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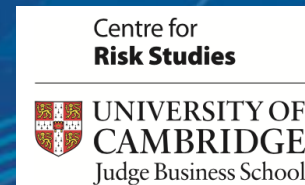
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Cambridge Centre for Risk Studies

Scenario Best Practices

DEVELOPING SCENARIOS FOR THE INSURANCE INDUSTRY

Dr Trevor Maynard

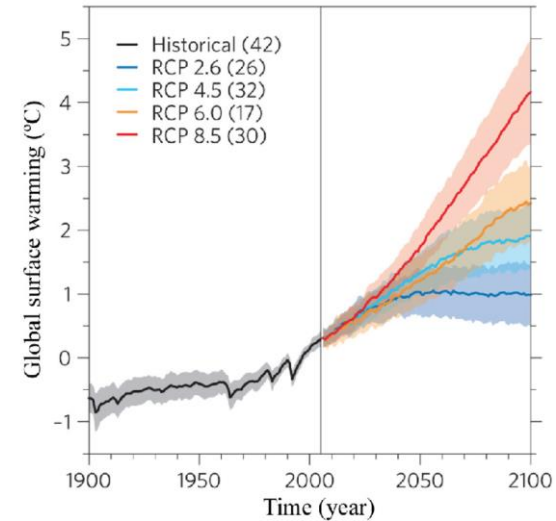
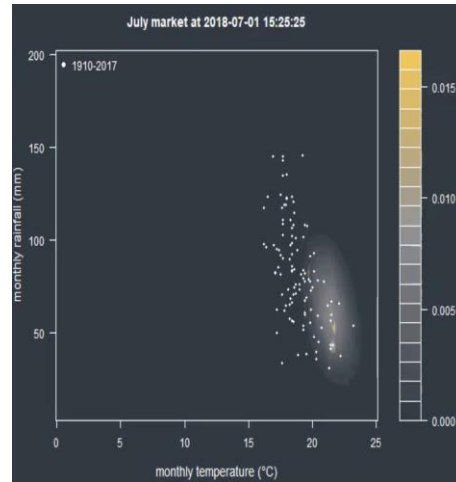
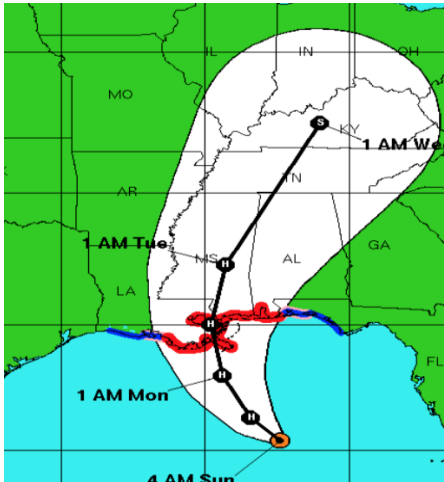


Forecast

Prediction

Projection

Scenario



Most likely outcome
Best track

Probabilistic assessment
X **will** happen

Probabilistic assessment
X **will** happen **if**
{conditions met}

Semi-Probabilistic assessment
X **could** happen if
{Fundamental assumptions}

What is a scenario?

- A Description
- Potentially plausible event
- Set of outcomes



Types of scenario

- Trend risk



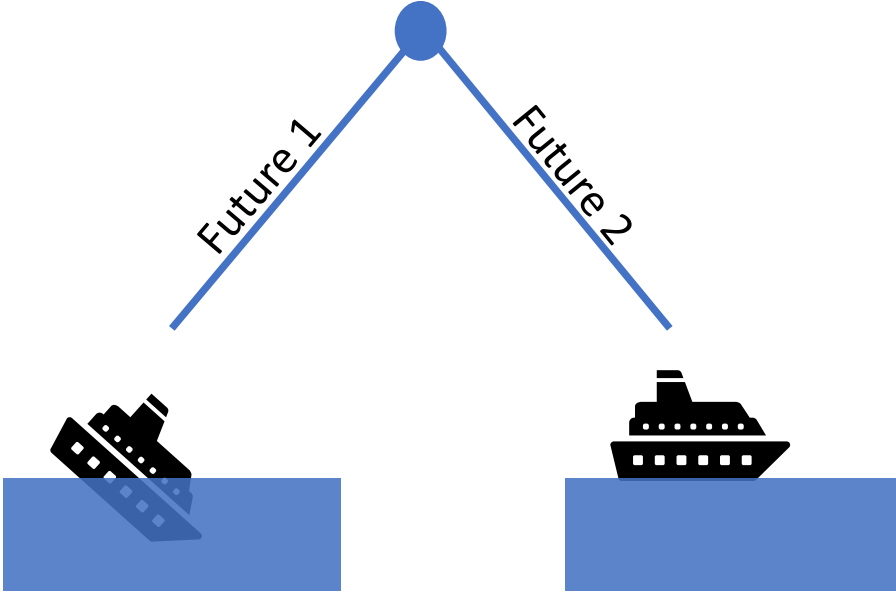
Lake Mead. Credit: Ethan Miller/Getty

- Shock risk



Oradea Romania

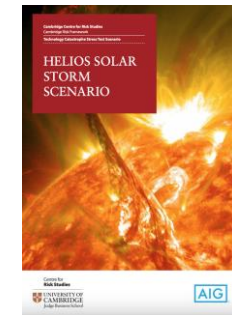
Scenarios provide alternative futures



Who uses scenarios?

(Enterprise) Risk Managers	Regulators
Accumulation Controllers	Claims Managers
Underwriters	Risk Capital Controllers
Pricing Actuaries	Business Planners
Advisors	Investment Managers
Transaction Intermediaries	Product Designers
Rating agents	Reinsurance Buyers

Who produces the scenario?



Participatory - Bottom-up, co-production of knowledge

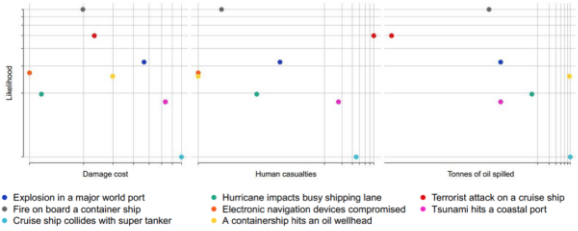
Expert-Driven - Top-down, analytical

Bottom up - example

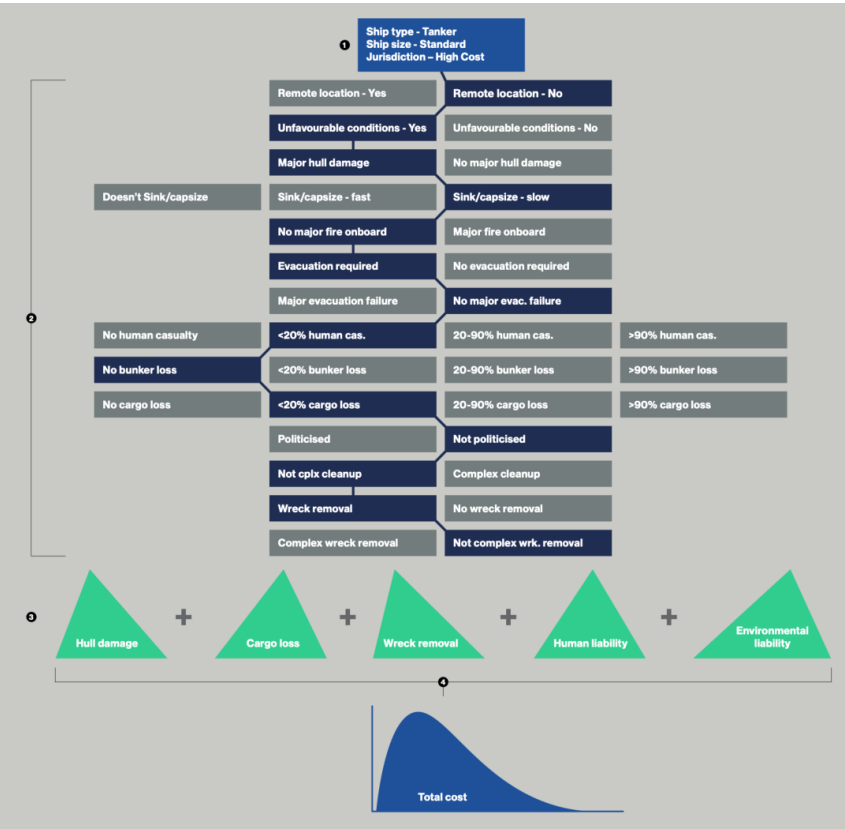
Data on frequency, by vessel class



Expert views on likelihood

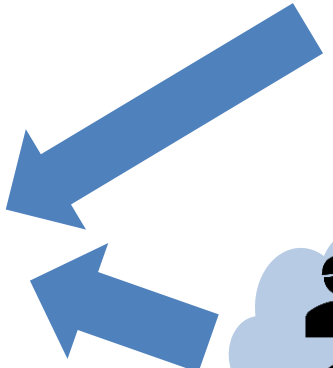


Expert views on event tree design



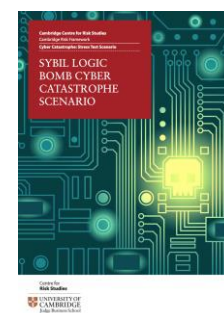
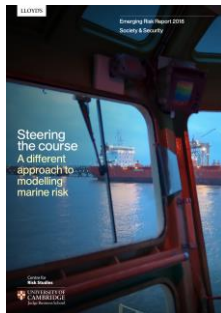
Lloyd's-Cambridge Marine Risk Model

