



Institute
and Faculty
of Actuaries

IFoA GIRO Conference

**After Hours workshop: Climate Change – Getting to Grips with
Climate Modelling Challenges**

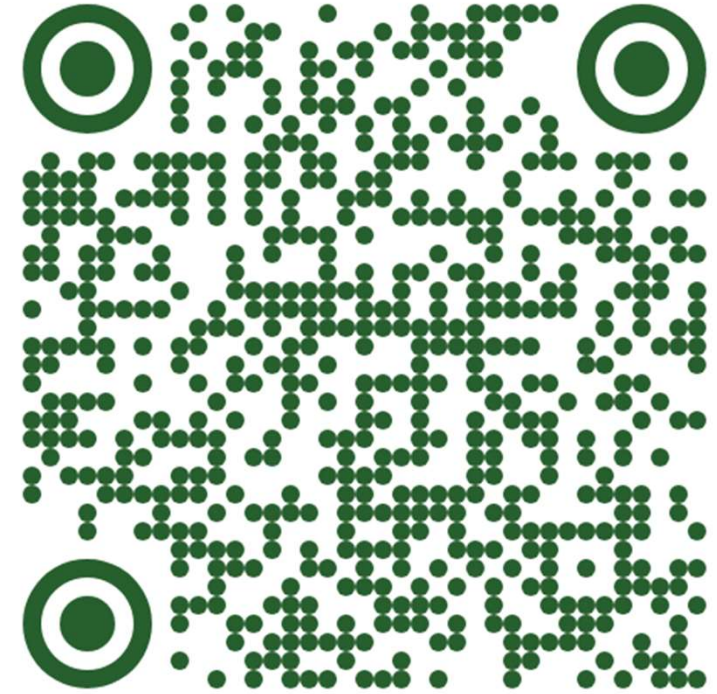
Alex Marcuson and Konrad Farrugia

THANK YOU!

Climate Change: After Hours

Agenda

1. Climate Litigation: Update and Scenario Modelling
2. (Re)insurance tools and techniques for modelling Climate Change
3. Q&A



Climate Change Working Party 2025 members

Alex Marcuson *

Josie Currie *

Dhrubajyoti Banerjee

Camilla Bennett

Amit Bhadula

Nikhil Bhatia

Ryan Blake

Lyon Cheu

Sid Chopra

Konrad Farrugia

Richard Footman

Zim Gandhi

Dhruv Gavde

Nidhi Goel

Amerjit Grewel

Pamela Hoto

Peter Kao

Martin Massey

Peter Moore

Wumi Offiong

Elliot Orenstein

Lara Palmer

Sachin Patel

Ian Penfold

James Pinion

Nicola Ralston

Nidhi Rathod

Nikhil Shah

Aditya Singhal

Tom Steeley

Kelly Tarrant

Lucy Thomas

Aashish Verma

Paul Wee

Matthew Wilmot

Charlie Winnan

* Co-chairs

Speakers in bold

Climate Litigation

Climate Litigation

1. CP 10/25 and climate litigation.
2. Recent developments in climate litigation.
3. Climate litigation scenario modelling.

Climate Litigation

CP 10/25 and climate litigation

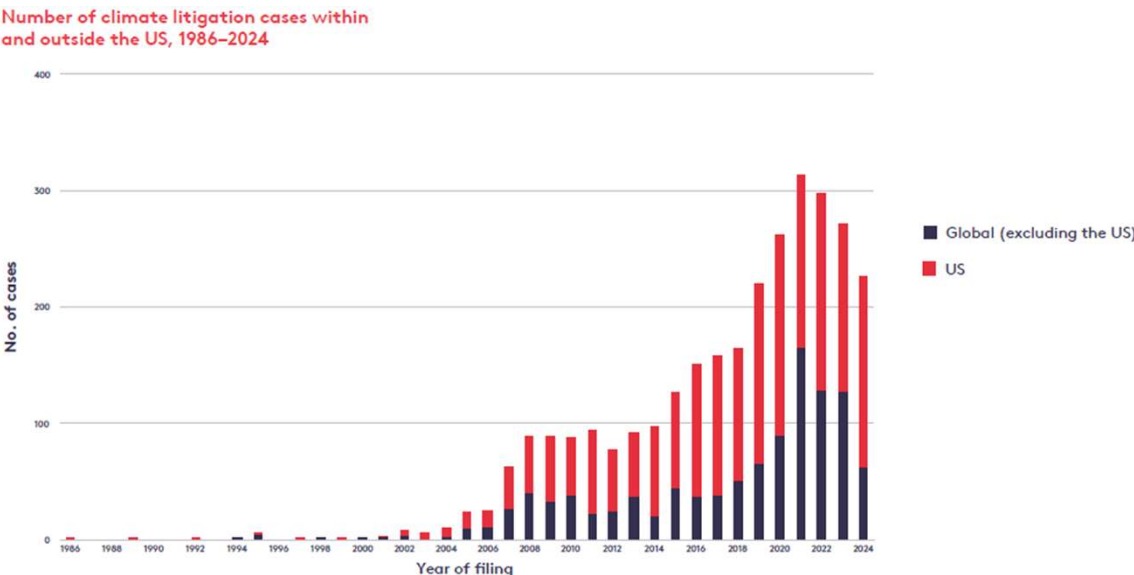
- Risk taxonomy has been drawn too narrowly.
 - Doesn't meet the requirements of the FSB.
 - Not just general insurers who are exposed to climate litigation risks.
 - Financial services firms are exposed to climate litigation risks directly and indirectly.
 - Need to consider potential exposures arising from both past and current/future activities.
 - Are climate litigation issues being thought through fully under Part VII transfers?
-

Emphasis on climate scenario modelling by firms.

Climate Litigation

Recent developments in loss and damage litigation

- Volume of cases can make the picture confusing...



