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?

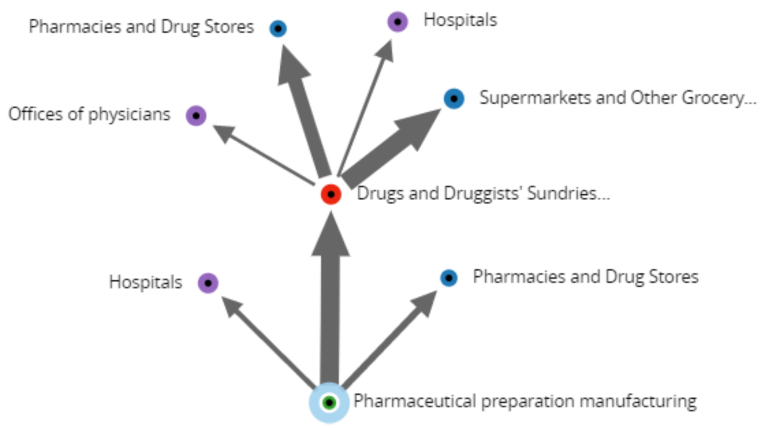
Envisioning future possibilities

Calculating financial impacts to portfolios

# What is a liability scenario?

Scenario = Footprints / Industries + Parameters

## Footprints / Industries




## Parameters

- Event severity
- Event frequency
- Time element
- Culpability distribution
  - Industries
  - Companies
  - Lines of business

# Calculating the impact of a scenario on a portfolio

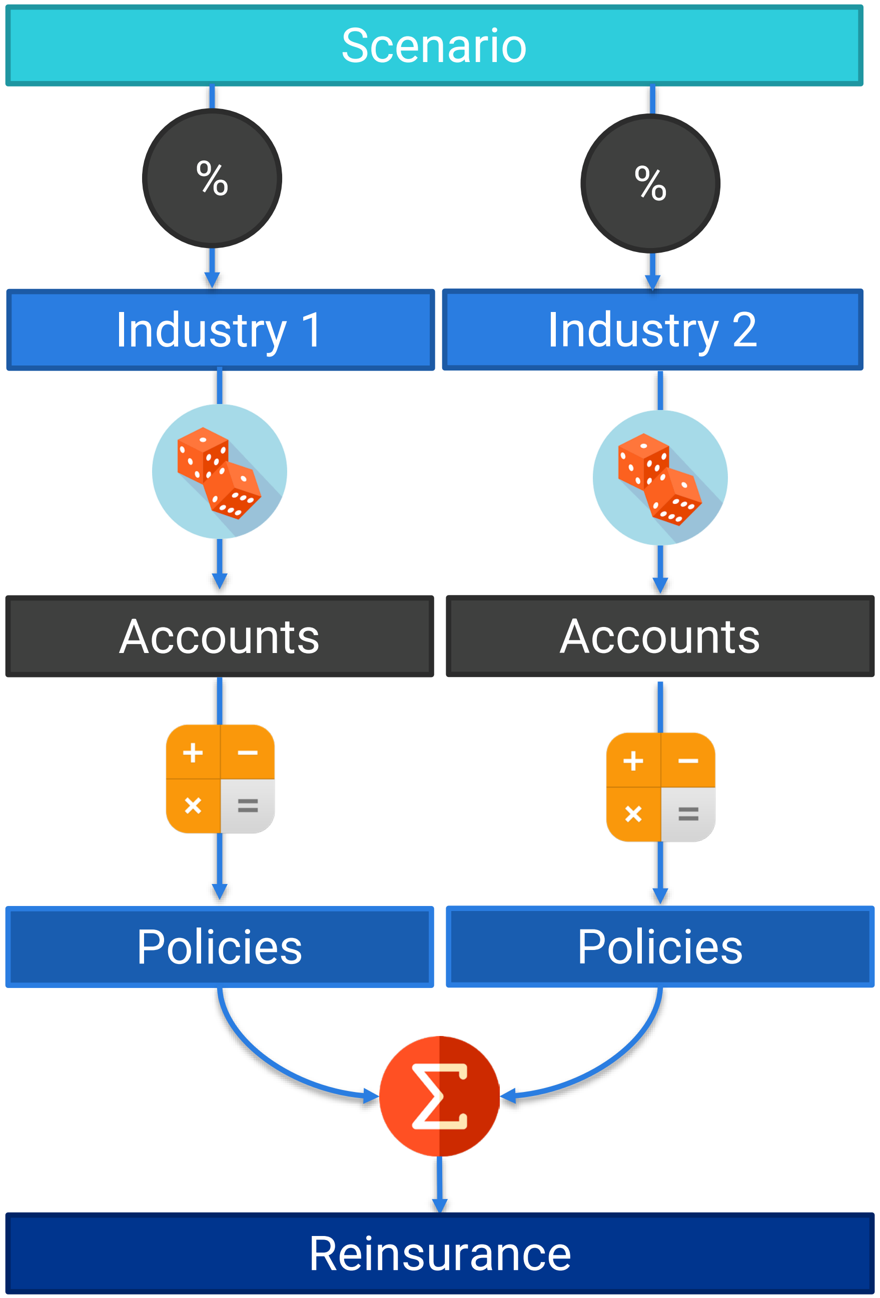
**The process cascades losses from the industry level to:**