Database of past events



Expert views on loss potential

Likelihood

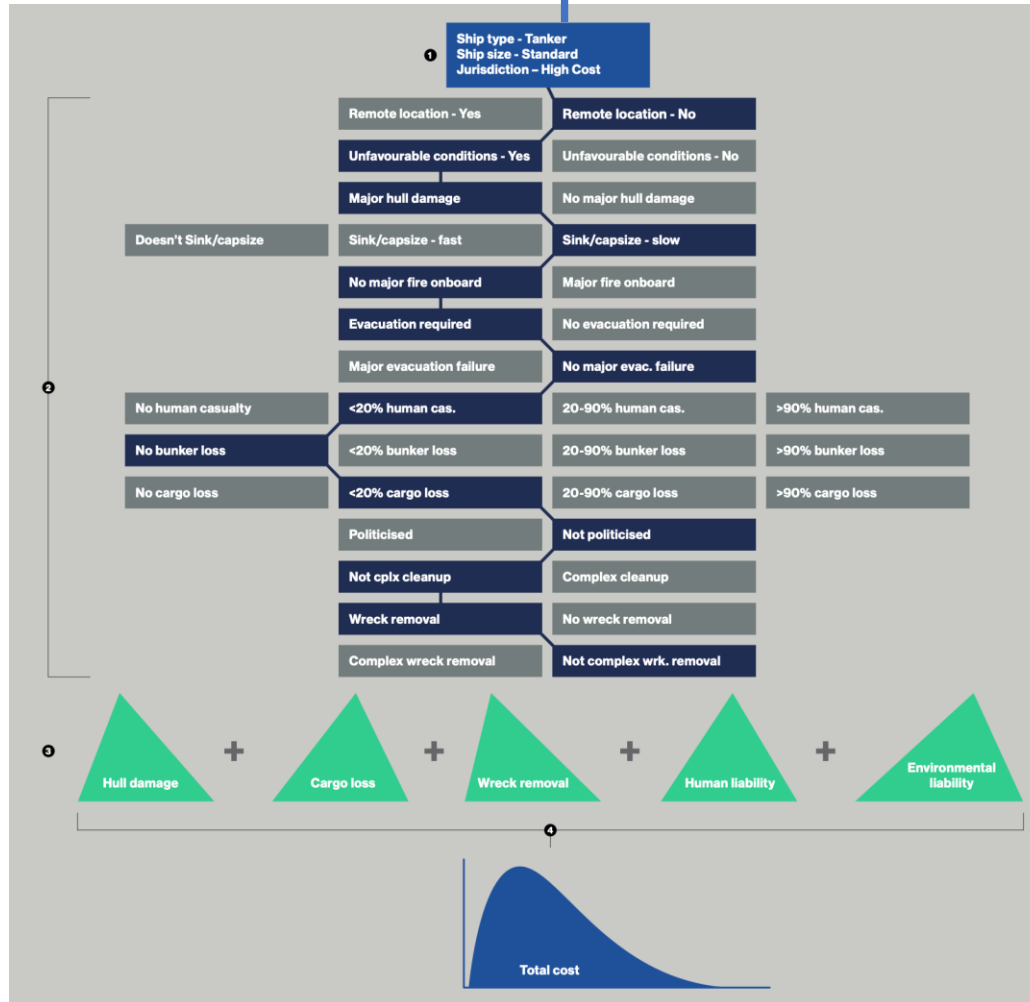


Probabilistic

Deterministic

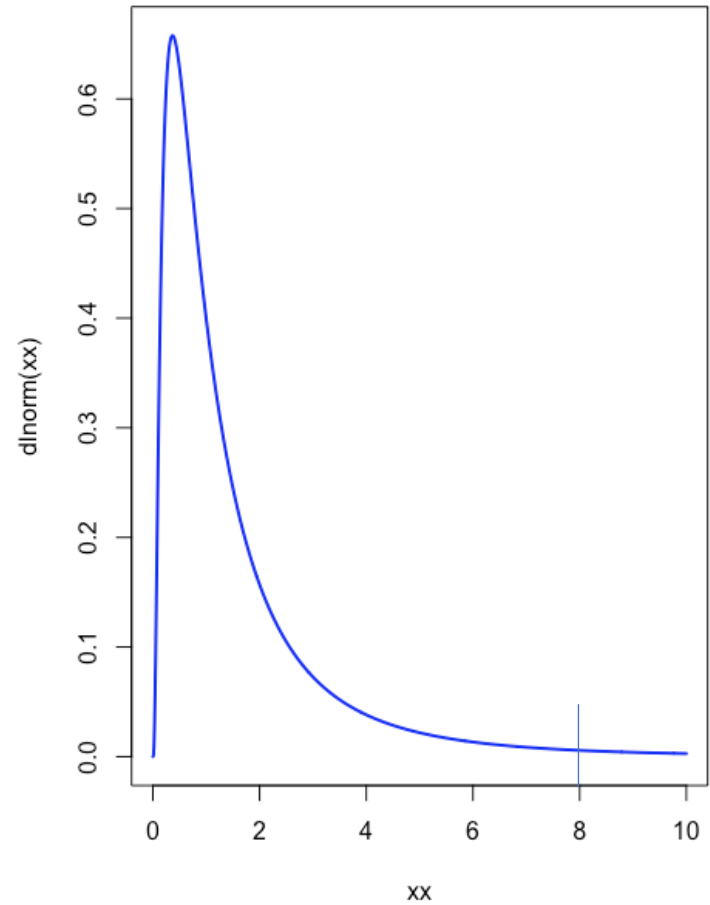
Future 1

Future 2



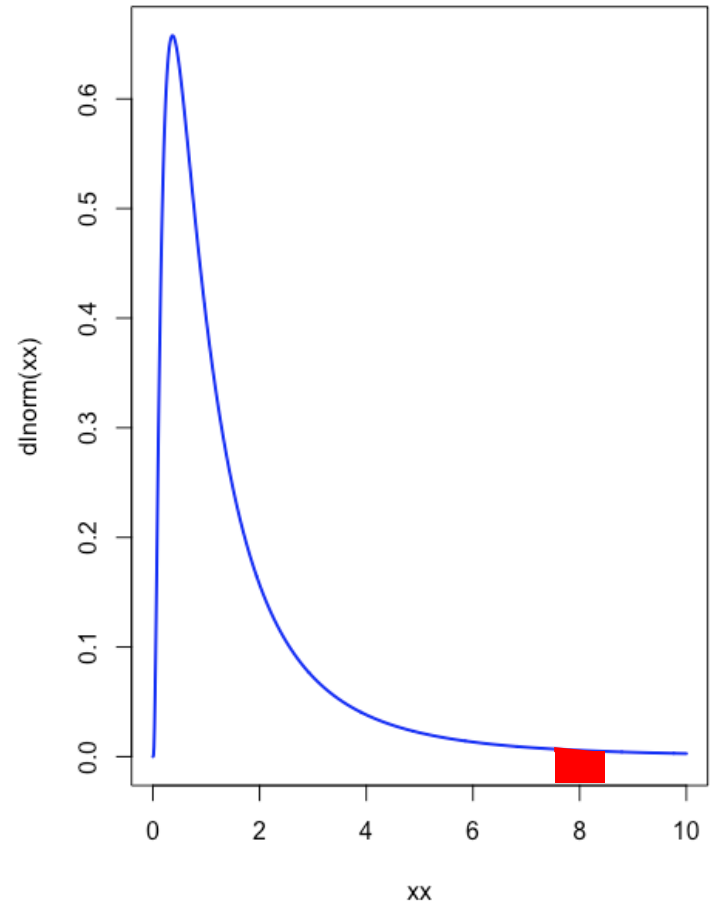
The more detail in a scenario the lower its probability becomes...