Global trends in climate change litigation: 2025 snapshot. J. Setzer and C Higham, LSE, Grantham Research Institute on Climate Change and the Environment, Columbia Law School/Sabin Center for Climate Change Law. – CC BY-NC 4.0 Creative Commons

Lliuya vs. RWE

Honolulu vs. Sonoco

Aloha vs. NUFIC

Asmania vs. Holcim

Pakistani farmers vs. RWE and Heidelberg Materials

Philippine survivors of Typhoon Rai vs. Shell

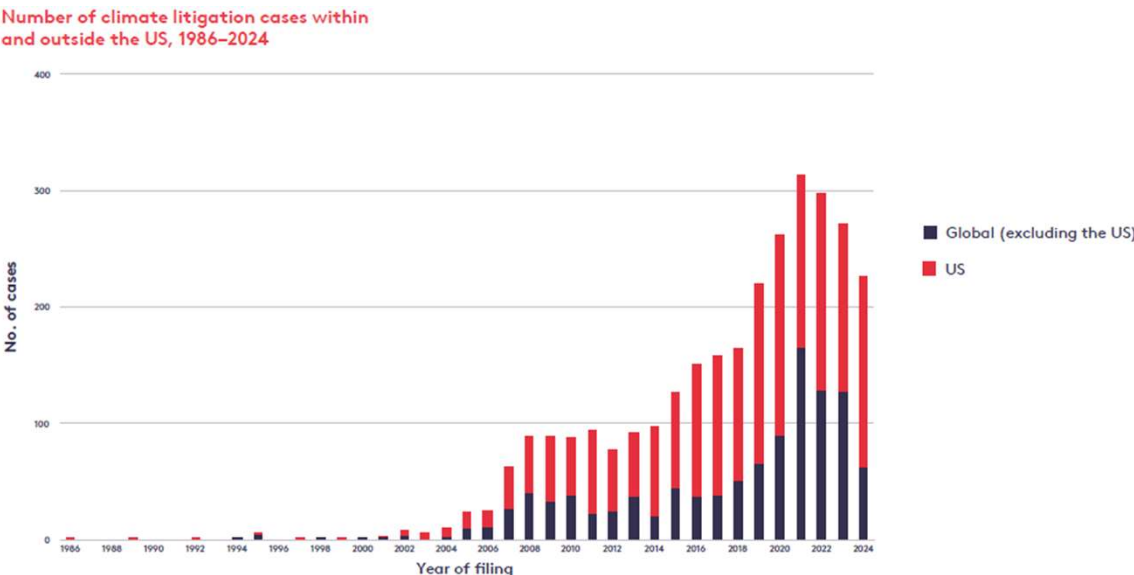
Leon vs. Exxon Mobil Corp.

e.g. Mayor & City Council of Baltimore v. BP p.l.c.

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Climate Litigation

Notable points from Lliuya vs. RWE

Peruvian farmer (Lliuya) seeking damages in German Regional Court of Hamm for cost of mitigating risk of flood damage to his farm from melting glacier.

Alleged that carbon emissions from RWE contributed materially to this. Damages sought were small, being $< \frac{1}{2}\%$ of costs of mitigation measures (roughly €17,000).

$$0.47\% \text{ of } €3.5m = €17k$$

The percentage was determined by reference to RWE's share of historical global CO₂ emissions.

$$0.47\% \text{ of global emissions } 1854\text{-}2010^1$$

¹ Heede, R. Tracing anthropogenic carbon dioxide and methane emissions to fossil fuel and cement producers, 1854-2010. *Climatic Change* 122, 229-241 (2014).
<https://doi.org/10.1007/s10584-013-0986-y> - Supplementary Table 3



Credit: Walter Hupiu Tapia / Germanwatch e.V.

Climate Litigation

Notable points from Lliuya vs. RWE



Source: T.A.G. Marcuson

Climate Litigation

Notable points from Lliuya vs. RWE

- Lliuya was unsuccessful because the court appointed experts concluded that the risk of harm to Lliuya's farm was too small. Debate over how climate effects were taken into account in the analysis; may be significant for future abatement cases.
- Court ruling rejected defence arguments of:
 - (1) knowledge – harmful effects were known since at least the mid-1960s;
 - (2) “drop in the ocean” – the drop should be assessed relative to the size of other drops, not the size of the ocean;
 - (3) legality of activity – what matters is not the conduct, but the resulting harm.
- Expect these arguments to be used by claimants in future.

Source: <https://blogs.law.columbia.edu/climatechange/2025/06/19/what-lliuya-v-rwe-means-for-climate-change-loss-and-damage-claims>
Maxim Bönnemann and Maria Antonia Tigre, 19 June 2025

Climate Litigation

Recent developments in loss and damage litigation

- Volume of cases can make the picture confusing.
- Two important strands of cases to track:
 - “European”: e.g. Lliuya vs. RWE
 - “American”: e.g. Honolulu vs. Sonoco