- **the insured**
- **its policies**
- **reinsurance**

- Not portfolio-specific

- Occurrence
- Ground-up loss

- Terms & Conditions
- Multi-year



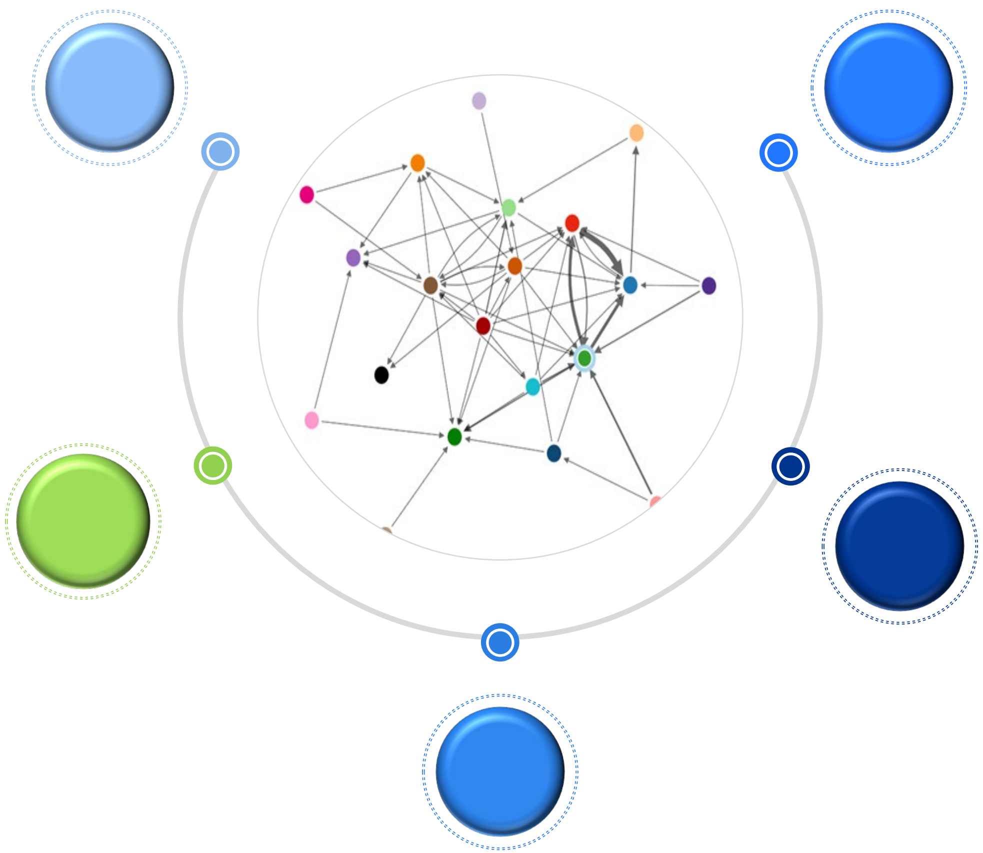
# Drivers of uncertainty in liability scenarios

- 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

# Using liability scenario analysis to quantify financial impacts

## Risk identification and monitoring

## Capital adequacy



## Portfolio diversification

## Reinsurance

## Exposure management

# 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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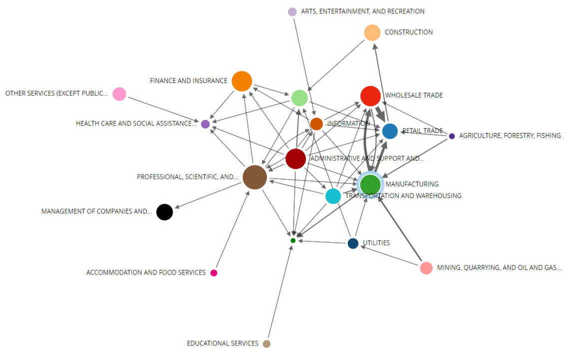
SEC Proposes Rules to Enhance and Standardize Climate-Related Disclosures for Investors