What is the probability $xx = 8$?



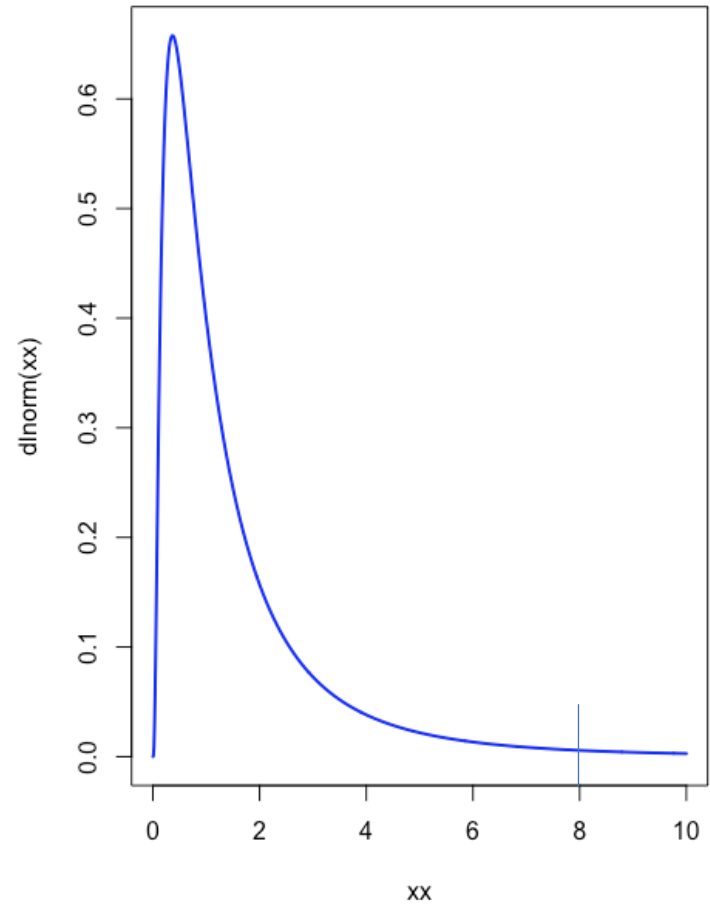
Zero

Probability of a range is meaningful



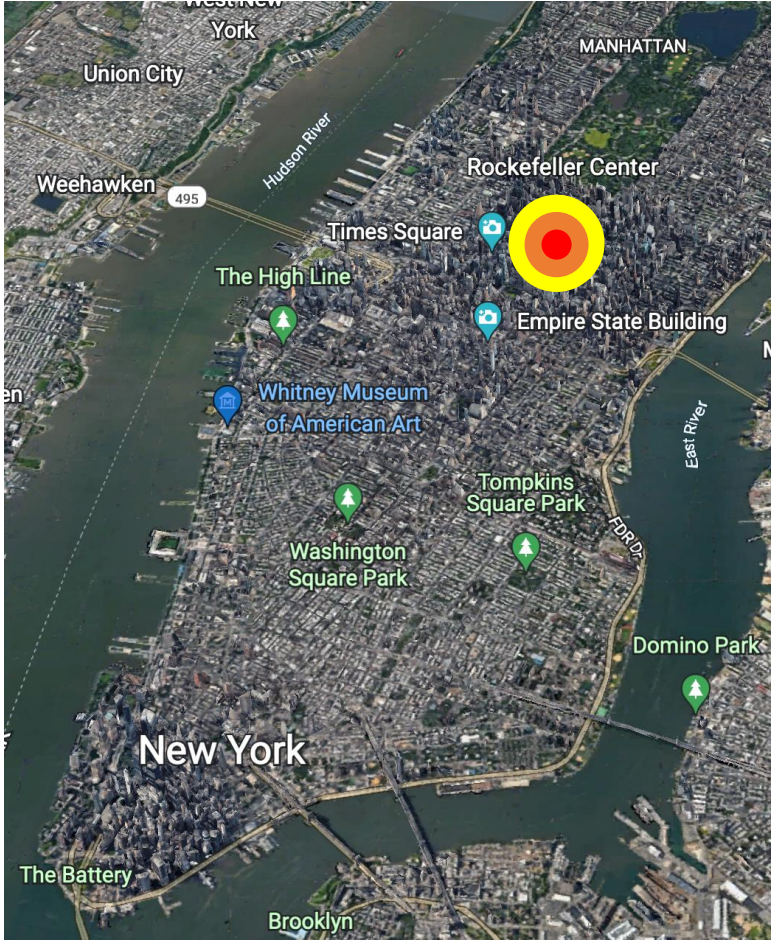
$$7.82 < xx < 8.25$$

Scenarios describe events



$$xx = 8$$

The probability of a scenario “like this”



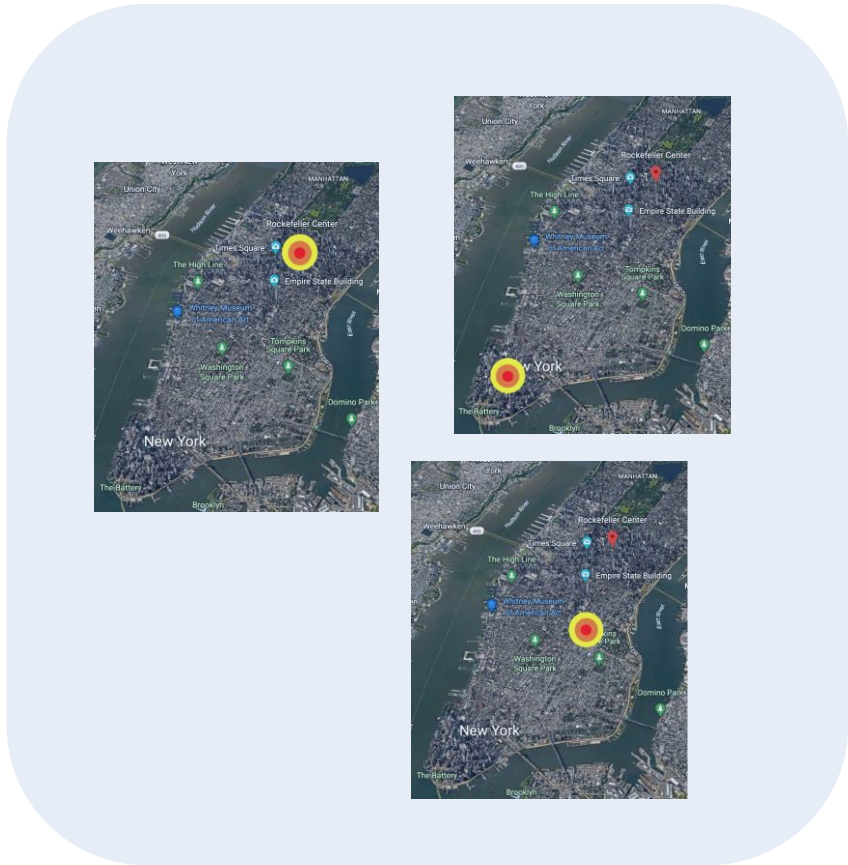
The probability of a scenario “like this”



The probability of a scenario “like this”

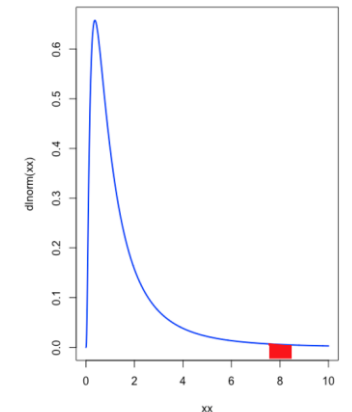


The probability of a scenario “like this”

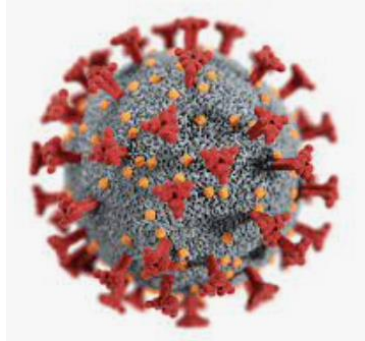


A single scenario *represents* a class of “similar” scenarios

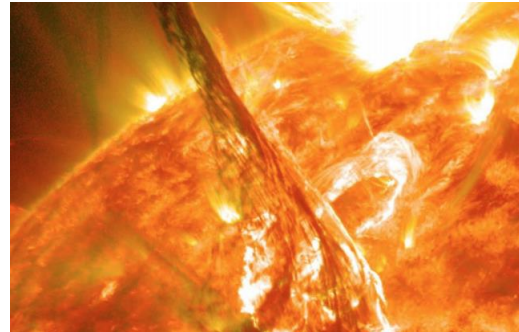
Taken together a scenario class can have a probability



Probability is important



1/40 ?



