



10/12/22

**SOLVENCY WORKSTREAM OF THE CLIMATE AND RESILIENCY (EX) TASK FORCE**

Thursday, Oct. 13, 2022

12:00 – 1:00 p.m. ET / 11:00 a.m. – 12:00 p.m. CT / 10:00 – 11:00 a.m. MT / 9:00 – 10:00 a.m. PT

**ROLL CALL**

Kathleen A. Birrane, Vice Chair	Maryland	Trey Hancock	Tennessee
George Bradner	Connecticut	Scott A. White	Virginia
David Altmaier	Florida	Mike Kreidler	Washington
Gary D. Anderson	Massachusetts	Amy Malm	Wisconsin
Harriette Resnick	New York		

NAIC Support Staff: Dan Daveline

**AGENDA**

1. Opening Comments - *Commissioner Kathleen A. Birrane (MD)*
2. How Scenario Analysis is Designed, Implemented, and Carried Out
  - Robin Wilkinson (Verisk)
  - Srinivasan Iyer (Moody's)
3. Any Other Matters
4. Adjournment



# Quantifying financial impacts through scenario analysis

**Robin Wilkinson**

October 13, 2022

# Agenda

- What is liability scenario analysis?
- Components and uncertainties of a liability scenario
- How to use liability scenario analysis to quantify financial impacts to portfolios
  - Case study: climate change liability

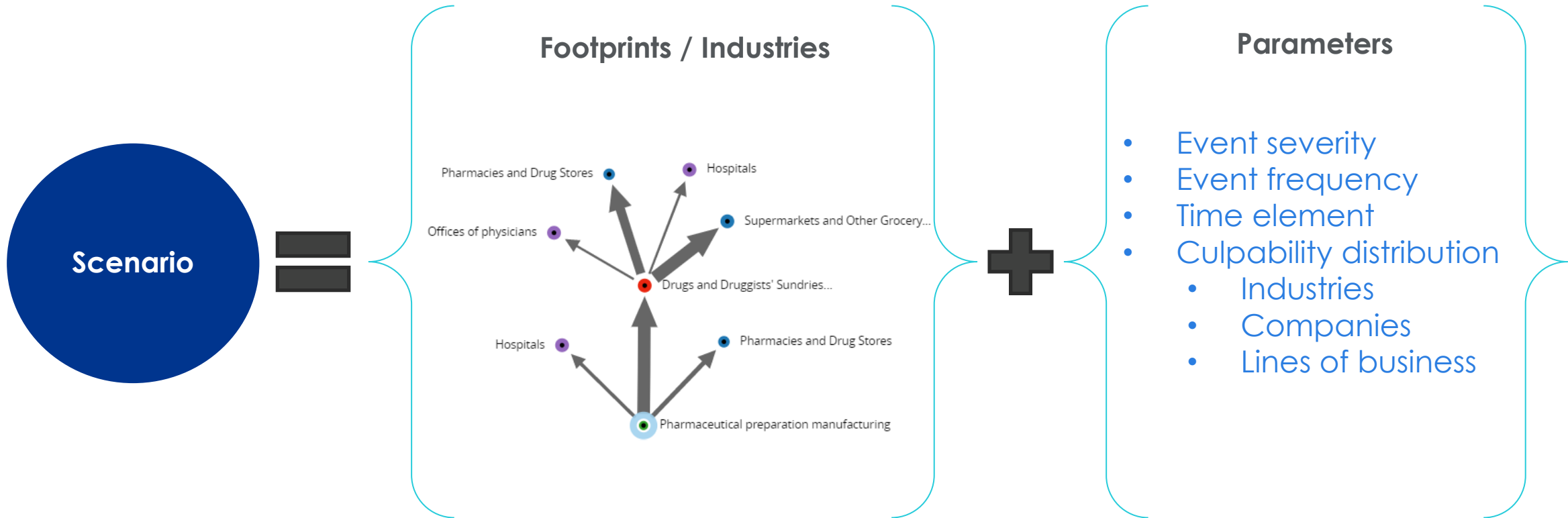
# What is liability scenario analysis?



Envisioning future possibilities

Calculating financial impacts to portfolios

# What is a liability scenario?



# Calculating the impact of a scenario on a portfolio

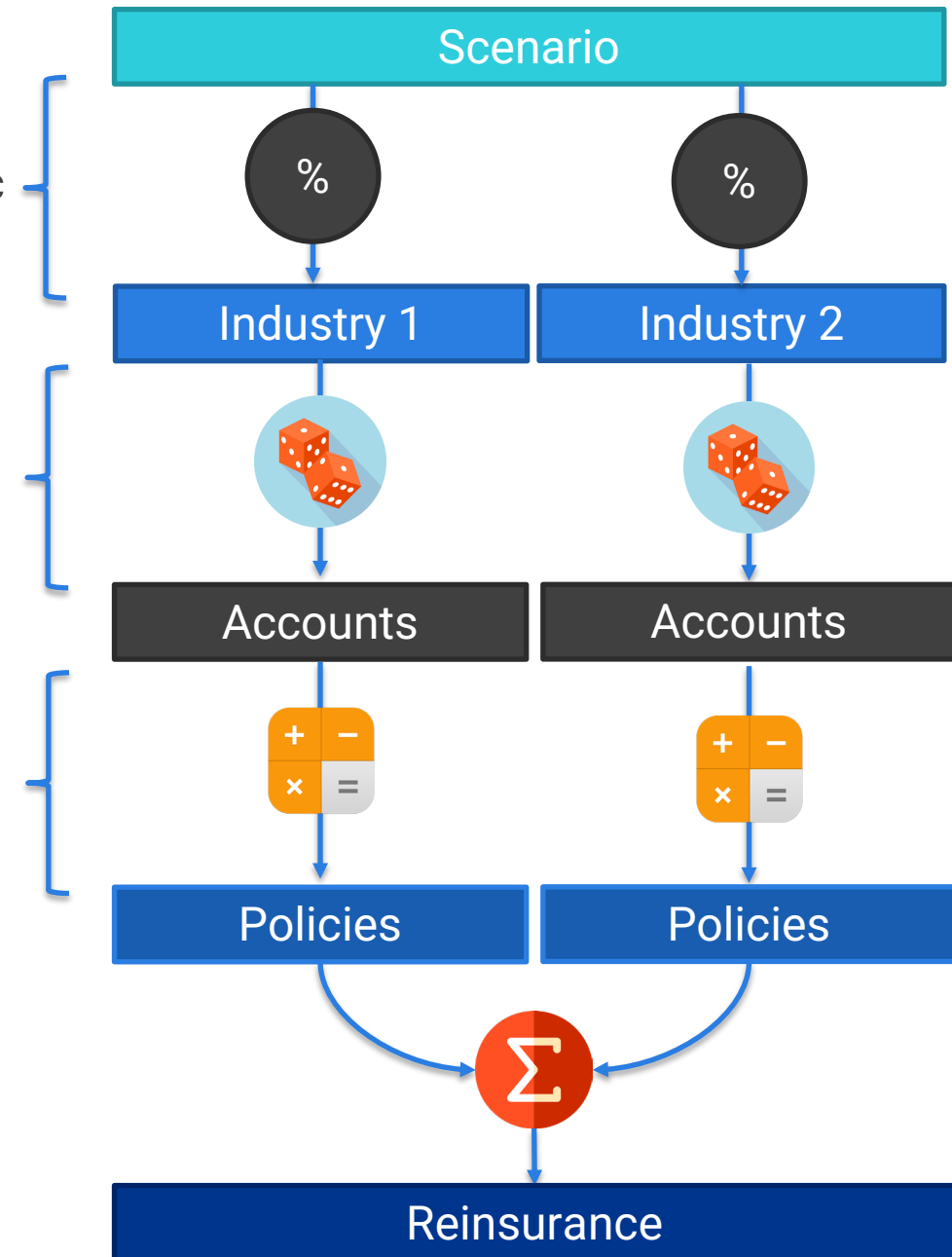
- Not portfolio-specific

- Occurrence  
- Ground-up loss

- Terms & Conditions  
- Multi-year

The process cascades losses from the industry level to:

- the insured
- its policies
- reinsurance



# Drivers of uncertainty in liability scenarios



Diversity of event types

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

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

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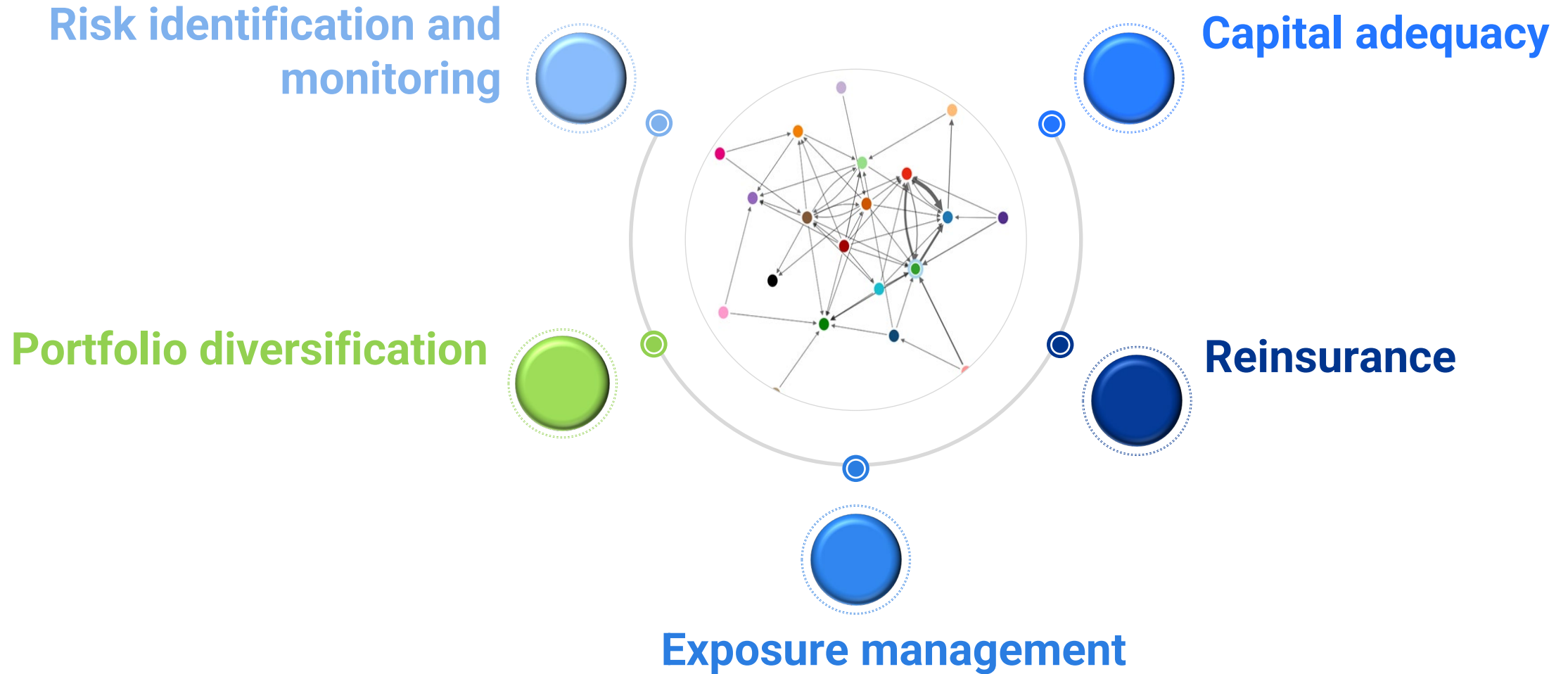
Losses can vary widely for same event (e.g., between courts, states, countries)

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

# Using liability scenario analysis to quantify financial impacts





# Scenario use case: Exposure management and portfolio diversification

*Use scenarios to identify where there may be concerning accumulations and clash risks between lines of business and industries.*

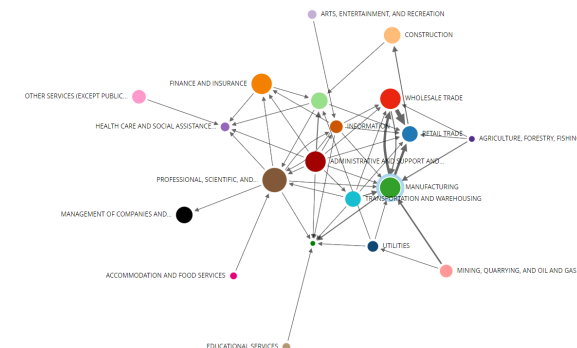
**Example:** Liability for misleading disclosures and statements related to climate change risks

## Considerations for exposure management:

- Where might a portfolio be vulnerable to a potential increase in litigation?
- A variety of industries and companies could be implicated, including clusters in specific industries such as energy
- Exposure to both management and professional lines
- Potential for litigation outside the U.S.



The screenshot shows the U.S. Securities and Exchange Commission (SEC) website. The header includes the SEC logo and the text "U.S. SECURITIES AND EXCHANGE COMMISSION". A navigation bar contains links for "ABOUT", "DIVISIONS & OFFICES", "ENFORCEMENT", "REGULATION", and "EDUCATION". The main content area is titled "Press Release" and features a headline: "SEC Proposes Rules to Enhance and Standardize Climate-Related Disclosures for Investors". Below the headline, it states "FOR IMMEDIATE RELEASE 2022-46" and "Washington D.C., March 21, 2022 — The Securities and Exchange Commission today proposed rule changes that would require registrants to include certain climate-related disclosures in their".



# Scenario use case: Capital adequacy

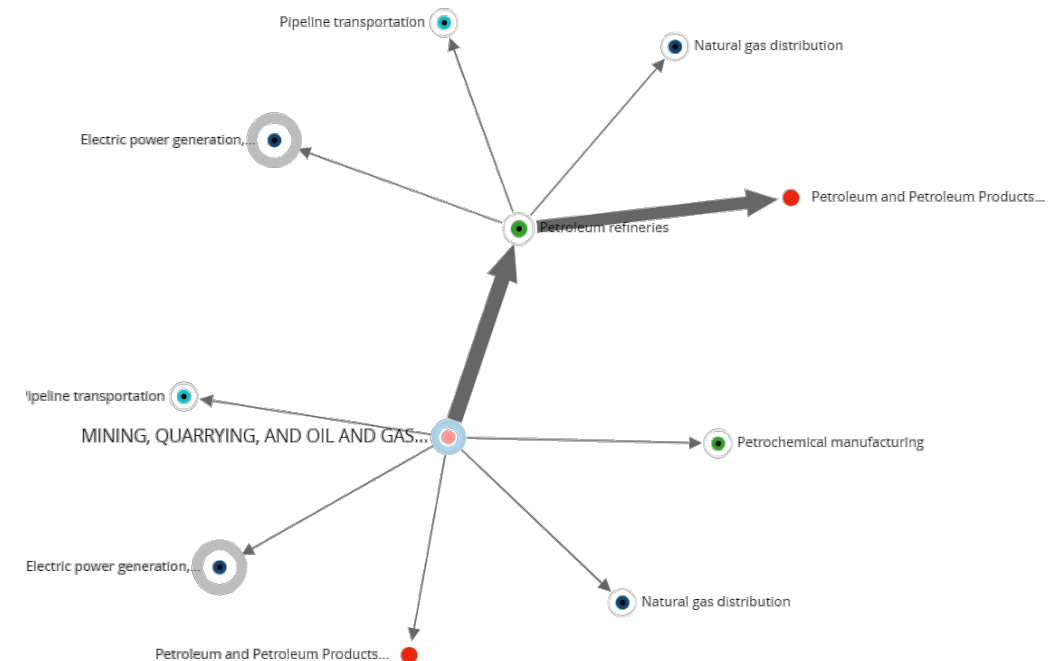
*Use scenarios to calculate solvency in the event of a significant liability catastrophe. This facilitates benchmarking losses to liability catastrophe scenarios over time to monitor solvency measures and to assist with regulatory reporting.*

- Stress test portfolios on generic classes of liability catastrophe scenarios (“RDS”)
- Measure potential catastrophic losses to specific emerging risks threatening liability portfolios

**Example:** Liability for contributing to sea level rise

## Considerations for stress testing:

- How significant could losses be in the event of successful litigation?
- Which industries are particularly vulnerable to large losses?
- Which liability lines might respond?
- How might portfolios overall be impacted by various plausible outcomes?



# Scenario use case: Reinsurance

*Use scenarios to support the evaluation of treaty structures and optimize risk transfer.*

- Group similar liability scenarios together and develop frequencies
- Adjust views to account for risks that will impact scenario and group parameters

**Example:** Liability for failing to prepare and mitigate against climate change risks

## Considerations for reinsurance:

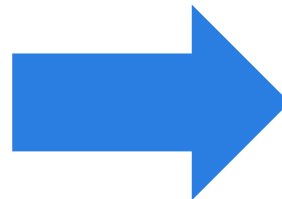
- How might known and foreseeable events change in frequency and severity?
- How might liability shift over time to other industries and lines of business?
- Where might these events manifest in the future?

BUSINESS

## PG&E Announces \$13.5 Billion Settlement Of Claims Linked To California Wildfires

December 7, 2019 · 12:05 AM ET

 RICHARD GONZALES



AIR Worldwide is now Verisk.