**FOR IMMEDIATE RELEASE**
**2022-46**

*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

## 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.



# Scenario use case: Capital adequacy

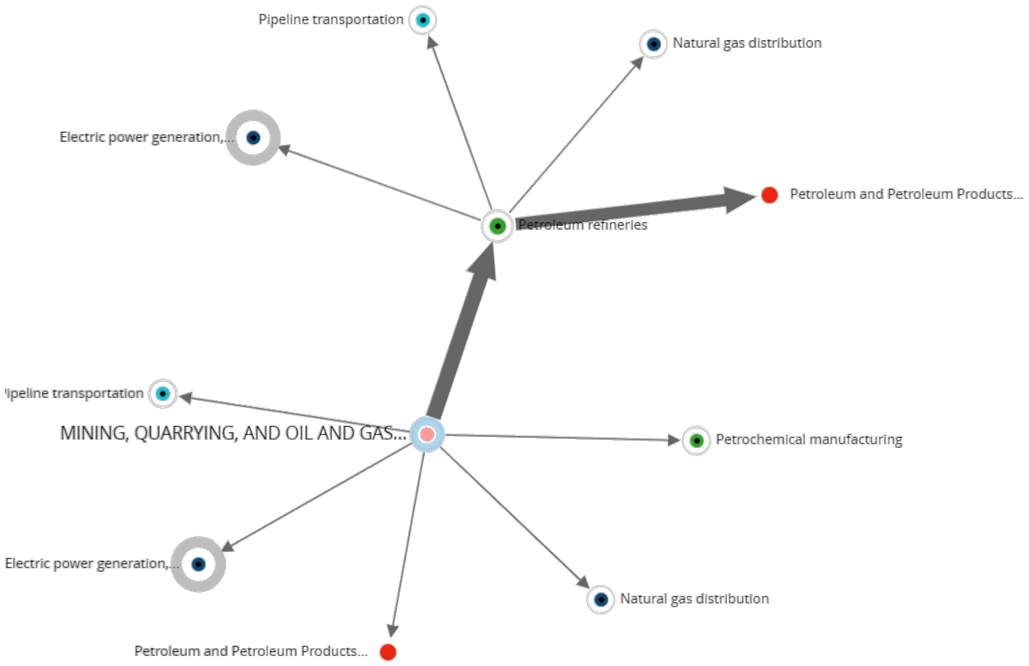
*Use scenarios to calculate solvency in the event of a significant liability catastrophe. This facilitates benchmarking losses to liability catastrophe scenarios over time to monitor solvency measures and to assist with regulatory reporting.*

- 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?