1/150 ?

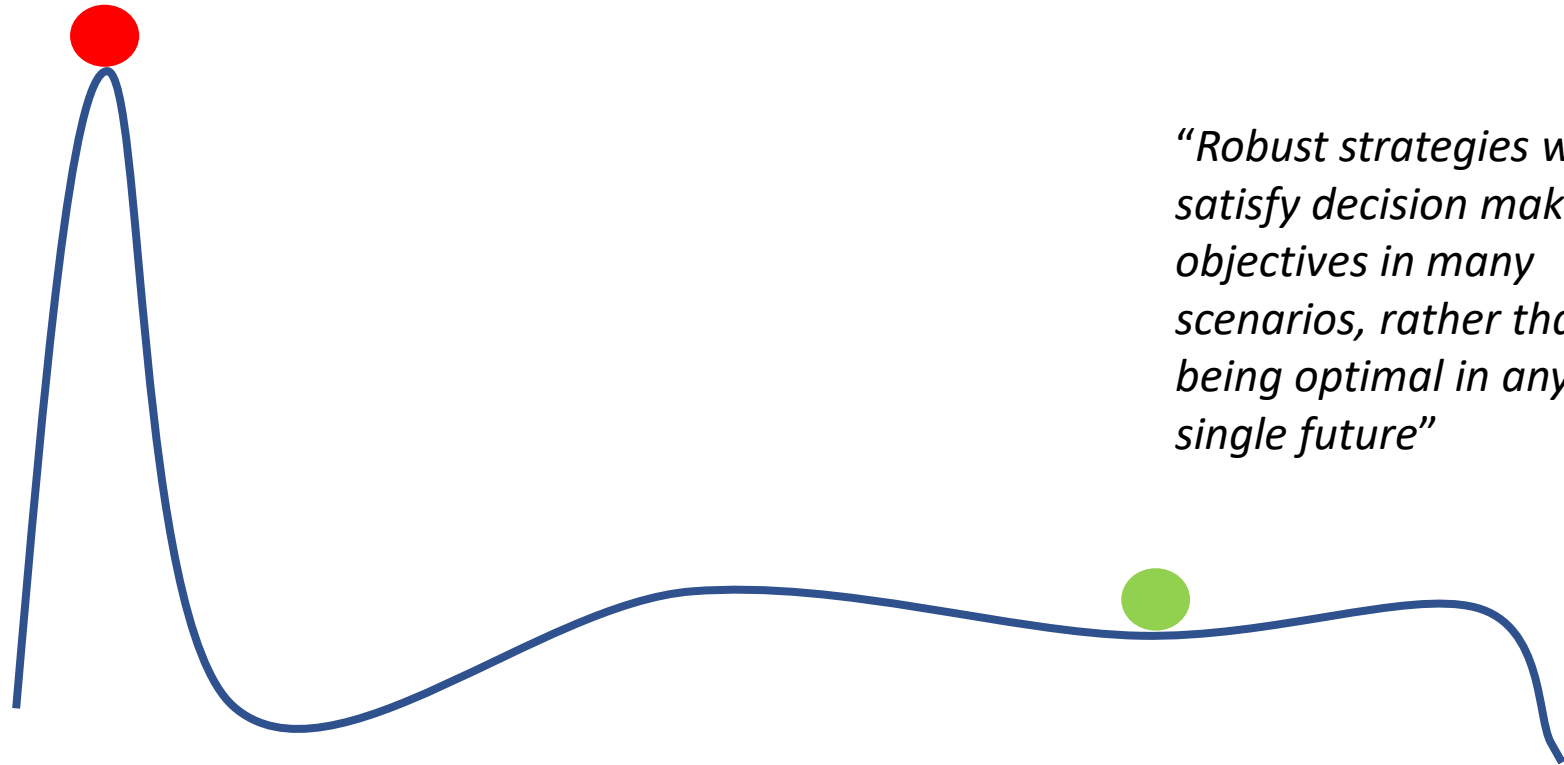
Source: Nasa



1/65000000 ?

Single scenarios are dangerous

Optimal vs robust



"Robust strategies will satisfy decision makers' objectives in many scenarios, rather than being optimal in any single future"

When to avoid (single) scenarios

- Major uncertainty
 - Danger of group think
 - Belief only one set of outcomes possible
-
- To avoid: develop multiple scenarios not just one

Single scenario

Pandemic = Influenza

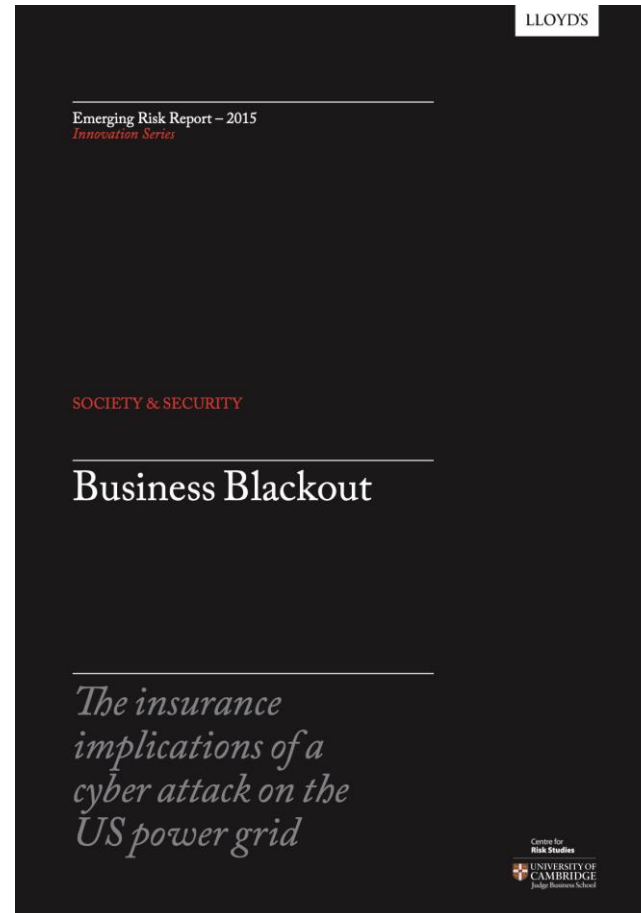
- E.g. Covid – 19 vs Typical Influenza
 - More contagious
 - Contagious 2-3 days before symptoms vs 1
 - Contagious for longer
 - Symptoms last 2-14 days (vs 1-4)
 - More serious illness in some
 - Different drugs required to treat

Steps to create a scenario



Illustrative example

Business blackout





Scope the risk

- Purpose: explore clash risk from a cyber cause
- Intention: explore a new non-standard scenario – power loss
- Focus: Explore “silent cyber” / ambiguous cover



Conduct background research

Consult experts

- What policies might pay out in a power outage?
- Does it matter that the proximate cause was cyber?
- What evidence is there for hackers targeting this area?
- Is a cyber induced outage possible?
 - Which vulnerabilities could be exploited?
 - Extent of geographical impact?
- How extensive have blackouts been from non-cyber causes?
- Have there been near misses?
- How does a grid work? Weak points? What cyber security is in place?