ABOUT SOLUTIONS IN FOCUS HOME

How Climate Change May Influence Wildfire Losses to U.S. Property by Mid-Century

By Alastair Clarke, Doug Fullam, Peter Sousounis | October 25, 2021

# Summary

- The objectives of scenario analysis are to:
  - Envision future possibilities
  - Calculate financial impacts on portfolios
- Scenario analysis requires key data and parameter inputs
- Scenarios can be used to understand the impacts of climate change liability for exposure management, portfolio diversification, capital adequacy, and reinsurance



# Q&A



# Climate Scenario Analysis

# Today's Presenters



**Gavin Conn**  
Director, Climate Research  
Moody's Analytics



**Joss Matthewman**  
Senior Director, Climate Change  
RMS / Moody's Analytics



**Srini Iyer**  
Senior Director, Insurance Practice,  
Moody's Analytics



**Matthew Nielsen**  
Governmental and Regulatory Affairs  
RMS / Moody's Analytics

What will be covered  
in this session

- 1 **Moody's Approach to Climate Risk**
- 2 **Climate Scenario Pathways**
- 3 **Reflecting Climate Change in CAT Models**



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# Moody's Approach to Climate Risk

# Quantifying the impact of climate risk

## Assets

### Top-down Climate Pathways

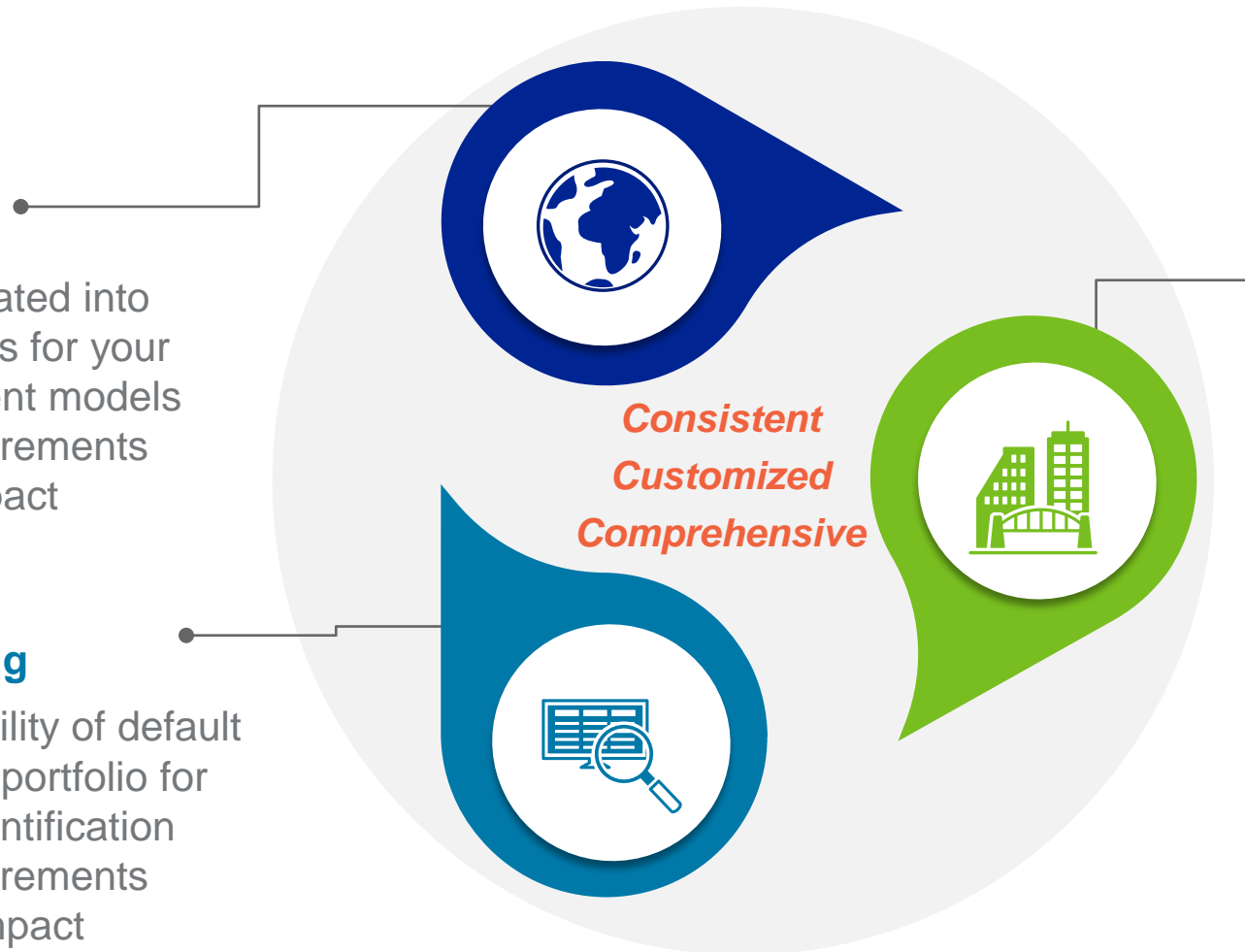
Climate scenarios translated into macroeconomic variables for your asset liability management models

- ✓ Meet regulatory requirements
- ✓ Quantify financial impact

### Bottom-up Climate Asset Modelling

Climate-adjusted probability of default for each security in your portfolio for granular climate risk quantification

- ✓ Meet regulatory requirements
- ✓ Quantify credit risk impact



## Liabilities

### Climate Scenario Physical Risk Modelling

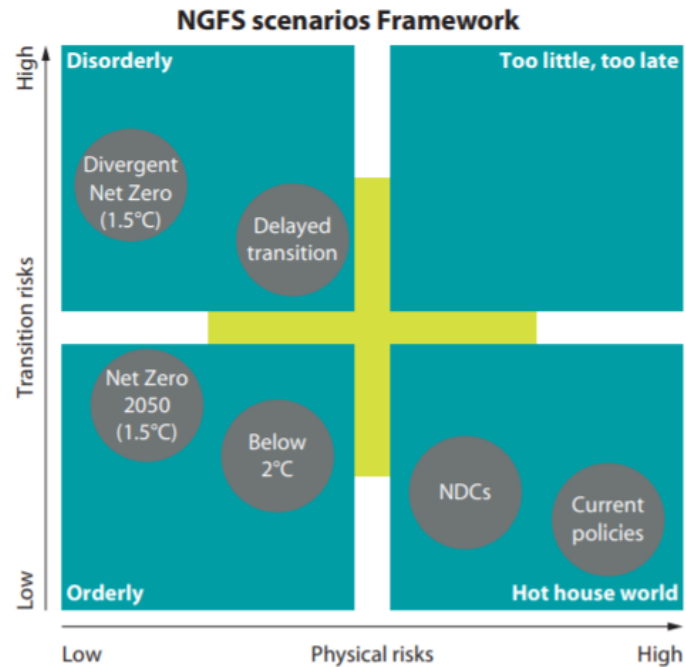
Climate conditioned Nat Cat models for individual perils based on Representative Concentration Pathways at a range of time horizons

- ✓ Support pricing decisions
- ✓ Inform capital allocation

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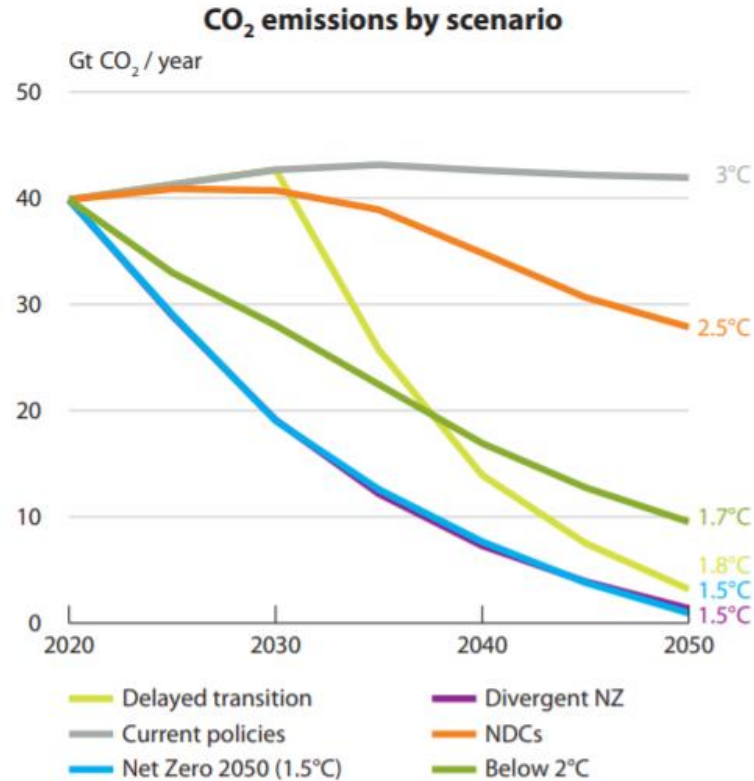
# Climate Scenario Pathways