Lliuya vs.
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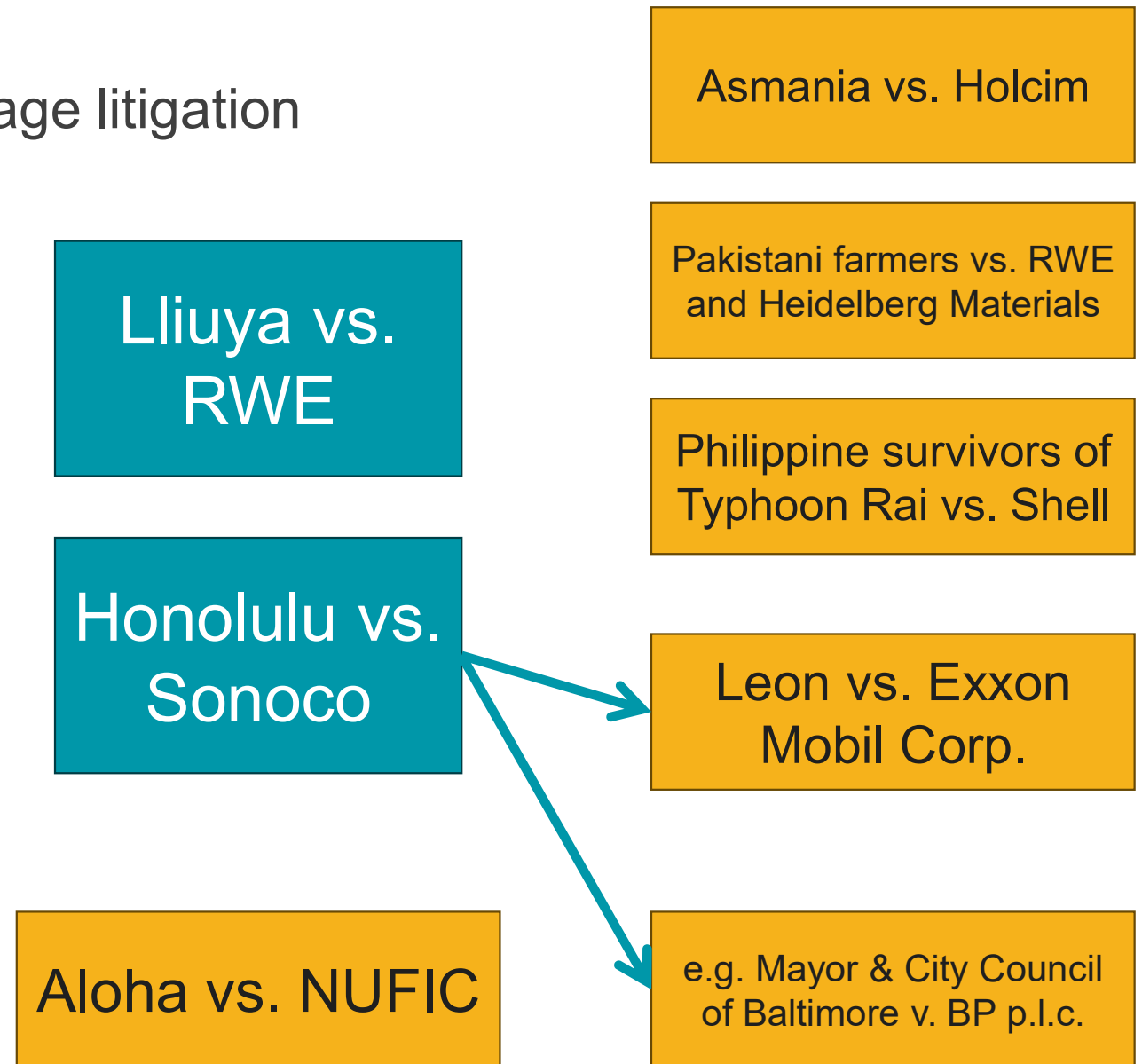
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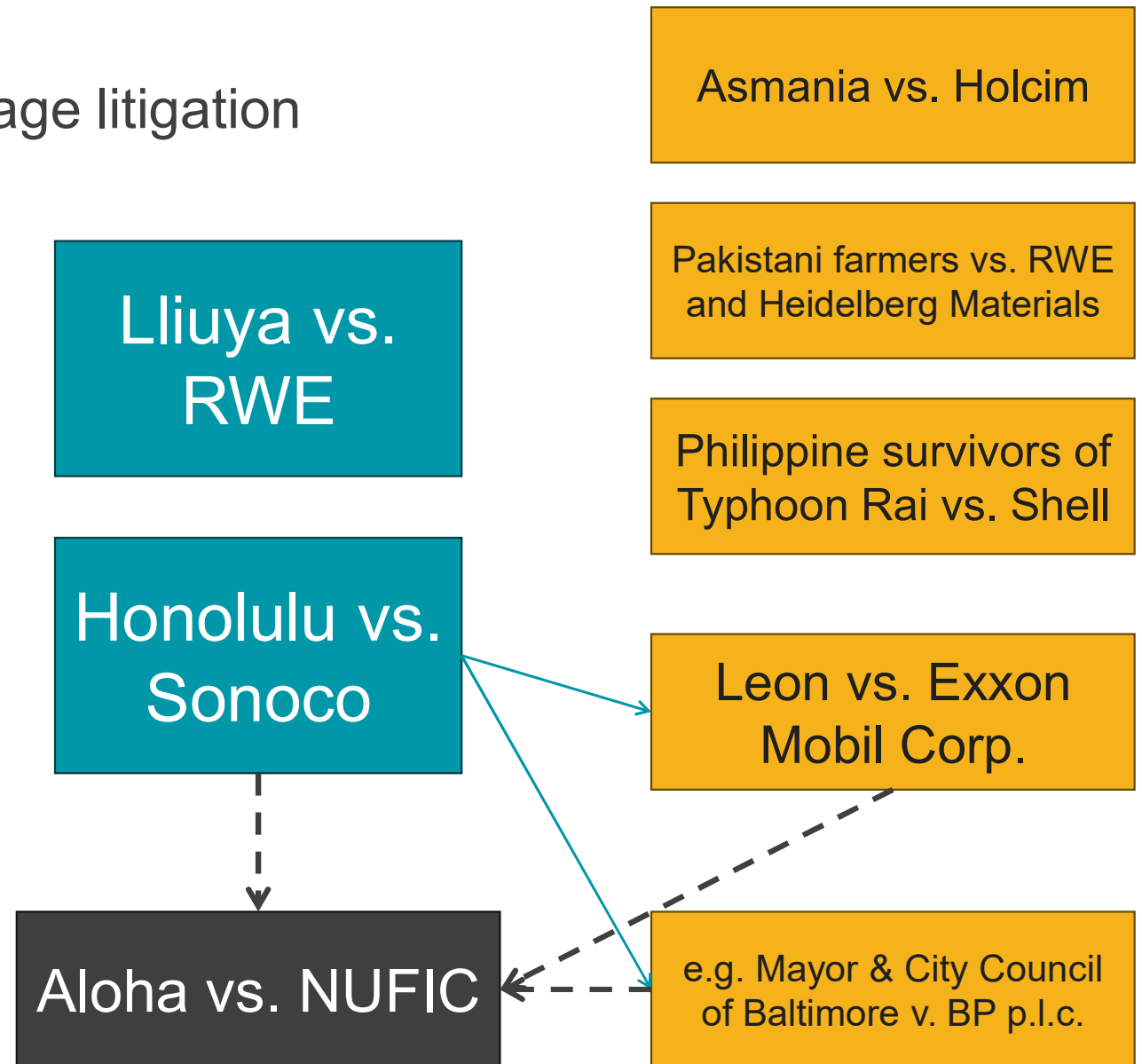
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 - “American”: e.g. Honolulu vs. Sonoco
- **Duty to defend implications for insurers**