Frame the scenario(s)

- What is the scenario for? Understand novel risk
- What benefit? Narrow uncertainty
- Timescale? Shock scenario (not trend)
- Outcome? What if?
- Method? Expert driven/ top down
- Promulgation? Public report
- Probability required? Yes (private)



Develop candidate scenarios

- From discussions; near misses; historical events; key vulnerabilities; counterfactuals
- Three candidates (brief narrative):
 - Attack generators; interfere with energy markets; attack analytics
- Review candidates at workshop
 - Feasibility; severity; insurance impact; interest



Develop a narrative

- Develop more detailed narrative
 - Generators attacked
 - Location for max impact
 - Time before emergency response
- Include insurance trigger pathways
 - Fire
 - Non-repairable
 - Unidentified group



Assess impacts and materiality

- Develop a ground up loss
- Details:
 - Which states
 - What assets impacted? (e.g. perishable products)
 - Where are these held: hospitality; medical centre; chemical facilities etc
- Incident rate
 - % of locations with no perishables
 - % of locations with back-up power
- Identify insurance coverages
- Calculate loss



Communicate and act

- Review aggregated results **given outputs**
 - Expert opinion
 - Questions:
 - Outage length plausible?
 - Missing steps in narrative?
 - Losses within expected range?
- Iterative process (sometimes)
- Publish (sometimes)

Danger

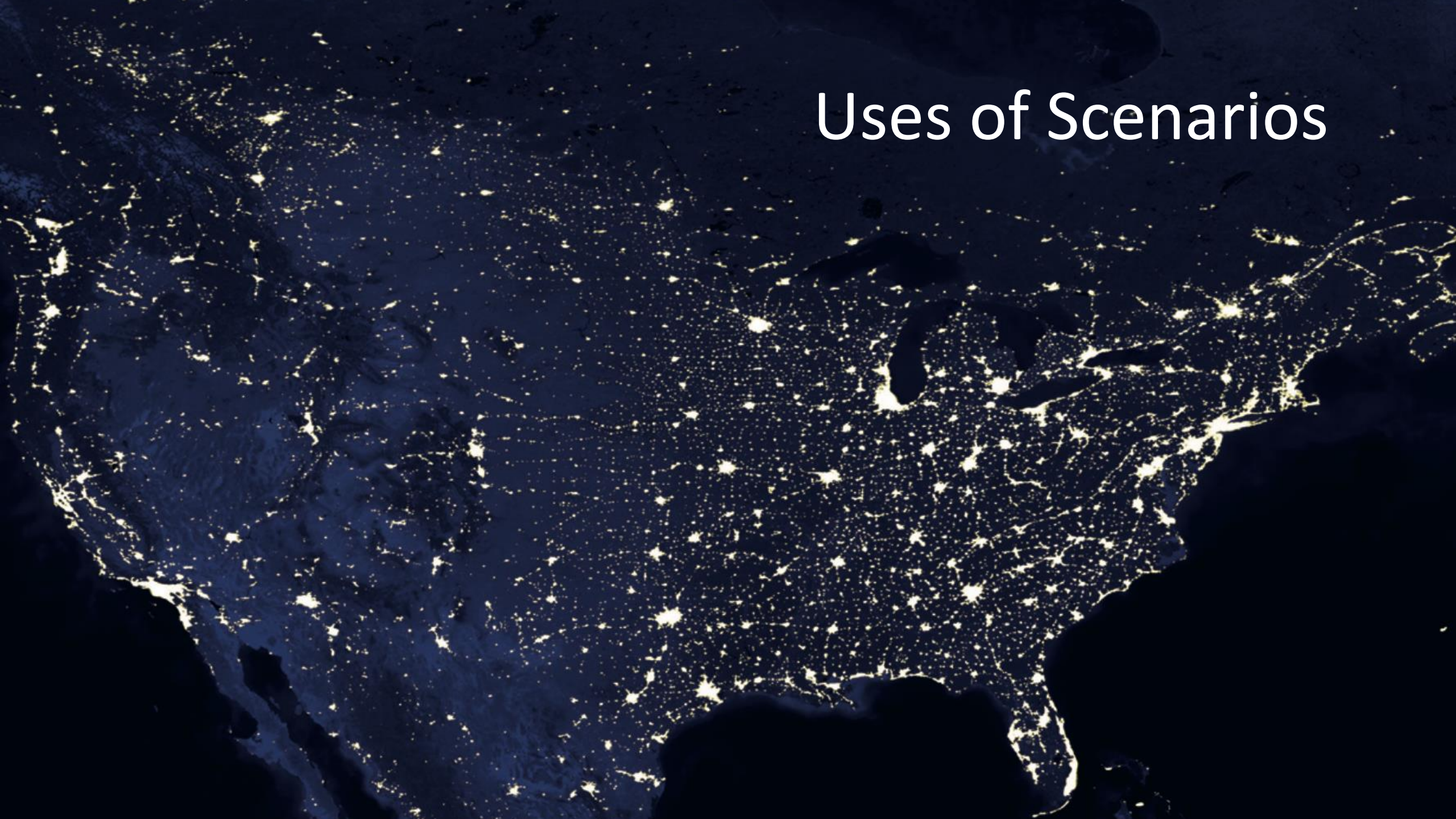
Groupthink
Availability bias
Representation risk
Cognitive dissonance
Confirmation bias



Evaluate and update

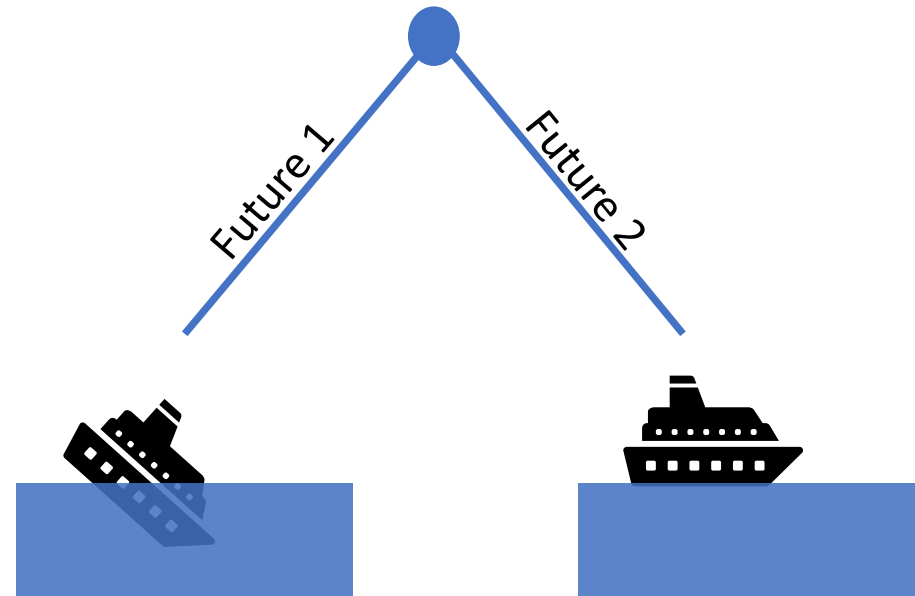
- Were objectives achieved?
 - Yes: Scenarios used in practice for many years
- Contrary opinions?
 - Avoids groupthink
 - Discussion around plausibility of vulnerability
- Update?
- Retire

Uses of Scenarios



Scenarios provide

- Different futures
- Key features of risk
- Understanding of
 - Tail risk
 - Emerging risk
 - Clash risk
 - Impact on strategy
 - Aggregations
- Mitigate biases



Availability heuristic

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1st	Blow up in asset prices	Blow up in asset prices	Asset price collapse	Asset price collapse	Fiscal crises	Financial failure	Financial failure	Fiscal crises	Water crises	Climate action failure	Weapons of mass destruction	Weapons of mass destruction	Weapons of mass destruction	Climate action failure
2nd	Deglobalization	Deglobalization (developed)	Deglobalization (developed)	Deglobalization (developed)	Climate change	Water crises	Water crises	Climate action failure	Infectious diseases	Weapons of mass destruction	Extreme weather	Extreme weather	Climate action failure	Weapons of mass destruction
3rd	Interstate and civil wars	China hard landing	Oil and gas price spike	Oil price spikes	Geopolitical conflict	Food crises	Fiscal imbalances	Water crises	Weapons of mass destruction	Water crises	Water crises	Natural disasters	Extreme weather	Biodiversity loss
4th	Pandemics	Oil price shock	Chronic diseases	Chronic disease	Asset price collapse	Fiscal imbalances	Weapons of mass destruction	Unemployment	Interstate conflict	Involuntary migration	Natural disasters	Climate action failure	Water crises	Extreme weather
5th	Oil price shock	Pandemics	Fiscal crises	Fiscal crises	Energy price volatility	Energy price volatility	Climate action failure	Infrastructure breakdown	Climate action failure	Energy price shock	Climate action failure	Water crises	Natural disasters	Water crises