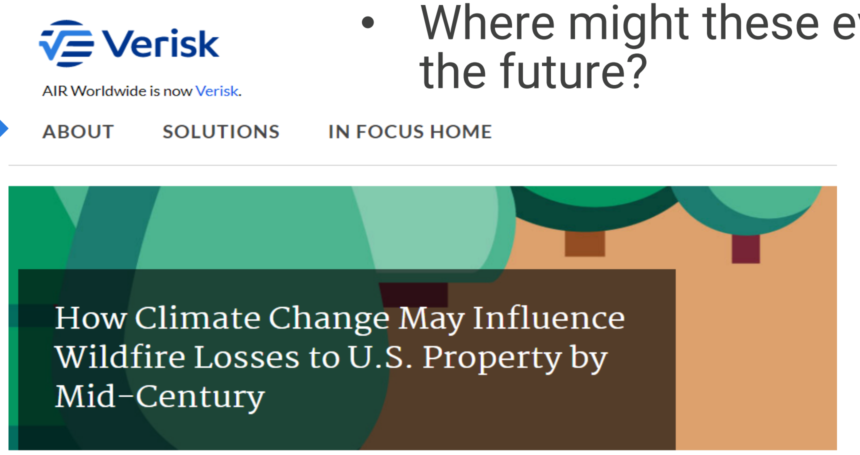


# Scenario use case: Reinsurance

*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


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

**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?

# 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

Moody's
ANALYTICS

# Climate Scenario Analysis

October 2022

# 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**

# Moody’s Approach to Climate Risk

# Quantifying the impact of climate risk

## Assets

Top-down
**Climate Pathways**

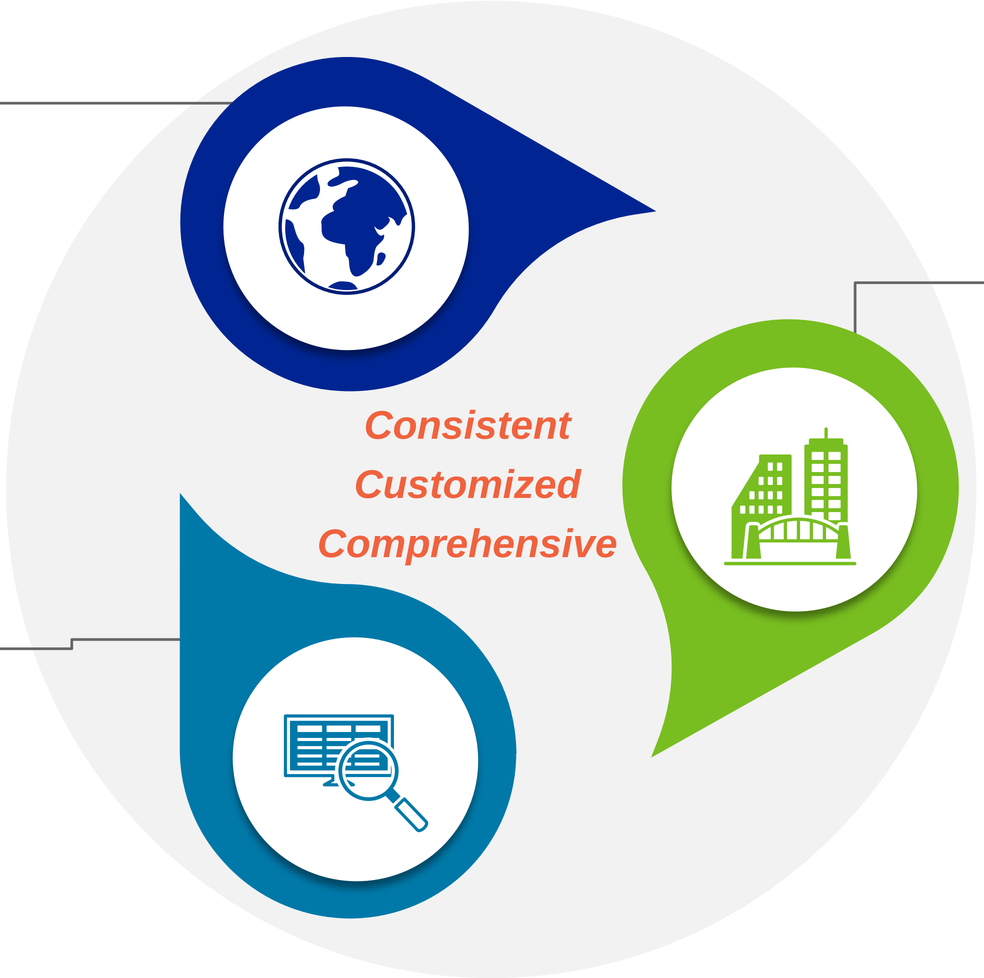
Climate scenarios translated into macroeconomic variables for your asset liability management models

- ✓ 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

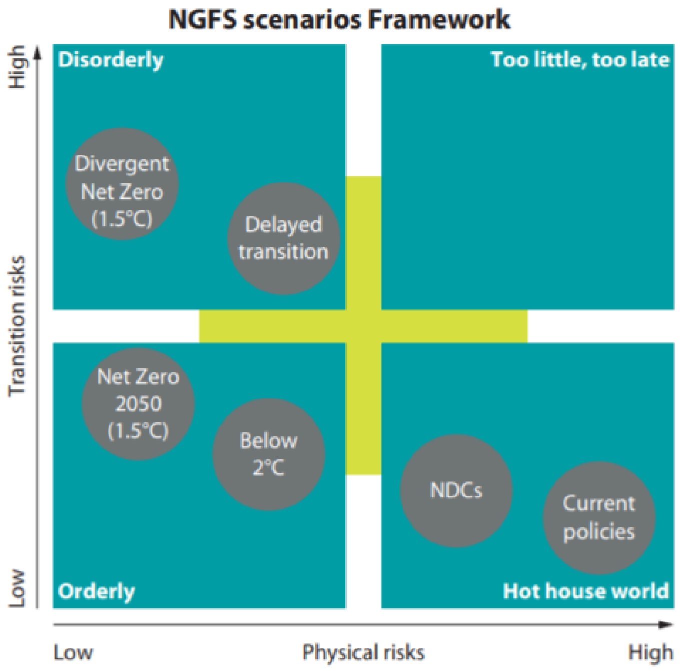
Climate Scenario
**Physical Risk Modelling**