Climate Litigation

Climate litigation scenario modelling – overview

- Workstream seeking to develop some generic scenario frameworks and datapoints that firms can use to model climate litigation exposures.
- Three headings for type of loss:
 - Loss and damage / abatement.
 - Mitigation / failure to prepare / adapt.
 - Regulatory and governance.
- Two flavours of scenario:
 - Acute – i.e. large vertical loss.
 - Chronic – i.e. high volume of smaller losses of similar type.
- Assume that insurer wordings defences are (at best) only partially effective.

Climate Litigation

Climate litigation scenario modelling – implementation

This year:

- Developed a detailed set of scenario descriptions.

Next year:

- Populate scenarios with external reference data points.
- Methodology for implementation of scenarios. How to marry generic scenarios with firm-specific exposures.

Keen to receive feedback and suggestions.

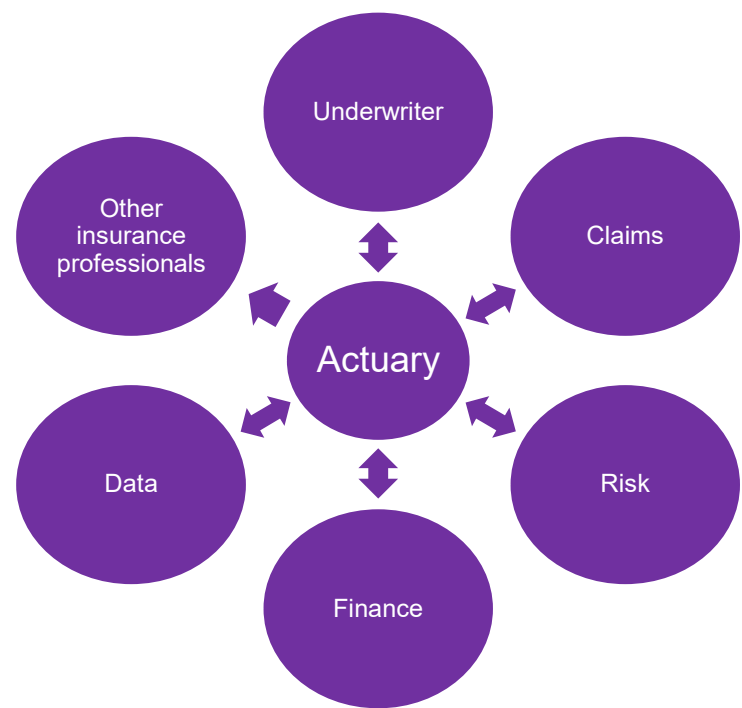
| | Acute | Chronic |
|-----------------------------|--|---|
| Loss and damage / abatement | <i>Honolulu vs. Sonoco</i> type claims succeed. Multiple large-limit insured parties. Insurer defences/exclusions not fully effective. | <i>Leon vs. Exxon Mobil</i> type claims succeed. Very large numbers of lower value awards arise. <i>Lliuya vs. RWE</i> type claims too? |
| Adaptation | Liability for failure of major mitigant (e.g. dam/sea wall failure) following climate-exacerbated physical loss event. | Wave of personal injury claims against organisations (hospitals, prisons, schools) for failure to install appropriate AC or mosquito netting and who have duty of care to many individuals. |
| Regulatory | Multiple Fortune 500 shareholder class actions against firms for greenwashing and/or other misrepresentations in public statements. | Increased frequency of SME regulatory fines as a result of failure to keep pace with complex and inconsistent array of international climate standards. |

Modelling tools and techniques

Lines of Business Modelling Workstream

The Lines of Business (“LoB”) Modelling workstream is focused on developing a bottom-up modelling framework and toolkit to support GI actuaries. The key deliverables include:

(A) Questions / discussion prompts for actuaries when engaging with various stakeholders:



GIRO 2025: to address and present on (A) above.

(B) Identification of qualitative and quantitative tools to support actuarial portfolio analysis:

- Heat maps
- Scenario models (limited to avoid excess overlap with specific climate scenario working parties).
- Direct quantitative modelling techniques.