Great financial crisis starts here

WEF top threats by impact – Global perceptions survey

https://www3.weforum.org/docs/WEF_Global_Risk_Report_2020.pdf

Availability heuristic

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1st	Blow up in asset prices	Blow up in asset prices	Asset price collapse	Asset price collapse	Fiscal crises	Financial failure	Financial failure	Fiscal crises	Water crises	Climate action failure	Weapons of mass destruction	Weapons of mass destruction	Weapons of mass destruction	Climate action failure
2nd	Deglobalization	Deglobalization (developed)	Deglobalization (developed)	Deglobalization (developed)	Climate change	Water crises	Water crises	Climate action failure	Infectious diseases	Weapons of mass destruction	Extreme weather	Extreme weather	Climate action failure	Weapons of mass destruction
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WEF top threats by impact – Global perceptions survey
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Availability heuristic

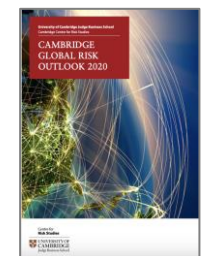
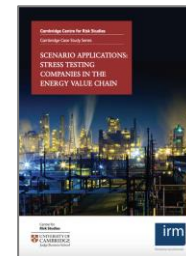
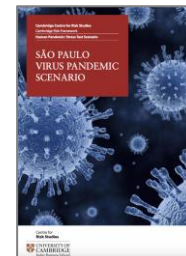
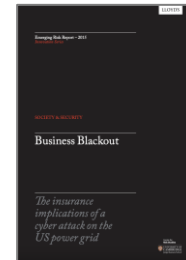
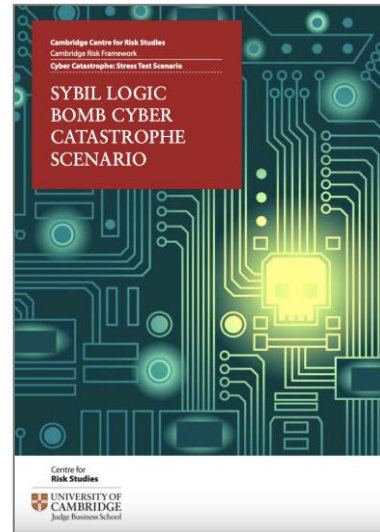
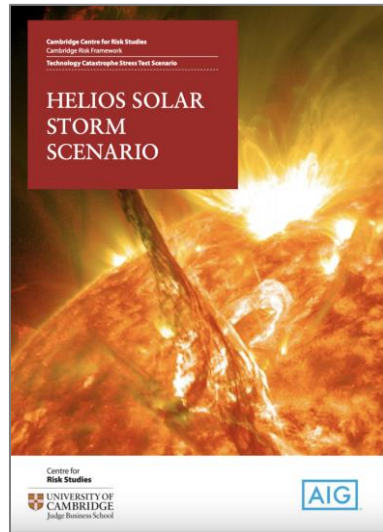
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1st	Blow up in asset prices	Blow up in asset prices	Asset price collapse	Asset price collapse	[Blacked out]				Water crises	Climate action failure	Weapons of mass destruction	Weapons of mass destruction	Weapons of mass destruction	Climate action failure
2nd	Deglobalization	Deglobalization (developed)	Deglobalization (developed)	Deglobalization (developed)	Climate change	Water crises	Water crises	Climate action failure	Infectious diseases	Weapons of mass destruction	Extreme weather	Extreme weather	Climate action failure	Weapons of mass destruction
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5th	Oil price shock	Pandemics	[Blacked out]		Energy price volatility	Energy price volatility	Climate action failure	Infrastructure breakdown	Climate action failure	Energy price shock	Climate action failure	Water crises	Natural disasters	Water crises

And vanishes here

Scenarios help fight biases

- A suite of well constructed, scientifically based scenarios
- Tested every year will avoid:
 - Confirmation bias: scientifically based risk assessment
 - Availability bias: nothing leaves the list unless the risk reduces
 - Cognitive dissonance: if it could happen; you have to quantify it
 - Representation bias: evidence based; well described attributes
- Scientists are biased too....
....so diversity of opinion in key

Interested? Many resources available.



<https://www.jbs.cam.ac.uk/faculty-research/centres/risk/publications/>

In summary

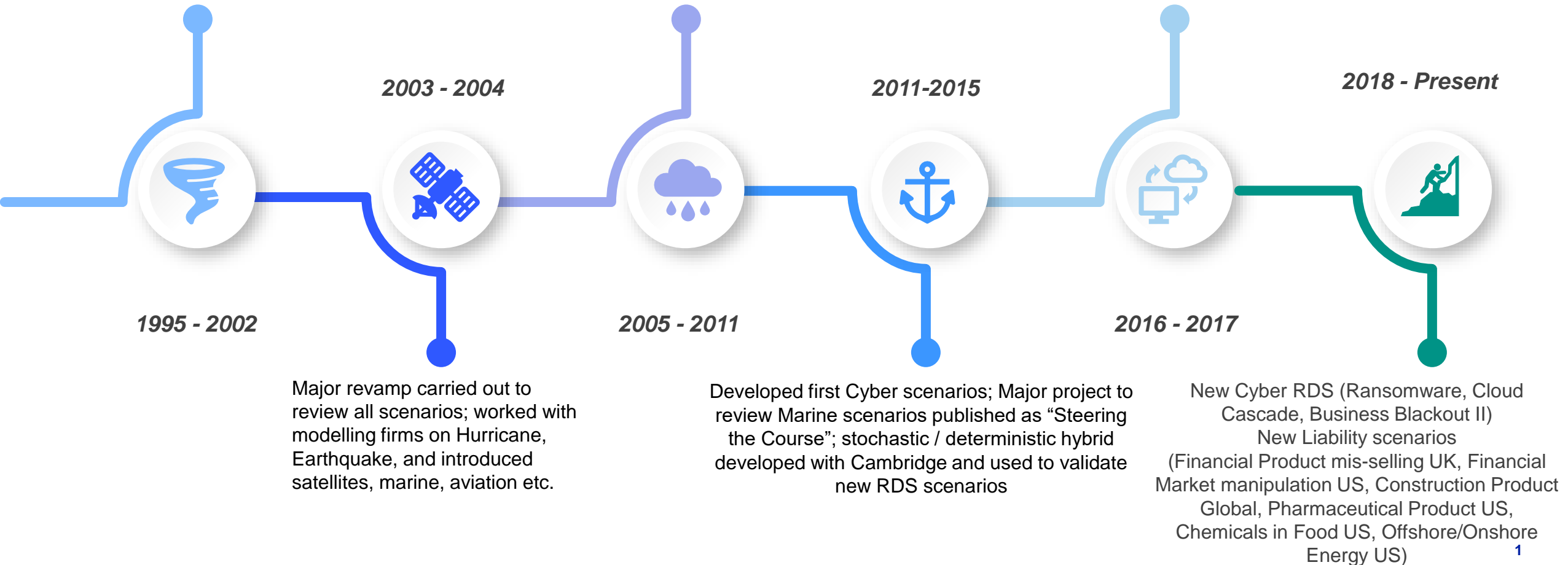
- Scenarios are stories: not forecasts, predictions or projections
- Address trends or shocks
- Are used by many disciplines
- Created top down or bottom up
- Scenarios “classes” have (useful) probabilities
- Can be created in 8 steps...
- Scenarios have many uses
- Should be part of any insurer’s toolkit
- <https://www.jbs.cam.ac.uk/faculty-research/centres/risk/publications>

A brief history of Realistic Disaster Scenarios at Lloyd's

Responding to Piper Alpha, Hurricane Andrew, Northridge – a basic set of scenarios were developed

Katrina necessitates a major review of hurricane scenarios. Developed UK flood scenario (w/JBA). Political risk regularly reviewed, space reviewed, and other scenario values updated annually

Significant enhancement to Cyber scenarios; published Cyence (Counting the cost) and AIR (Cloud failure)



Uses of Realistic Disaster Scenarios



Key considerations when designing RDS at Lloyd's



Prescriptive: to ensure that Lloyd's syndicates provide estimates using a consistent approach and losses can be aggregated at market level



Relevant: Must be relevant to the current threat landscape



Agnostic: of any model and use an approach and data that is accessible to all; including industry, revenue and policy terms and conditions. Modification factors are to be included where necessary



Revisable Framework: Should be developed such that scenarios can be revised and updated as required;

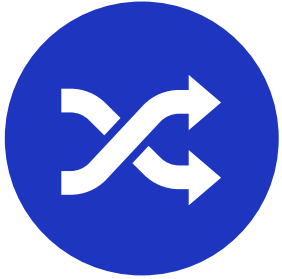


Transparent: Be defined by a transparent methodology that allows the Scenarios to be implemented in a Lloyd's syndicate's own framework, vendor models and/or by third parties.