# Modelling Physical and Transition Risk Scenarios

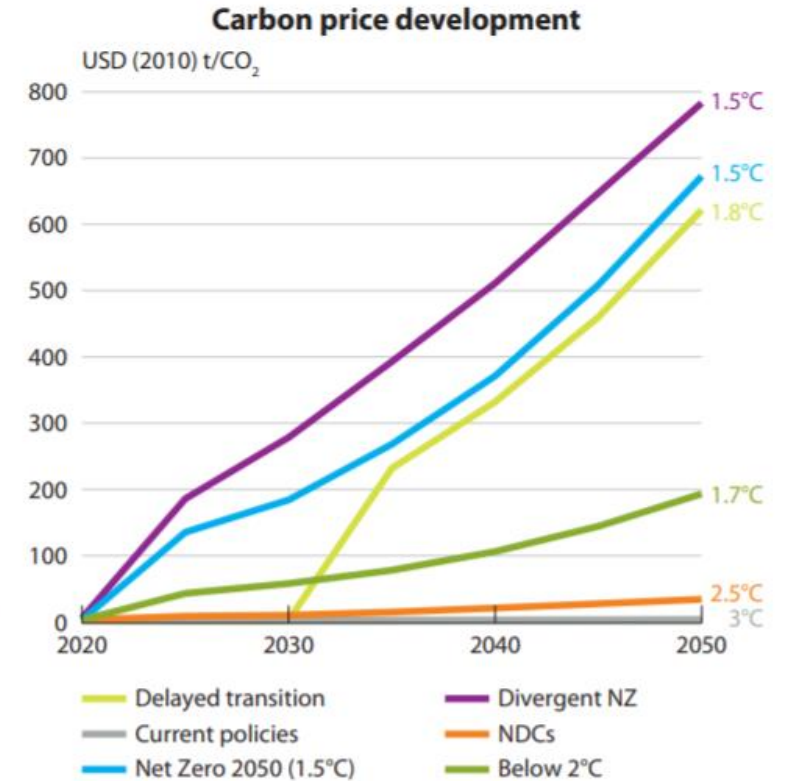


Positioning of scenarios is approximate, based on an assessment of physical and transition risks out to 2100.

- Orderly** Net Zero 2050
- Disorderly** Divergent Net Zero
- Hot House** NDCs



Source: IIASA NGFS Climate Scenarios Database, REMIND model. End of century warming outcomes shown.



Source: IIASA NGFS Climate Scenarios Database, REMIND model. Carbon prices are weighted global averages. End of century warming outcomes shown.

# Climate Calibration Process



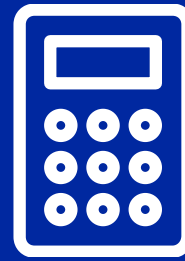
## Select Climate Scenarios

NGFS/IPCC aligned climate scenarios for 1.5°C, 2°C or hot house scenarios with early or late policy action



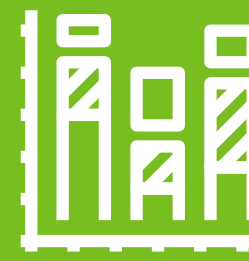
## Translate Macroeconomic Impact

Policy costs, via carbon taxes, and physical damages drive changes in GDP and consumption growth



## Calculate Financial Returns

Convert macroeconomic impact into key financial variables



## Set Calibration Targets

Decompose real returns to set expected paths for short rate, long rate, credit spreads and asset risk premia



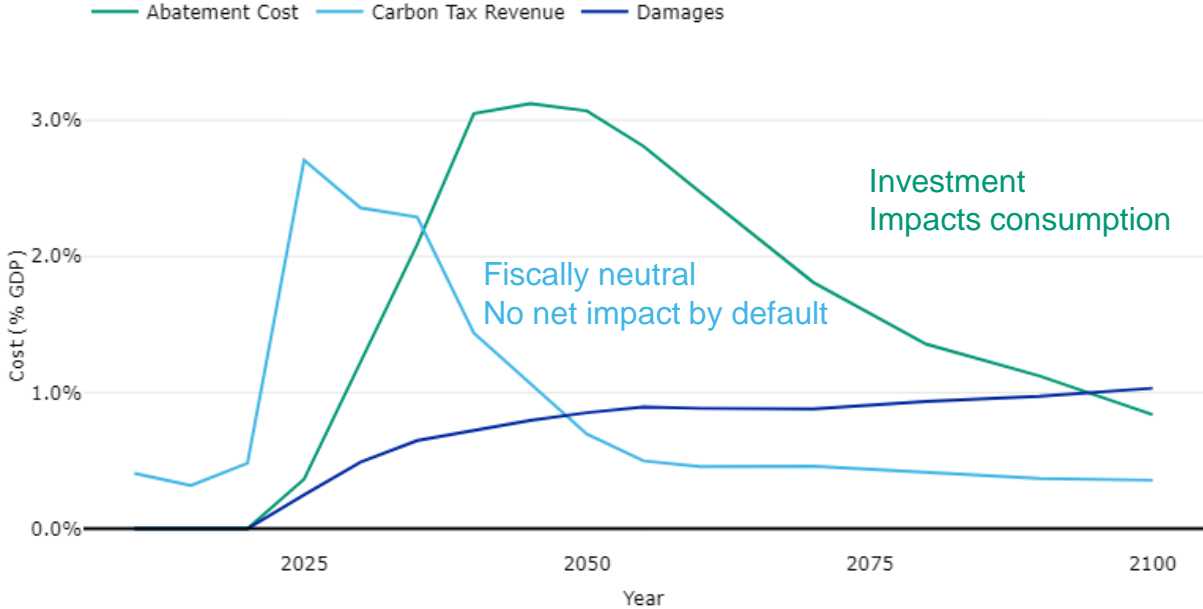
## Generate Scenario Sets

Calibrate and run Scenario Generator to produce deterministic or stochastic scenario sets