| D&O Triggers | Transition Risks - Transitioning to a low carbon or "Green" economy | | | Physical risks - Damage to assets/indirect impacts to supply chains etc. |
|--|---|--|--|--|
| | GHG Emissions Related | Change in consumer and investment sentiment | Policy/Legal changes (e.g. not meeting net zero targets) | Acute - Events and Chronic - Long-Term Changes |
| A: Climate Attribution for past Emitters and Climate Inaction (Cases A) | Stakeholder action against companies that have been responsible for emitting GHG emissions including new developments in attribution science, where the relationship between emissions and climate change impacts is quantified | | There may be legislation that comes in that makes companies pay for the damage that climate change has caused. | |
| B: Failure to adapt - Continued inaction/denial/Investing in causes of climate change. | Climate inaction by continuing BAU without changing strategy e.g. continuing to invest in fossil fuels with no transition plan in place i.e. not reducing carbon footprint | Claims against companies for not sufficiently addressing consumer/investor needs to reduce their carbon footprint | Claims against companies whose targets are not aligned with net zero and are not aggressive enough | Trend - Sewage and Water companies being sued as heavy rainfall is going into storm drains and causing flooding. |
| C: Failure to comply with regulations - Breach of Duty | Failing to comply with the emissions laws prevailing in respective jurisdiction. | Companies investing heavily in "green" ways of doing business at the cost of profits and so failing their fiduciary duty to make shareholders money. | Litigation against companies for anti-competition where they are working with competitors towards net zero. | Claims against companies for causing a major natural disaster such as a wildfire not complying the regulations. |
| D: Misrepresentation of exposures/reporting disclosures – Greenwashing | Failure to disclose climate change risks, misrepresenting its business practices related to use of proxy costs of carbon. | Claims against companies for overstating their green credentials to meet stakeholder expectations | Failure to report climate related risks | |
| E: Misleading/ Misdirection /Conflict of Interest - Greenwashing | Where firms cynically divert public attention away from say a polluting activity. | Companies advertising better green credentials than they have as society is more climate conscious. | | |

Setting the Context

Climate change and actuarial work

- The focus on climate-related risks has increased.
- The Institute and Faculty of Actuaries (“IFoA”) has issued several Risk Alerts urging actuaries to recognise, assess, and effectively communicate the potential impacts of climate change and broader sustainability risks within their actuarial work.

Objective

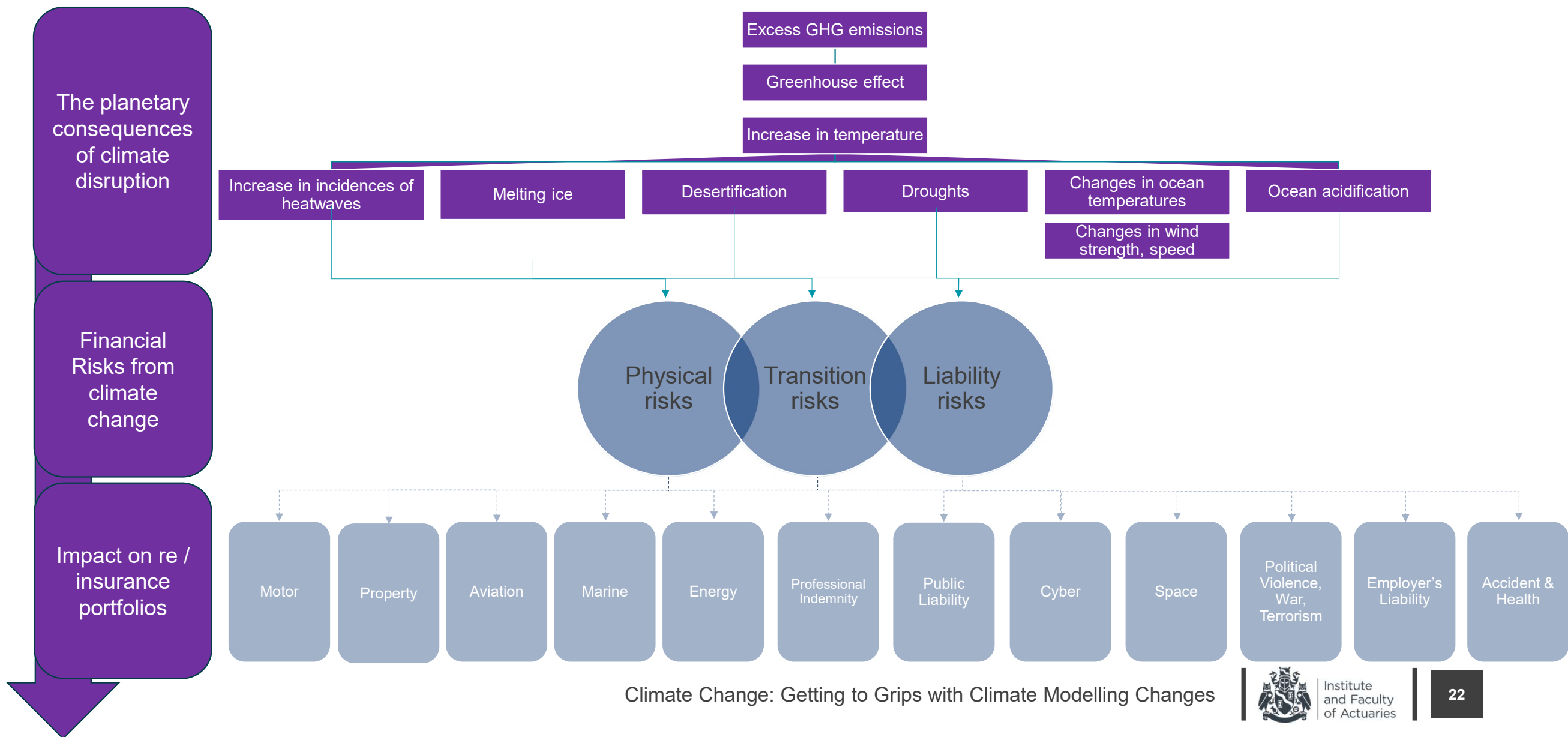
- **Understanding the Climate-Related Impacts:** develop a practical toolkit that enables actuaries to identify, assess, and manage exposure to climate-related risks across core areas of actuarial practice, including pricing, reserving, and capital management.

Methodology

- Develop a **bottom-up approach for GI actuaries** to assess climate-related risks and impacts, starting from **individual lines of business** and aggregating insights through to portfolio and strategic levels.