Case study: Lloyd's 2022 Cyber RDS Review

- ❖ **Ransomware** – scenario remains appropriate and relevant
 - Scenario type continues to represent the most significant threat potential
 - Scenario plausibility is more remote
 - There is a huge range of potential loss from this scenario, depending on the killchain methodology, so consideration of uncertainty around scenario loss is key here
- ❖ **Cloud Cascade** – scenario remains appropriate and relevant
 - Consider some narrative update to account for operational changes amongst Cloud Service Providers
- ❖ **Business Blackout** – scenario remains relevant as the risk reduces
 - Although alternative scenario definitions for cyber-physical could be used, this footprint is still relevant.
 - Affirmative cyber policy language work continues to reduce scenario exposure
- ❖ **Major Data Breach** – scenario narrative is under review

The Future of RDS



Stress Disaster Scenarios



Drains Up



Continue to work with market



Scenario Modelling: Challenges and Approaches

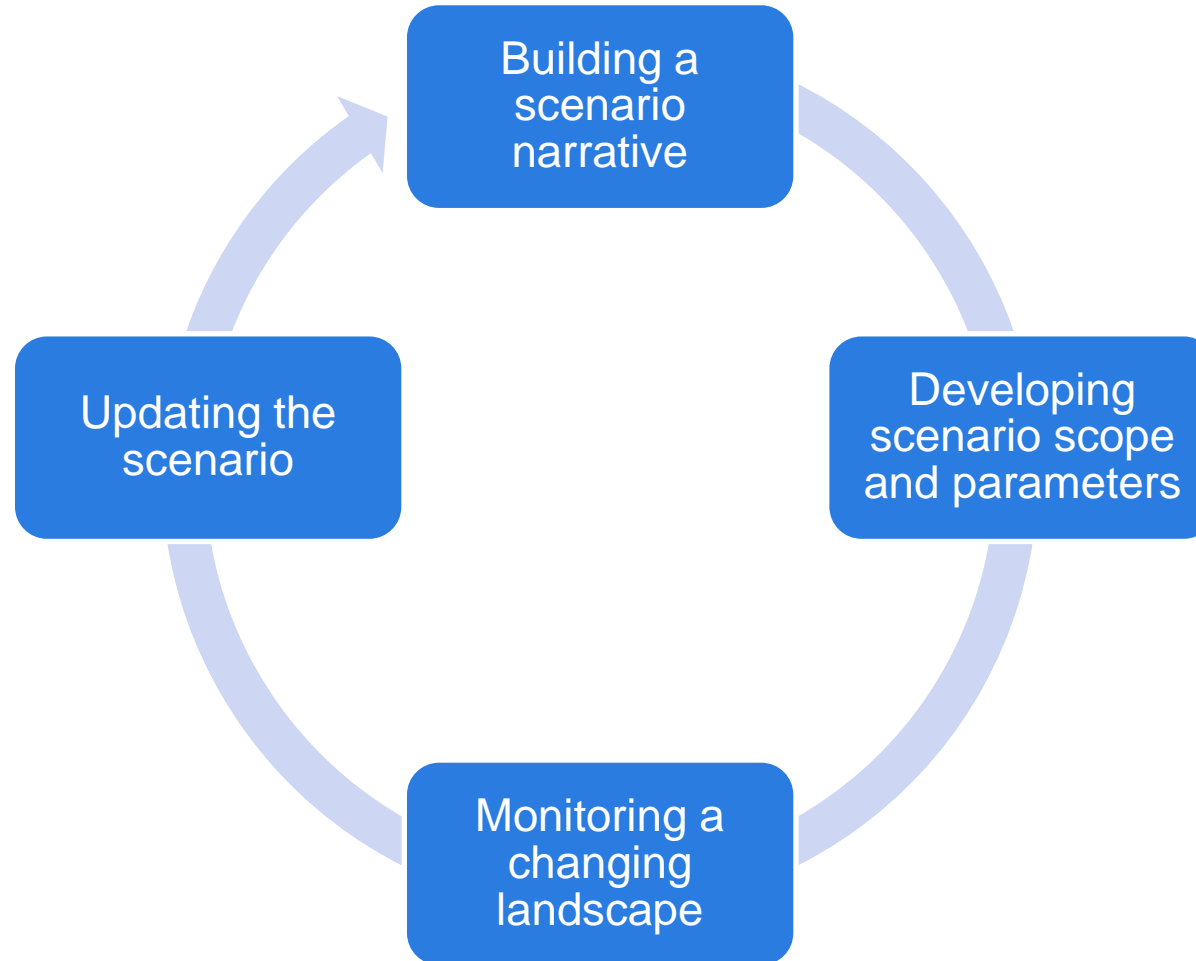
Robin Wilkinson

Agenda

- Key considerations for building scenarios
 - Focus: climate change liability
- Managing inherent uncertainty in liability modeling
- Liability modeling use cases

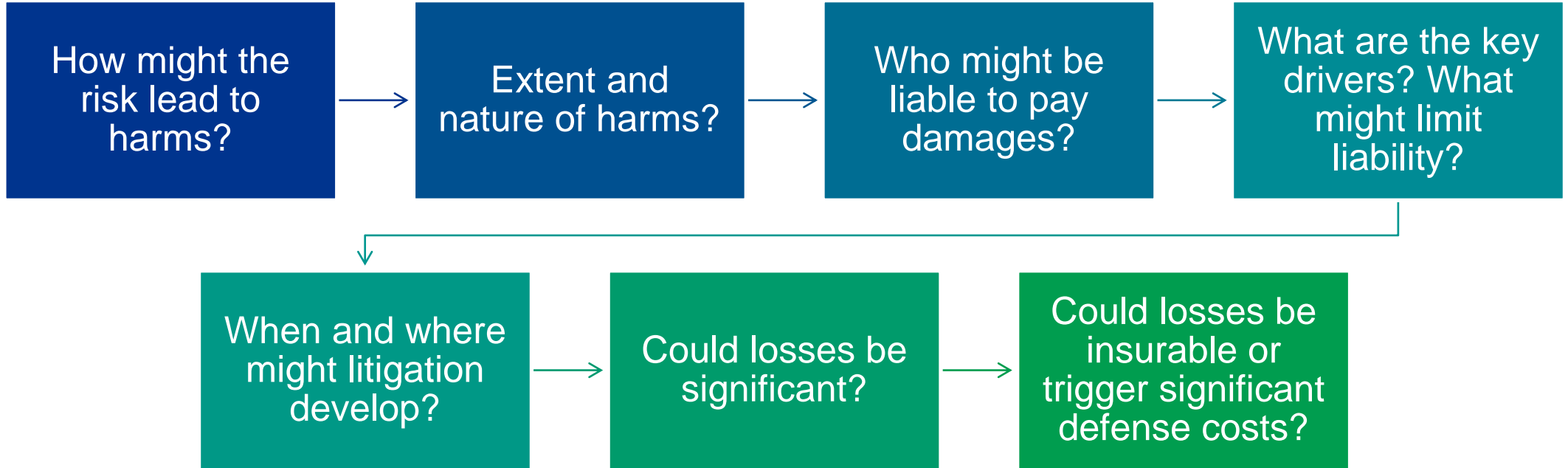


Key Considerations for Building Scenarios



How might a risk or trend plausibly result in significant and systemic insurable liability losses?

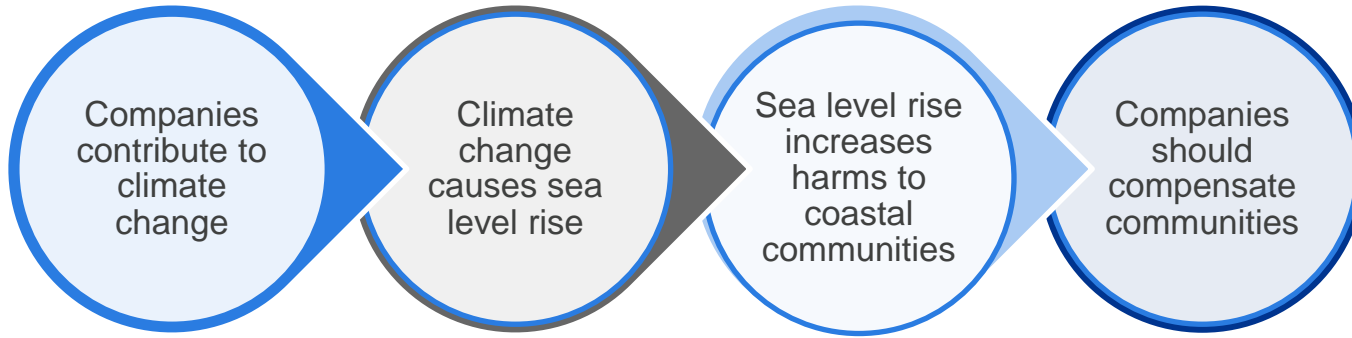
Extreme heat contribution liability: anthropogenic climate change might increase the frequency, severity, or duration of heatwaves. Could corporates be liable for contributing to climate change and for its impact on extreme heat?



