Mechler 2016)
- Scenario approach is critical tool for disaster risk managers
  - Knowledge exists, but not widely shared
- Similarly, aim to engage a wider range of stakeholders to benefit from scenario planning





# Disaster Risk and Resilience: Opportunity for Scenario Planning

## Germany Floods 2013

- Adequately financed & effectively managed
- Coordinated FRM strategies at catchment level, but questionable across state/national borders
- Reliance on flood protection & significant residual risk ('levee effect')

## UK Floods 2007

- Marked a step change in UK FRM (motivated by Pitt review)
- Developed (subsidised) flood insurance market (90% penetration)
- But improved resilience has had limited impact on recovery speed/quality

## Hurricane Sandy USA 2012

- FEMA generally commended for immediate management effort (especially compared to Katrina)
- But disparate recovery – exacerbated existing socioeconomic inequality
- NYC adaption pathways represent shift in thinking towards resilience

## Typhoon Damrey Vietnam 2017

- Communal self help & finance
- Little international attention & involvement
- Rapid development of economy provides opportunity but challenges existing resilience mechanisms

## Typhoon Haiyan Philippines 2013

- Extreme magnitude event impacted huge swath of central PHP islands
- Exposed structure of management & governance – national vs regional
- Dependence on external aid
- Coordinated efforts to build back better

## India-Pak. Floods 2014

- Poor regional risk management, no early warning systems
- Cross-border tension & Kashmiris reject Indian rule – media further eroded gov. trust
- Reliance on external aid, but failure of state to provide timely relief



# Case Study: Shen Cyber Attack Scenario



- Exploring impact to the global economy and insurers of several Asia-Pacific ports closed as a result of a cyber-attack?
- Economic losses from closures and disruption range from \$40.8 billion in the least severe scenario variant to \$109.8 billion in the most extreme

The Shen attack was named from Shèn 蜃, a shapeshifting sea monster or clam monster from Chinese mythology. The large-scale cyber-attack on ports scrambles records of container contents, causing widespread chaos and confusion.

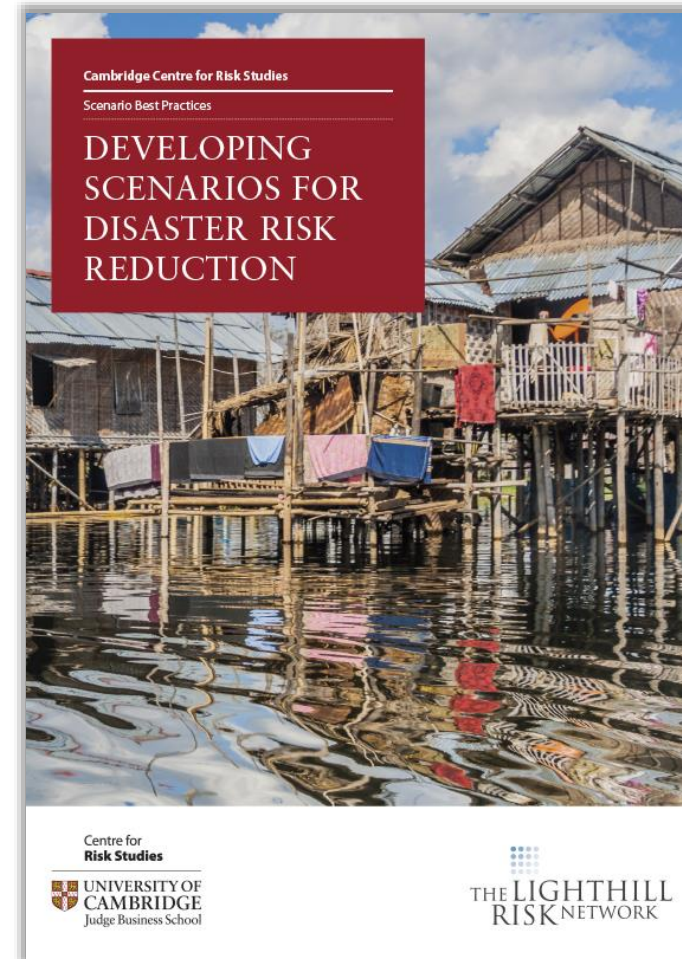
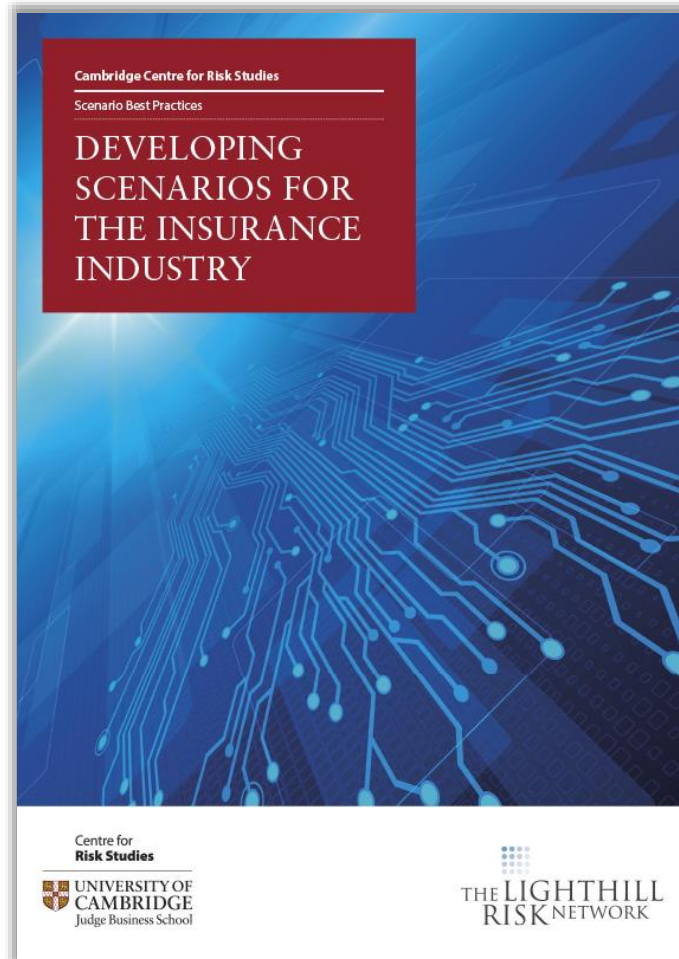


Scenarios need catchy names!



Shen attack: Cyber risk in Asia Pacific ports

# Scenario Best Practices: Reports Launch



Centre for  
**Risk Studies**

---



UNIVERSITY OF  
CAMBRIDGE  
Judge Business School





The Insurance  
Institute of London  
Chartered Insurance Institute

## Feedback

Please take a moment to complete this Feedback Form. Your comments will enable us to ensure that future CPD activities satisfy the needs our members.

To access the survey, scan this Quick Response code with your QR reader app on your mobile phone