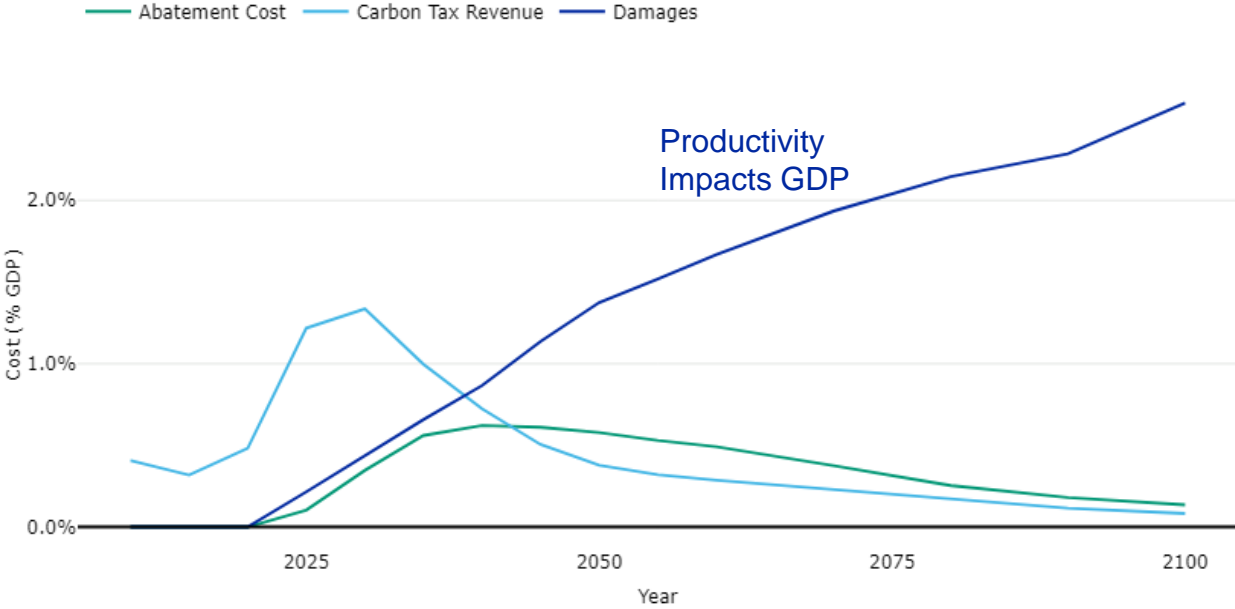
# Three waves of Costs

Costs vary across regions and scenarios

### Orderly Transition – Net Zero 2050



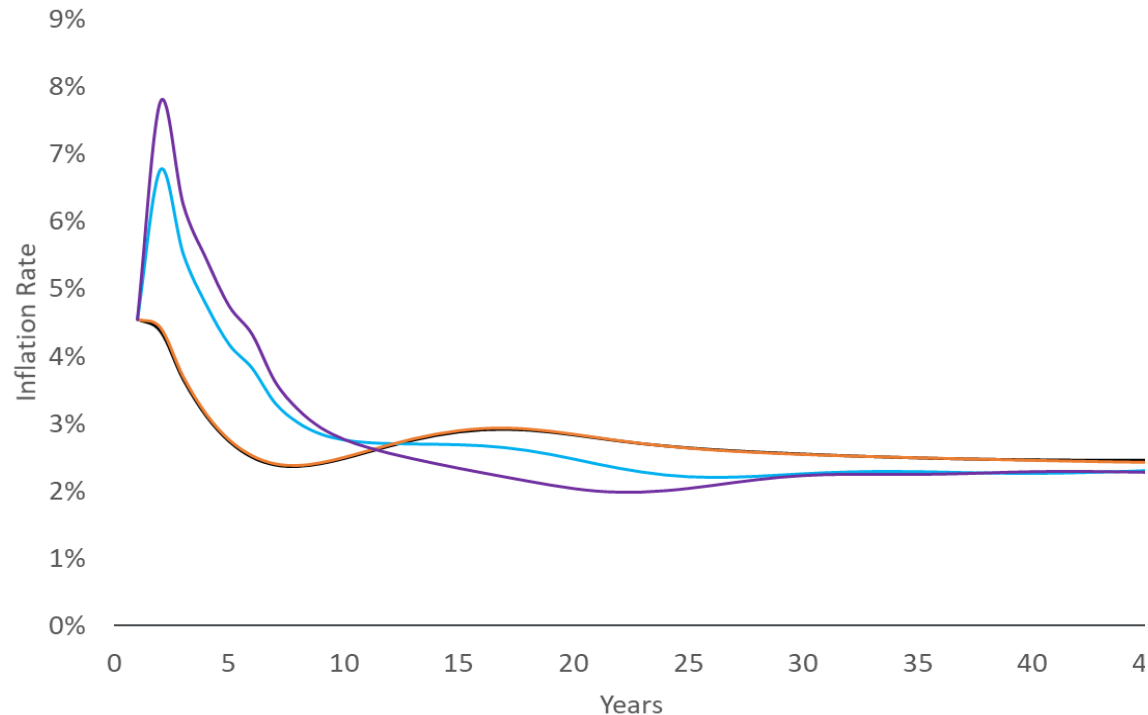
### Hot House Scenario – Nationally Determined Contributions



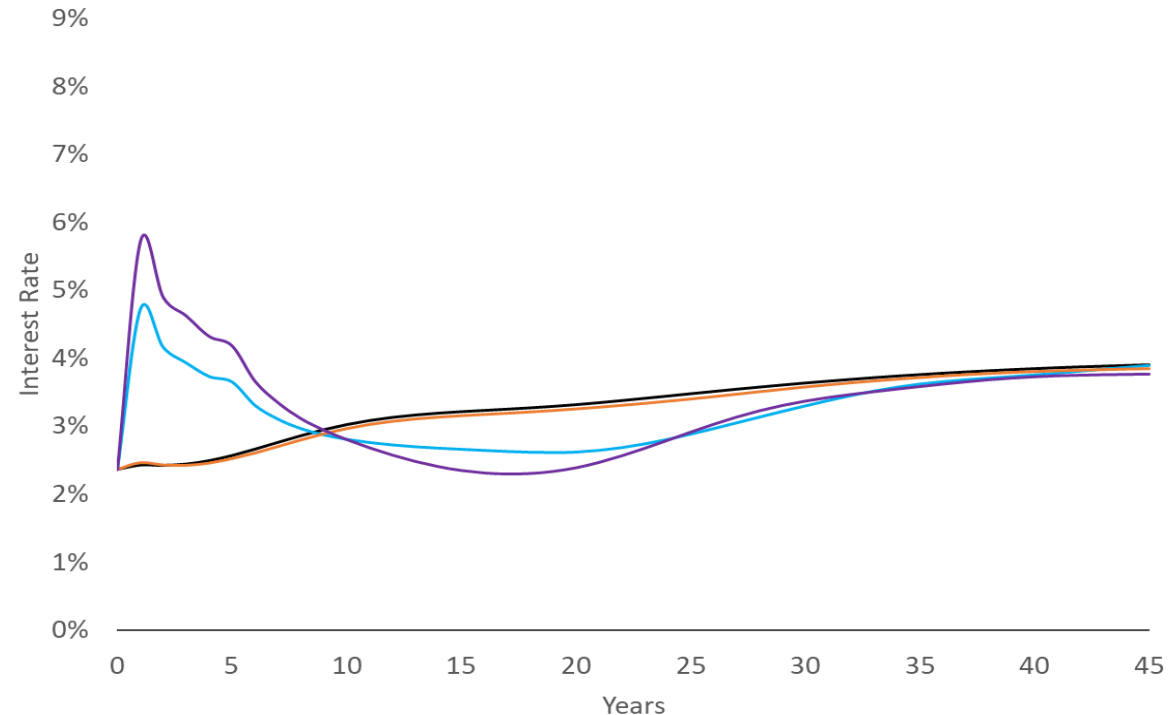
# Projecting financial variables

Moody's Analytics apply our expertise in both scenario modelling and climate risk modelling to convert the emissions and carbon price impacts into impact on financial market variables.

### Projection of Inflation



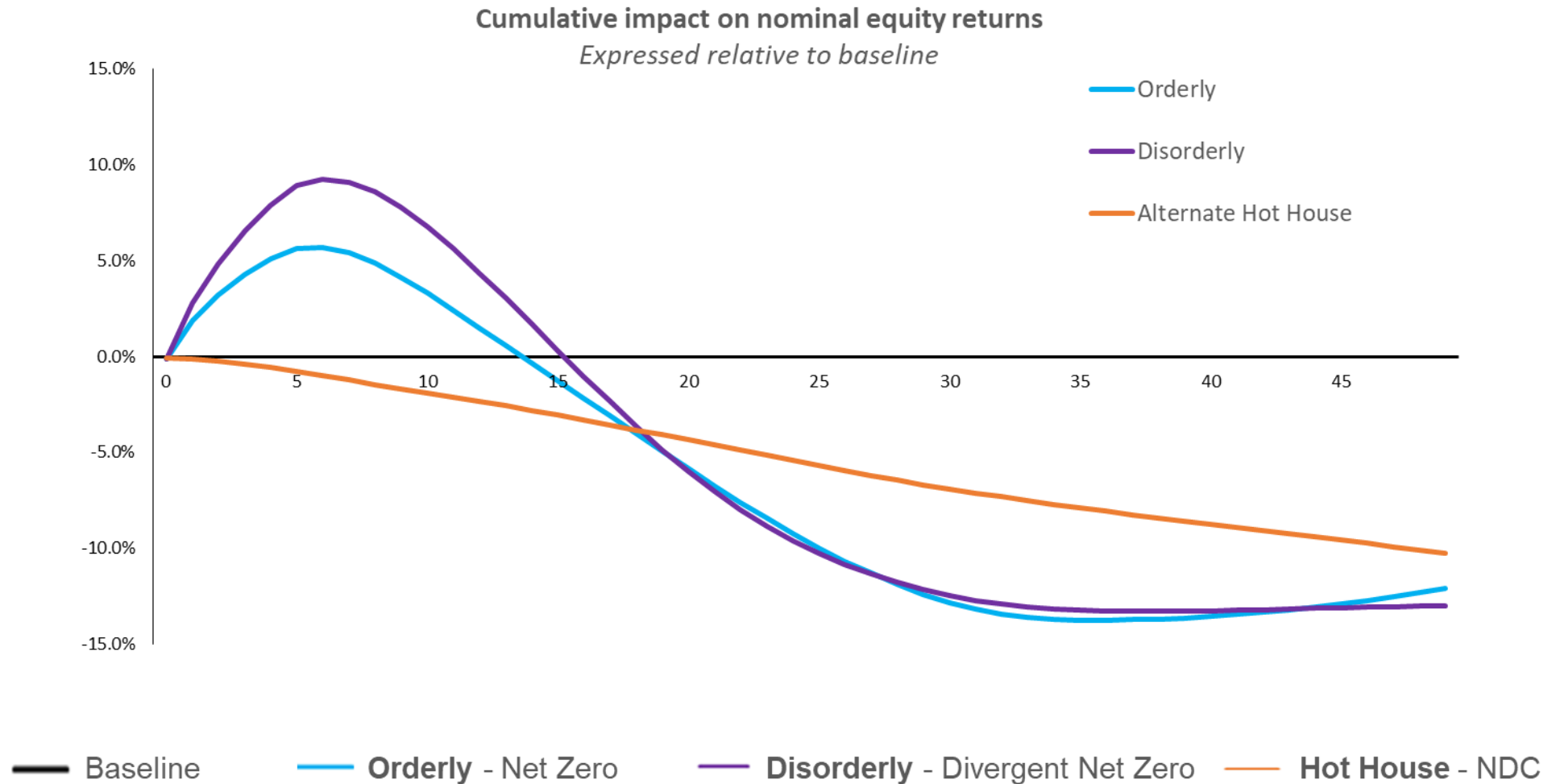
### Projection of US 10Y Treasury Rate



— Baseline    — Orderly - Net Zero    — Disorderly - Divergent Net Zero    — Hot House - NDC