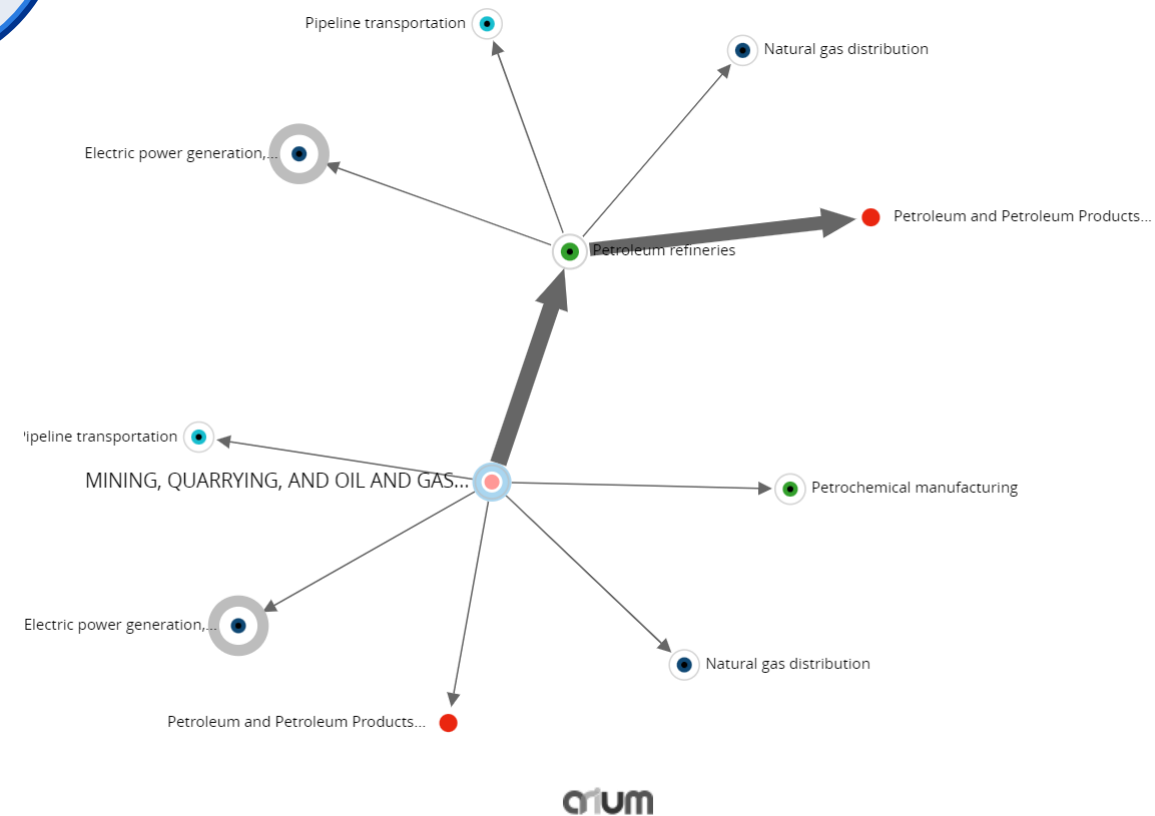
Building a Scenario Narrative




Scope and parameters: liability for contributing to sea level rise




- Potential losses
- Industrial footprint(s)
- Lines of business
- Jurisdiction



Identifying potential changes that may affect the narrative and parameters



Triaging the materiality of these changes to the scenario



Implementing and communicating changes

What drives uncertainty in liability scenarios



Diversity of event types



Driven by human factors and sensitive to a fast-changing regulatory, technological, and social environment



Events and claims can take years to unfold (“long tail”) and pose profound challenges for reserving



Losses can vary widely for same event (e.g., between courts, states, countries)



Events can draw in multiple lines of business, including professional, D&O, general, product, EPLI and employers’ liability

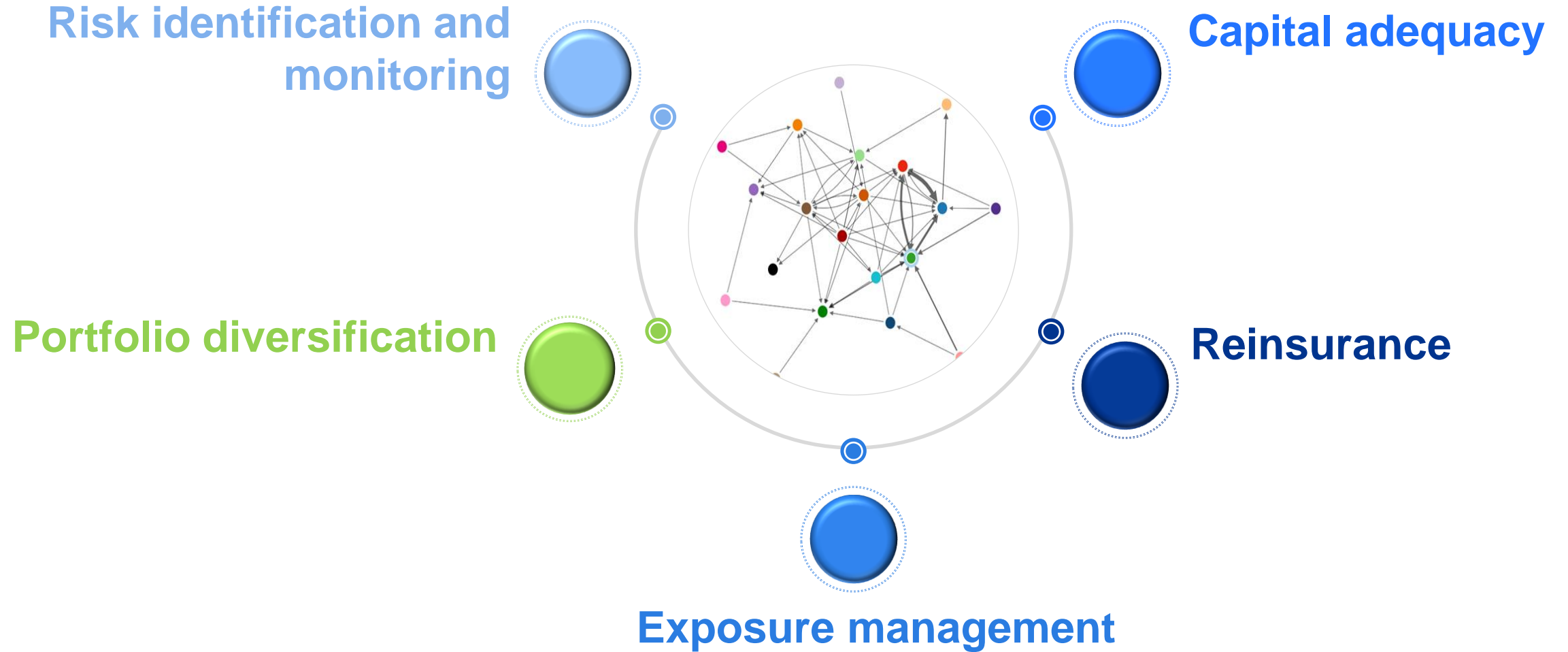
Managing uncertainties in liability scenarios

Development of stochastic views

Transparency around assumptions and limitations

Decision guidance

Scenario modeling use cases





Thank you!

GET INVOLVED

Tech and Web

Developing new and improved website containing industry calendar; white papers; forum; job opportunities.

Marketing

Messaging current happenings and web content. Promoting ISCM and the Cat Credentials.

Education

Plan virtual and in person sessions for all levels in the field.

Credential Exams

Exam writing and review of Experienced Industry Practitioner applications.