¹ The related Risk Alerts are: [Risk alert: Climate-related risks \(12 May 2017\)](#); [Risk Alert: Climate change and sustainability related issues \(21 April 2022\)](#) and [Risk alert: Climate change scenario analysis \(6 June 2024\)](#)

Exposure to Climate-Related Risks



Research Methodology

- **Research and Landscape Assessment**
 - Detailed review of current and emerging climate-related financial risks relevant to insurers.
- **Lines of Business**
 - Establish a comprehensive and standardised list of LoBs covering both Lloyd's and the P&C insurance market.
- **Identification and Mapping of Climate-Related Risks**
 - Identify and categorise climate-related risks affecting financial outcomes for each LoB.
 - Climate-related risks segmented into: Physical, Transition, and Liability risks.
 - Assessment conducted by continent to reflect regional differences in: climate exposure, regulatory environments and market dynamics.
- **Translation into Actuarial Considerations**
 - Leverage the mapping by climate-related risks to derive actuarial insights and targeted questions for each LoB.
 - Consider how climate-related factors affect the core domains of general insurance actuarial work in the capital management, pricing and reserving practice areas.

How To Assess Exposure To Climate-Related Risks

The Bottom-up Approach



1 Conduct assessments at the General Insurance (GI) line-of-business level.

2 Identify macro-level climate impacts for each line of business.

3 Assess line of business specific impacts of climate-related risks.

4 Develop a targeted question bank for engagement with internal and external stakeholders.

Macro Climate-Related Impacts₍₁₎

- Is climate change still a global major concern?
 - According to the Allianz Risk Barometer¹, climate change risk has risen to No. 5 in 2025 (up from No. 7 in 2024) — its highest-ever ranking in the survey.
- Understand the challenges from measuring climate change related risks on the LoBs?
 - **Data availability** – Limited historical data makes it difficult to capture the full extent of climate-related risks.
 - **Quantification of Physical Risk Exposures** – Measurement can be approached through claims experience or the use of CAT modelling. Are the models adaptable to quantify these risk exposures?
 - **Model Parameterisation** – Requires adjustments to correlations, coefficients of variation (CoVs), and dependency structures across different classes of business.

1. Allianz Risk Barometer | Allianz Commercial / <https://commercial.allianz.com/news-and-insights/reports/allianz-risk-barometer.html>

Macro Climate-Related Impacts₍₂₎




- **Enhanced regulatory requirements**
 - Insurance regulators are increasingly issuing **enhanced rules and requirements** on climate-related risks e.g. CP10 /25.
- **Stress and scenario testing**
 - **Regulatory Expectations** – Regulators increasingly require robust stress and scenario testing, with clear articulation of climate-related risks, to be incorporated into ORSA (Own Risk and Solvency Assessment) reports.
 - **Readiness for industry wide regulatory exercises** – Insurers should ensure preparedness to conduct stress tests at the class-of-business level, particularly for industry-wide regulatory exercises (e.g. DYGIST).
- **Future insurability?**
 - **Risks:** Future affordability and availability?
 - **Opportunities:** Expansion across the class of business?
- **De-prioritisation of climate action**
 - What is the impact of reduced focus on climate policy on the insurance industry?

LoB Climate-Related Impact Analysis

- We conducted a LoB assessment across 10 high level LoBs sub-split into 49 LoBs.
- The assessment performed the following for each LoB:
 - Outlining the physical, transition and liability risks split by continent.
 - Listed the considerations actuaries should be making in each area: capital management, pricing and reserving.
- As an illustration, we selected 2 LoBs: Motor Insurance – Bodily Injury and Space Insurance. The illustration of the assessment is outlined in the subsequent slides.

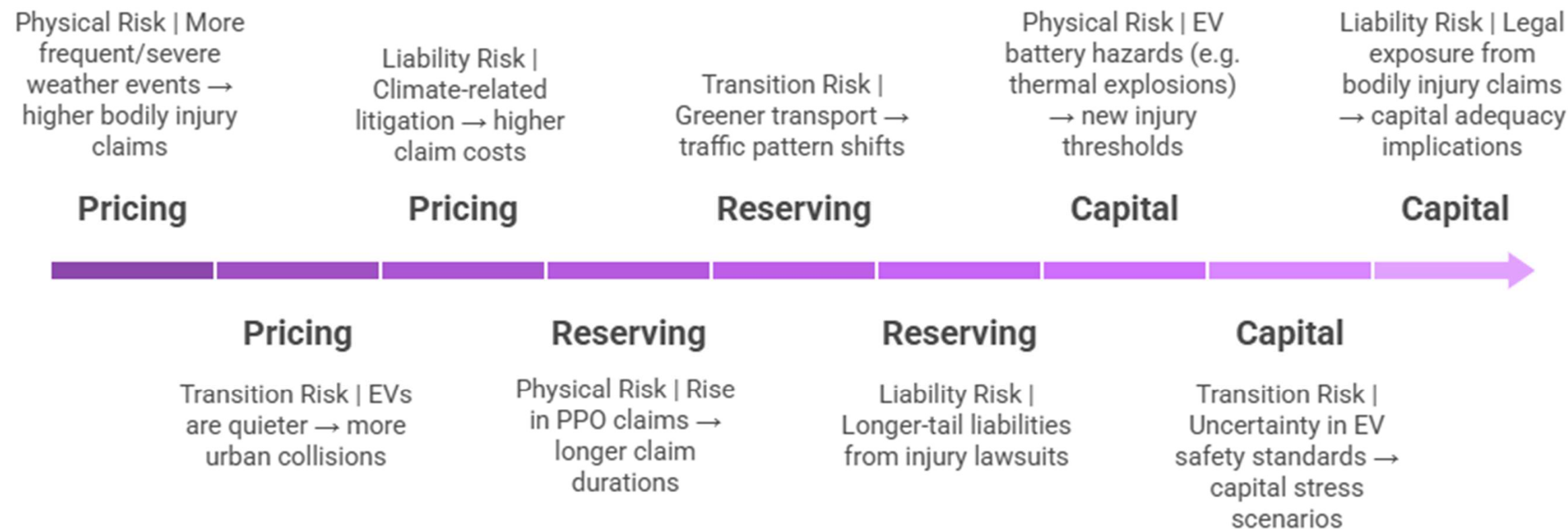
LoB Analysis:
Example 1 –
Motor Insurance:
Bodily Injury