# Projecting equity returns

Impact on Equities relative to baseline

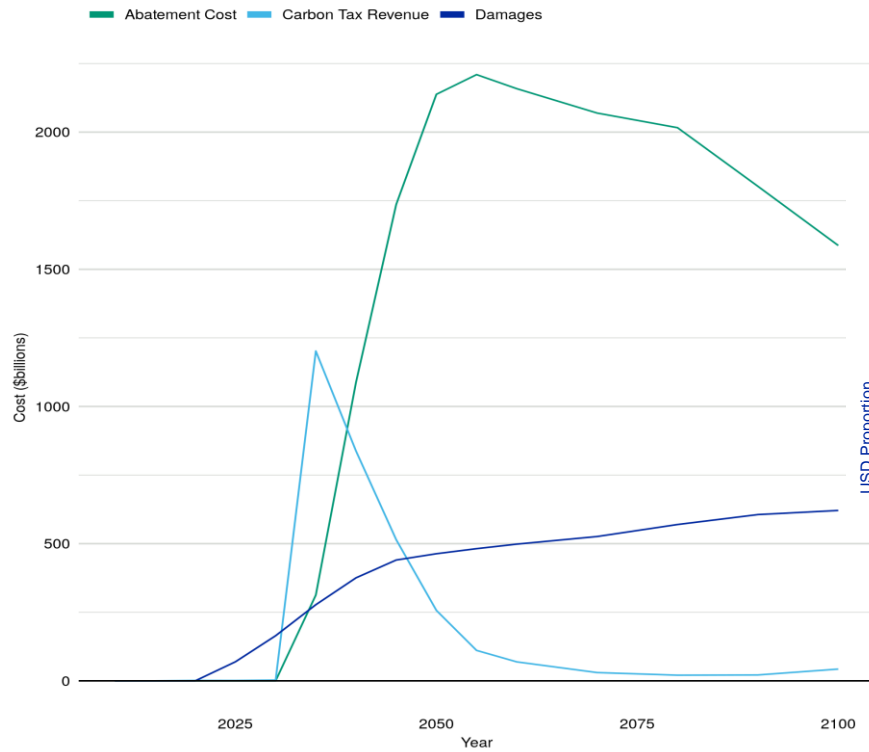




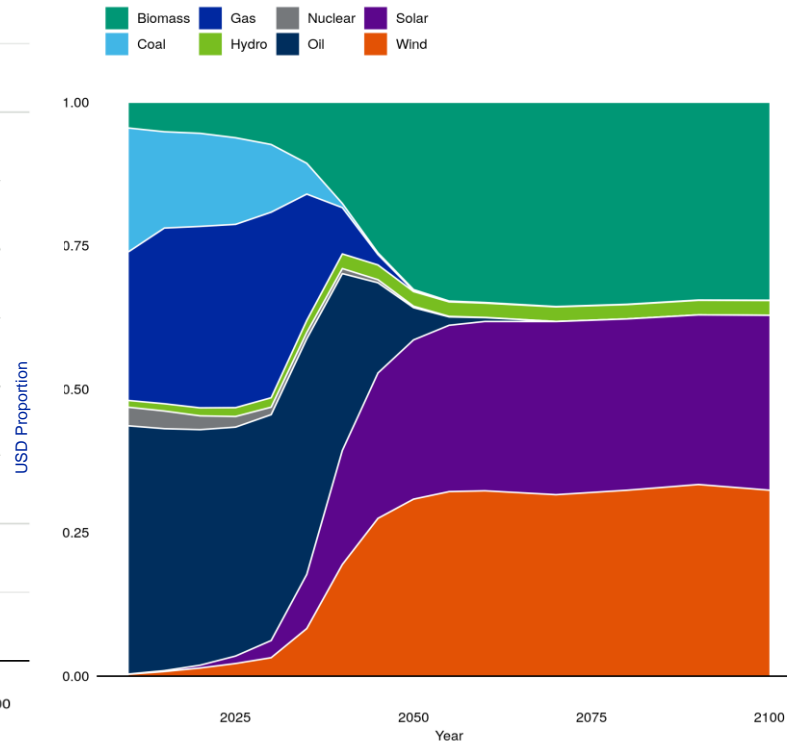
# Illustrative results

## Delayed Transition scenario

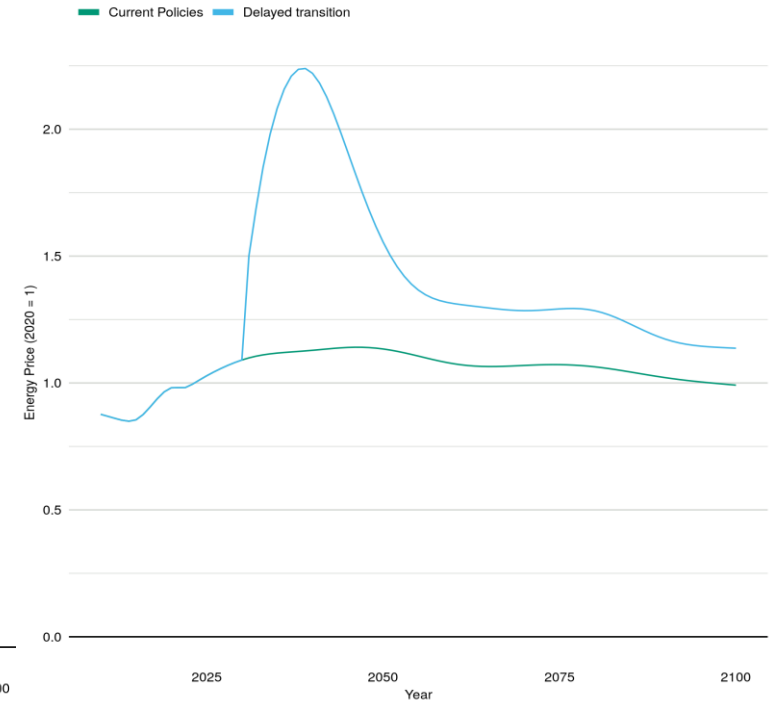
### Projected Costs



### Projected Energy Mix



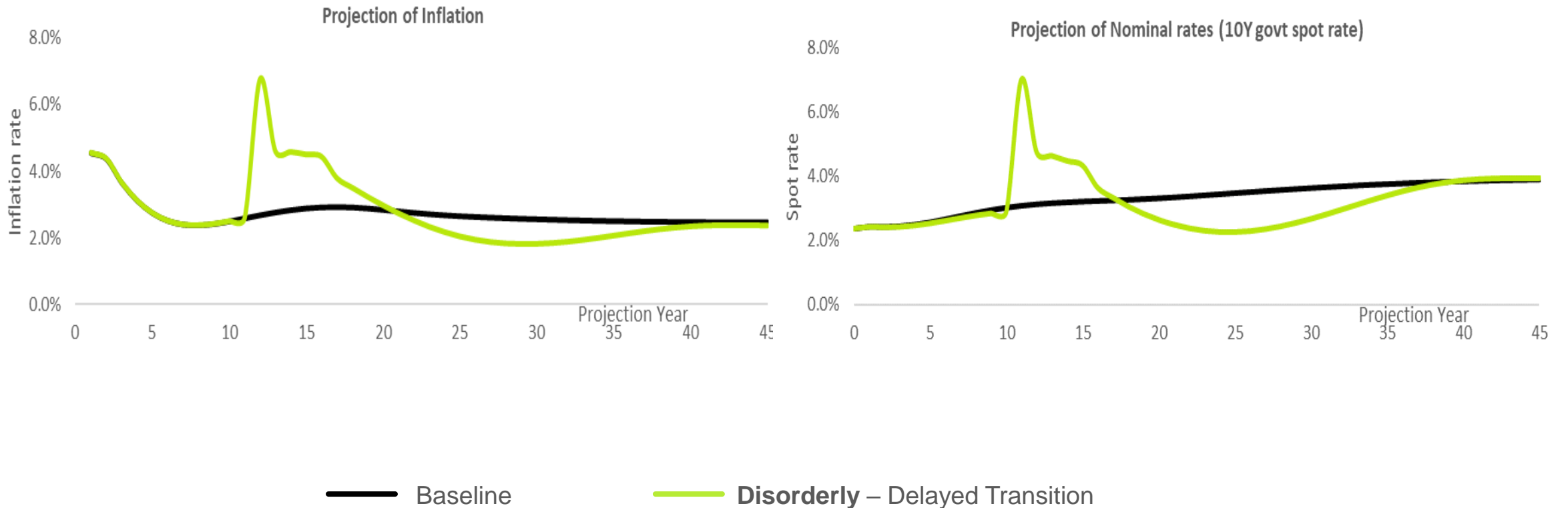
### Projected Energy Prices



# Illustrative results

## Delayed Transition scenario

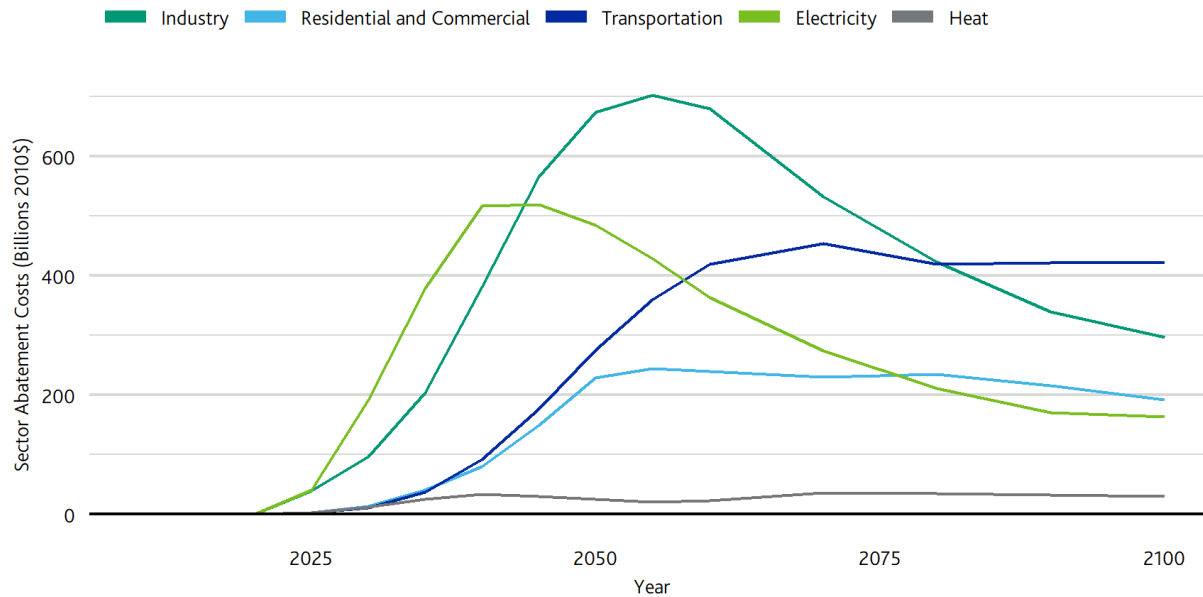
Scenario analysis converts the emissions and carbon price impacts into impact on financial market variables.



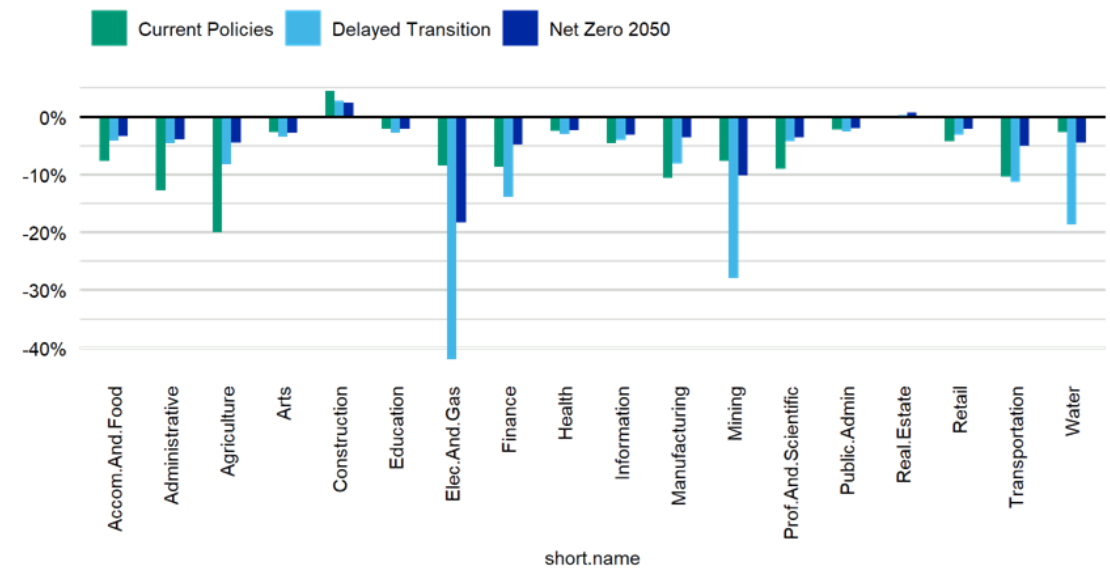