Risk Identification and
Mapping Split by
Continent

| Climate Risk Type / Region |  Physical Risk |  Transition Risk |  Liability Risk |
|----------------------------|---|---|--|
| North America | Floods, blizzards, wildfires ↑ accidents | EVs & congestion policies changing driving patterns | Litigation vs insurers & authorities post-events |
| Europe | Floods & heat ↑ crash frequency | ICE phase-out & low emission zones | Infrastructure & emission disclosure lawsuits |
| Asia | Monsoons & haze ↑ injury claims | Rapid EV adoption changing risk profiles | Urban liability for inadequate planning |
| Africa | Floods, droughts, dust storms worsen safety | Early EV/green transition emerging | Climate litigation and regulatory scrutiny |
| South America | Floods, landslides ↑ accident claims | Land-use policies reshape exposure | Infrastructure/ environment liability emerging |
| Oceania | Cyclones, bushfires ↑ road hazards | Strong EV & emission policies driving change | Legal scrutiny after extreme events |

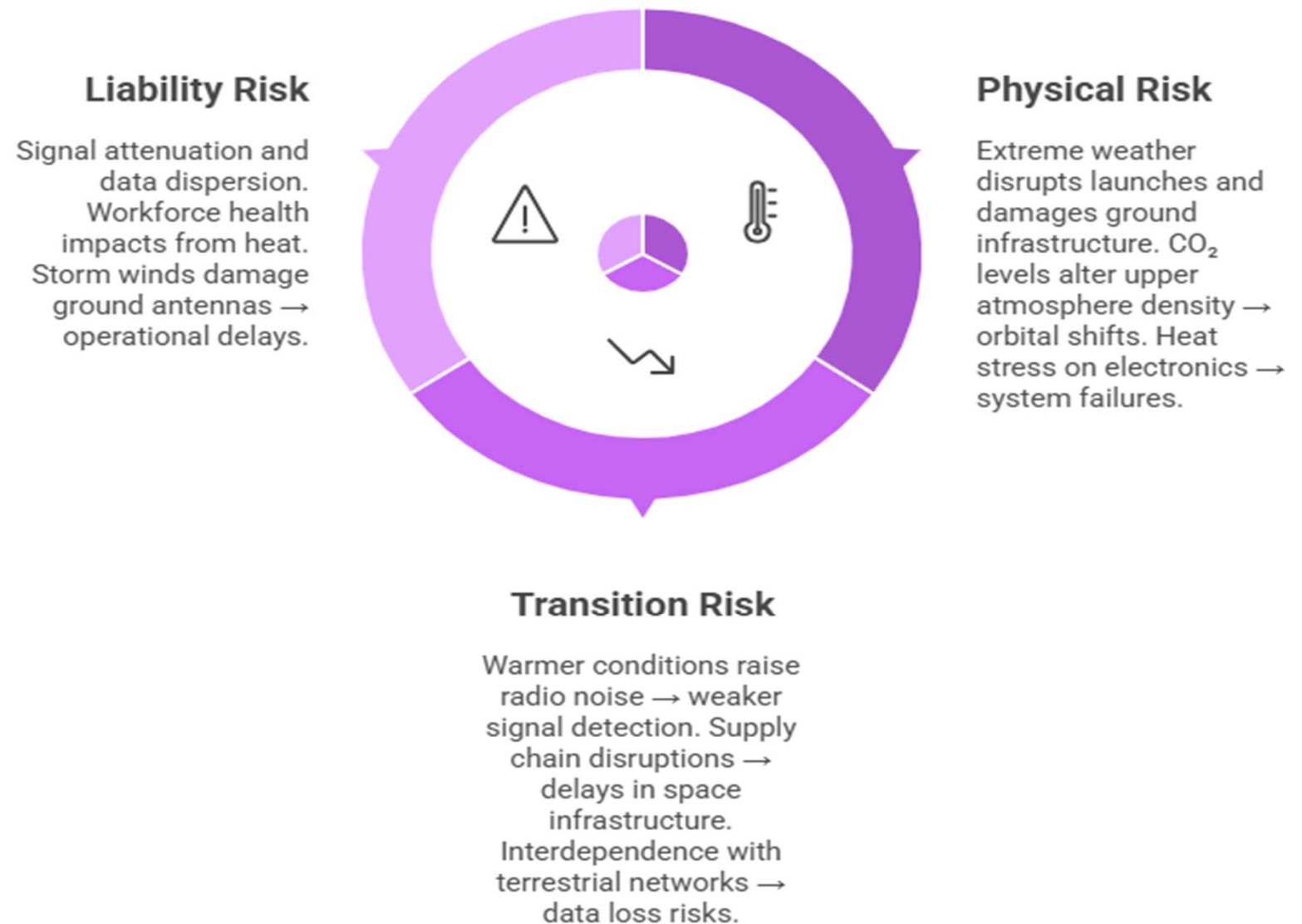
LoB Analysis: Example 1 – Motor Insurance: Bodily Injury

Actuarial Considerations



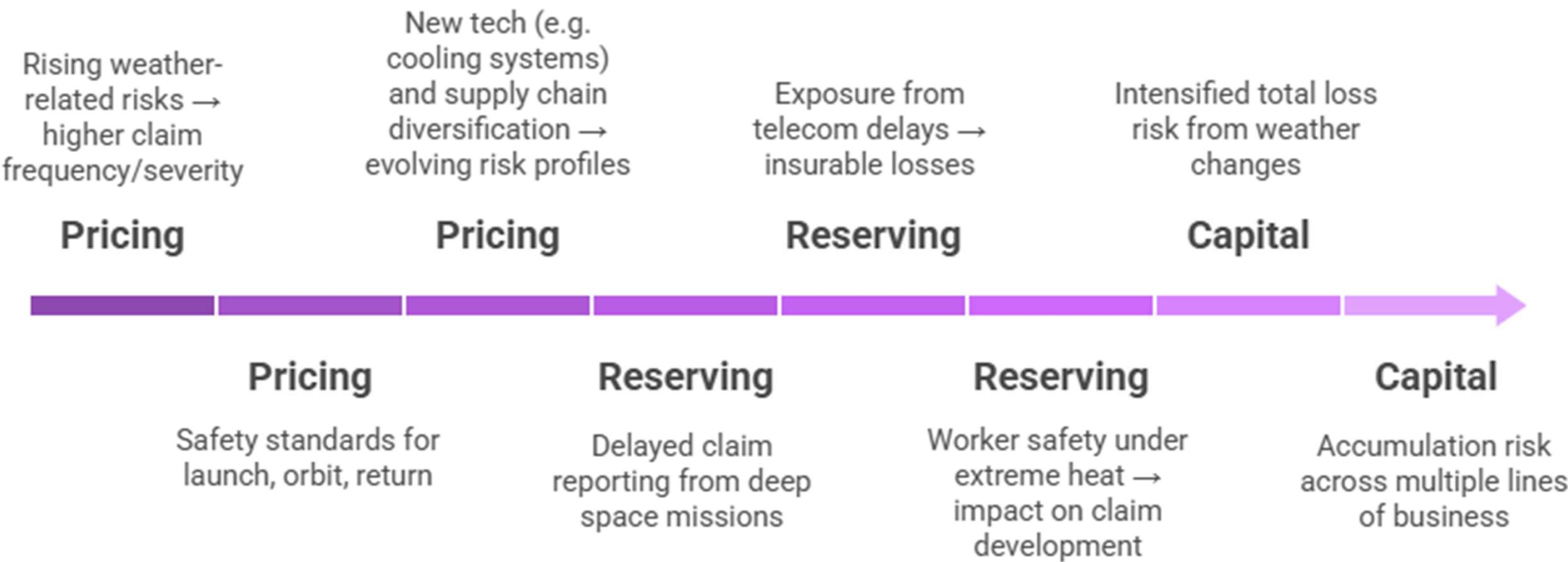
LoB Analysis: Example 2 – Space

Risk Identification and Mapping



LoB Analysis: Example 2 – Space

Actuarial Considerations



Lines of Business Modelling

Summary and next steps

This year:

- Developed a **bottom-up approach for GI actuaries** to assess climate-related risks and impacts by LoB.

Next year:

- Extend the LoB bottom-up framework into a structured question bank actuaries could use to engage with internal and external stakeholders.
- Identify modelling techniques and methodologies for the implementation of climate scenarios.

Your contribution matters:

- Is this research useful to your work or area of interest?
- What additional insights or analysis would you like us to include?

Where next?

Where next?

Climate Change Working Party:

- Four dedicated workstreams to advance the research to-date.
- Review and consolidate insights from GIRO 2025 outcomes.
- Stay tuned — thought leadership papers and articles to be published in 2026.

If you want more after today:

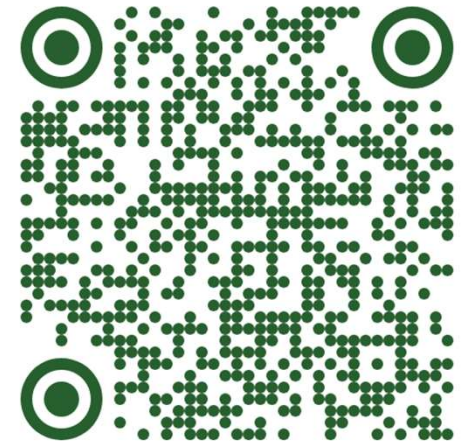
Visit our VLE site:

<https://vle.actuaries.org.uk/course/view.php?id=1684>

Contact a working party member.



Stock image



Q&A



Institute
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Thank you

For more information, contact:

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Josie Durley: jdurley@nephilasyndicate.co.uk

Konrad Farrugia: konrad.farrugia@pwc.com

Appendix 1: LoBs considered by this workstream

The figure below lists the LoBs considered for analysis in this research.

| Property | Casualty | Casualty Financial Lines | Marine | Energy | Property Treaty | Casualty Treaty | Specialty Other | Accident & Health | Aviation |
|--|--|--|--|---|--|---|---|--|---|
| <ul style="list-style-type: none"> • Motor Property Damage • Homeowners Property Damage • Property D&F • Heavy Industry (Mining & Chemicals) | <ul style="list-style-type: none"> • Motor Bodily Injury • General Liability • Employer's Liability • Medical Malpractice • Environmental Liability | <ul style="list-style-type: none"> • Fidelity, Bankers & Computer Crime • Cyber • Directors & Officers (D&O) • Financial Institutions • Professional Indemnity • Business Interruption | <ul style="list-style-type: none"> • Marine Hull • Fine Art • Marine Liability • Specie • Marine XL • Yacht • Marine War • Cargo | <ul style="list-style-type: none"> • Energy Onshore Liability • Energy Onshore Property • Energy Offshore Liability • Energy Offshore Property • Nuclear • Power Generation • Renewables | <ul style="list-style-type: none"> • Agriculture & Hail • Property Pro Rata • Property Cat XL • Property Risk XS | <ul style="list-style-type: none"> • Employers Liability/ WCA • Casualty Treaty • Motor XL | <ul style="list-style-type: none"> • Political Risks, Credit & Financial Guarantee • Legal Expenses • Livestock & Bloodstock • Extended Warranty • Space | <ul style="list-style-type: none"> • Accident & Health (direct) • Medical Expenses • Personal Accident XL • Pecuniary • Contingency | <ul style="list-style-type: none"> • Aviation • Aviation XL |



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