# Sector Costs

Output from the IAM provides emissions data split in to different sectors. Marginal abatement cost curve can be applied to sectors, as well the whole economy.

### Sector Abatement Costs



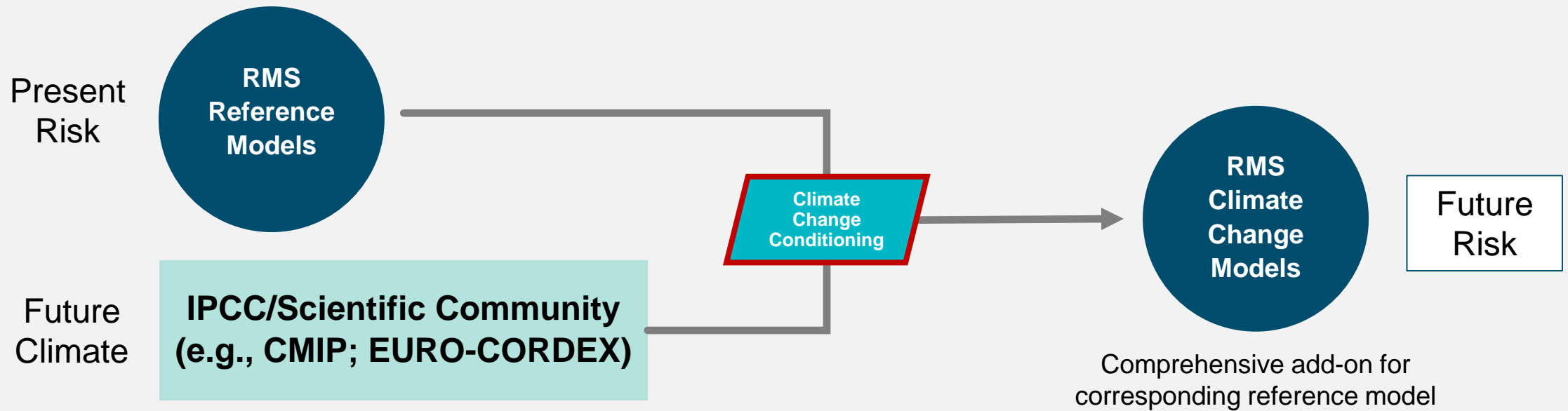
### Impact on Equities by sector (relative to baseline)



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# Reflecting Climate Change in CAT Models

# RMS Climate Change Models

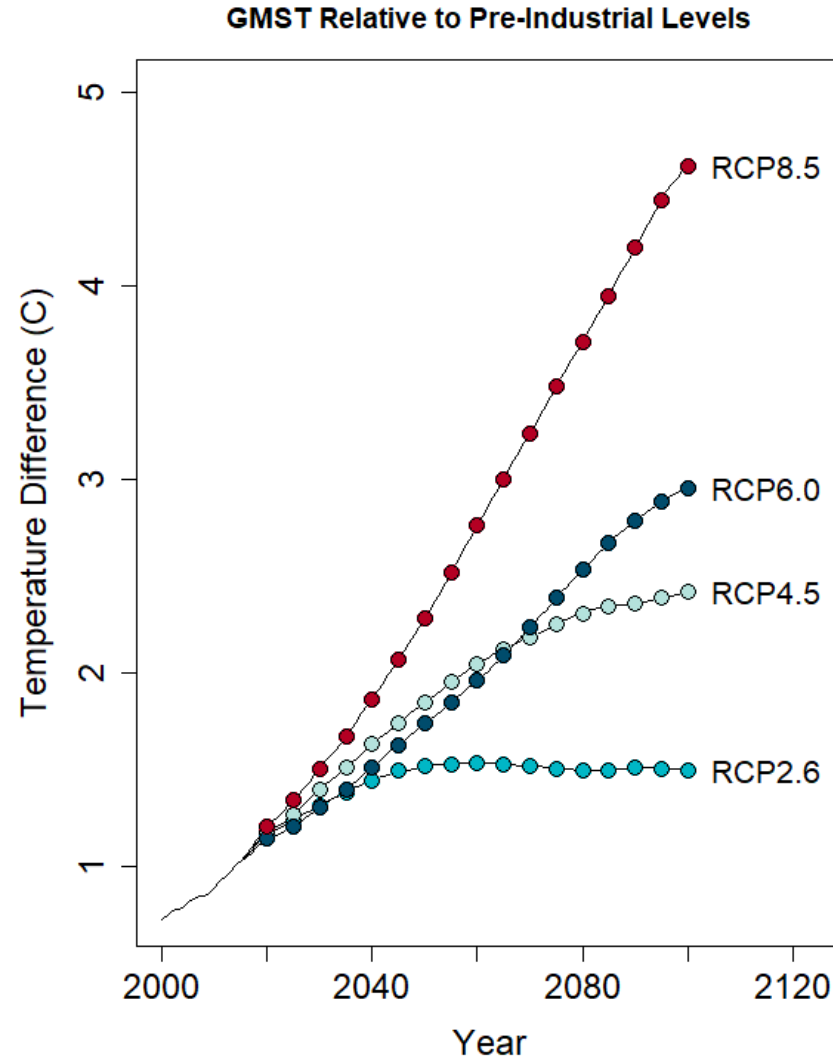


- Climate change conditioning driven by robust science
- Probabilistic modelling of climate change impacts (EP Curves etc.)
- Delivered within established risk management approach & software

IPCC: Intergovernmental Panel on Climate Change | CMIP: Coupled Model Intercomparison Project

# Full Range of RCPs and Time Horizons

- Representative Concentration Pathways (RCPs) are pathways not snapshots
- Rate of climate change varies:
  - By time along each RCP
  - Between RCPs
- RMS climate change models aim to capture:
  - RCP2.6, RCP4.5, RCP6.0, RCP8.5
  - From 2020-2100 in 5 year intervals
  - Total of 68 RCP/Time Horizon conditioned views
- Select region-perils (e.g. NAHU) also have user-defined choices for which physical variables are conditioned



# Mapping RCPs & Time Horizons to GMST increase scenarios

- The wide range of RCPs & time horizons in the RMS Climate Change Models can be mapped to existing and future use-cases and regulatory requirements:

## Operational Business Decisions

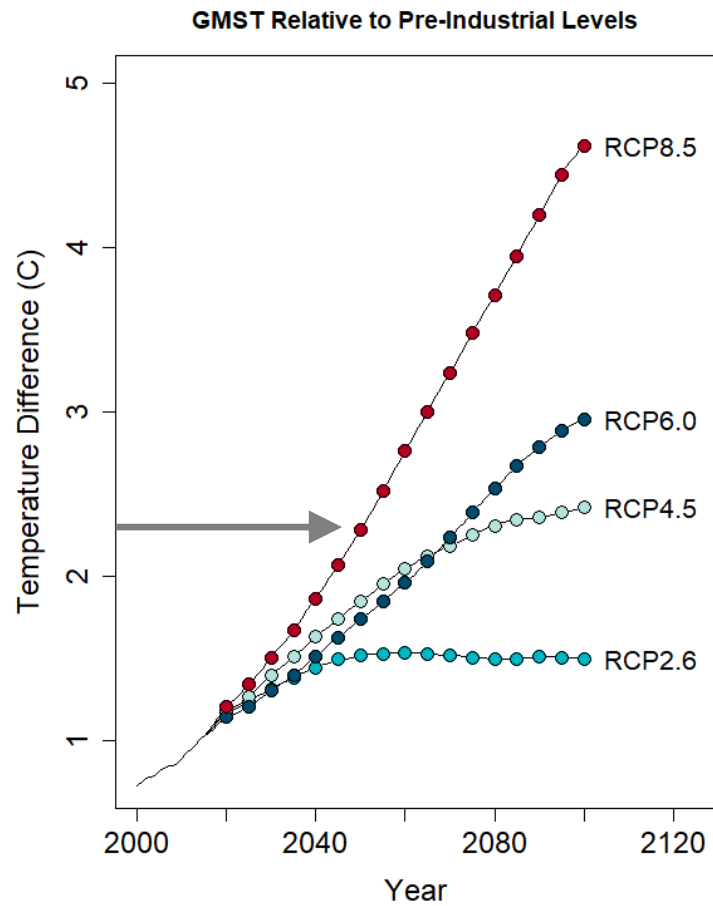
- Pricing adequacy
- Business planning
- Capital stress testing

Global Mean Surface Temperature (GMST) increase relative to pre-industrial (1880-1900) levels																	
	Year																
	2020	2025	2030	2035	2040	2045	2050	2055	2060	2065	2070	2075	2080	2085	2090	2095	2100
RCP2.6	1.2	1.2	1.3	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
RCP4.5	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.0	2.0	2.1	2.2	2.3	2.3	2.3	2.4	2.4	2.4
RCP6.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	2.0	2.1	2.2	2.4	2.5	2.7	2.8	2.9	3.0
RCP8.5	1.2	1.3	1.5	1.7	1.9	2.1	2.3	2.5	2.8	3.0	3.2	3.5	3.7	3.9	4.2	4.4	4.6

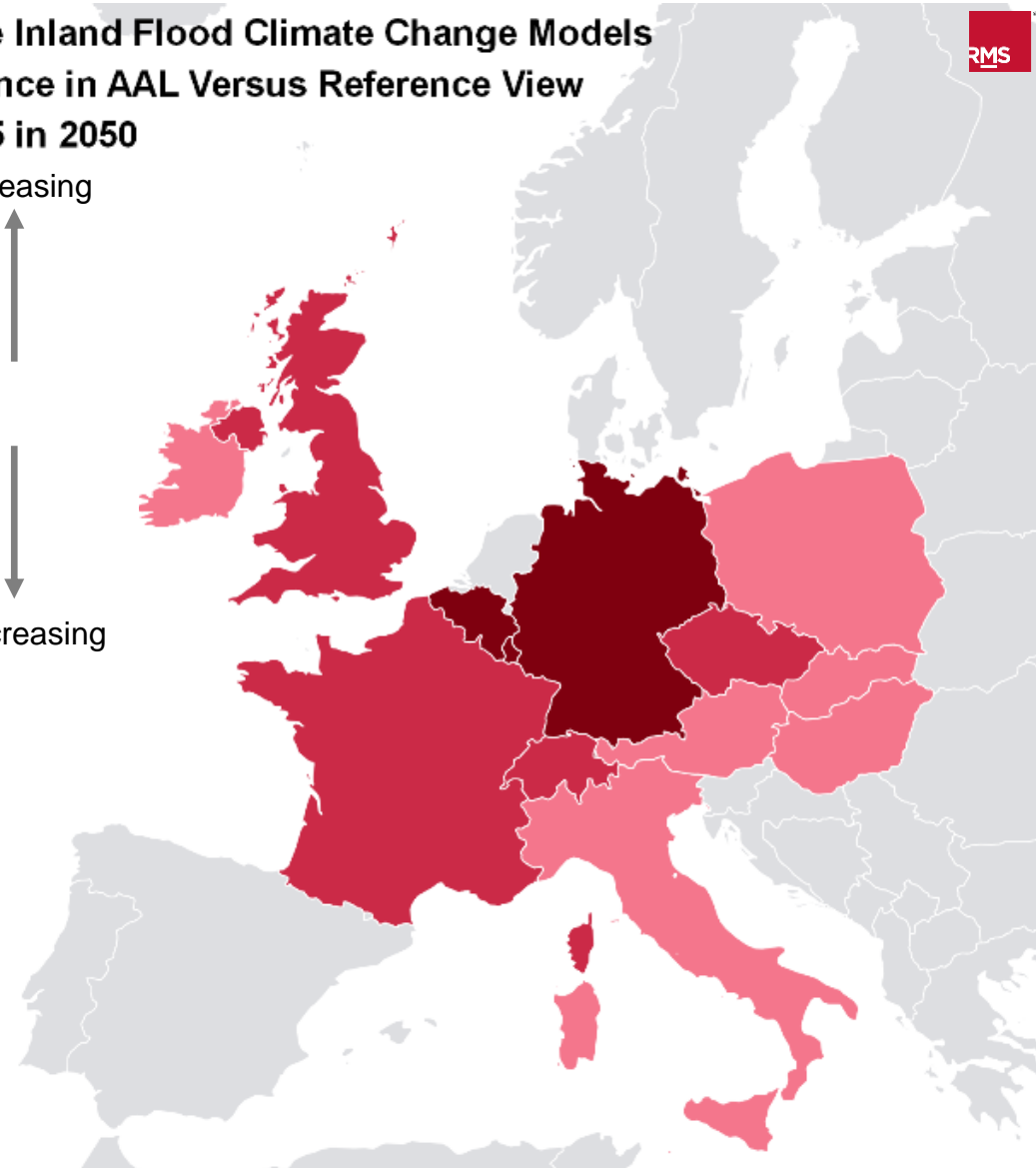
Provided in the RMS Climate Change Model documentation



# European Flood: Future Climate Impacts



Europe Inland Flood Climate Change Models  
Difference in AAL Versus Reference View  
RCP8.5 in 2050







Better, faster decisions

# Thank You

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ENTER TITLE OF EVENT OR PRESENTATION HERE

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