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

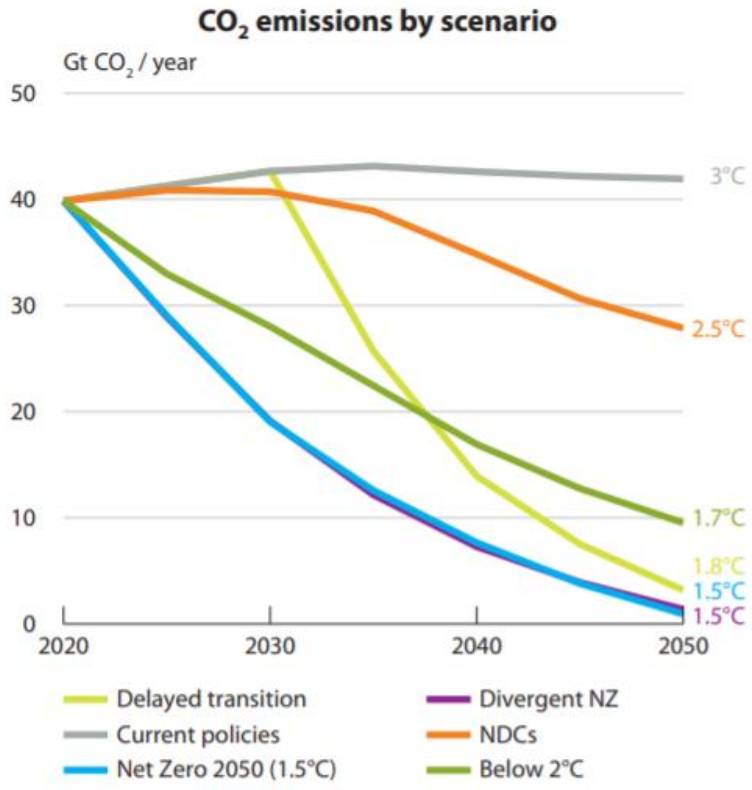
- ✓ Support pricing decisions
- ✓ Inform capital allocation

# Climate Scenario Pathways

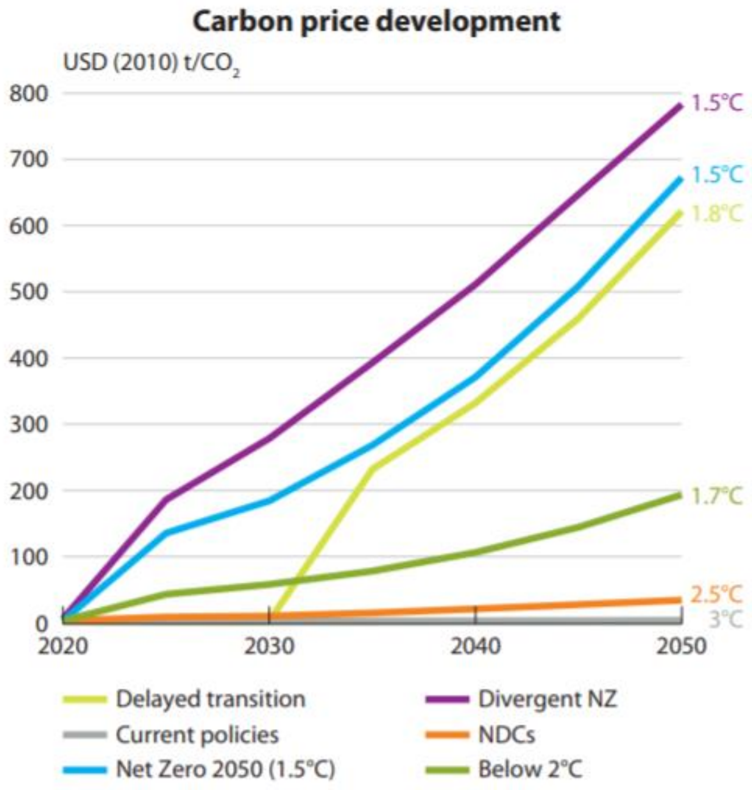
# Modelling Physical and Transition Risk Scenarios




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




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.

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

# 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**

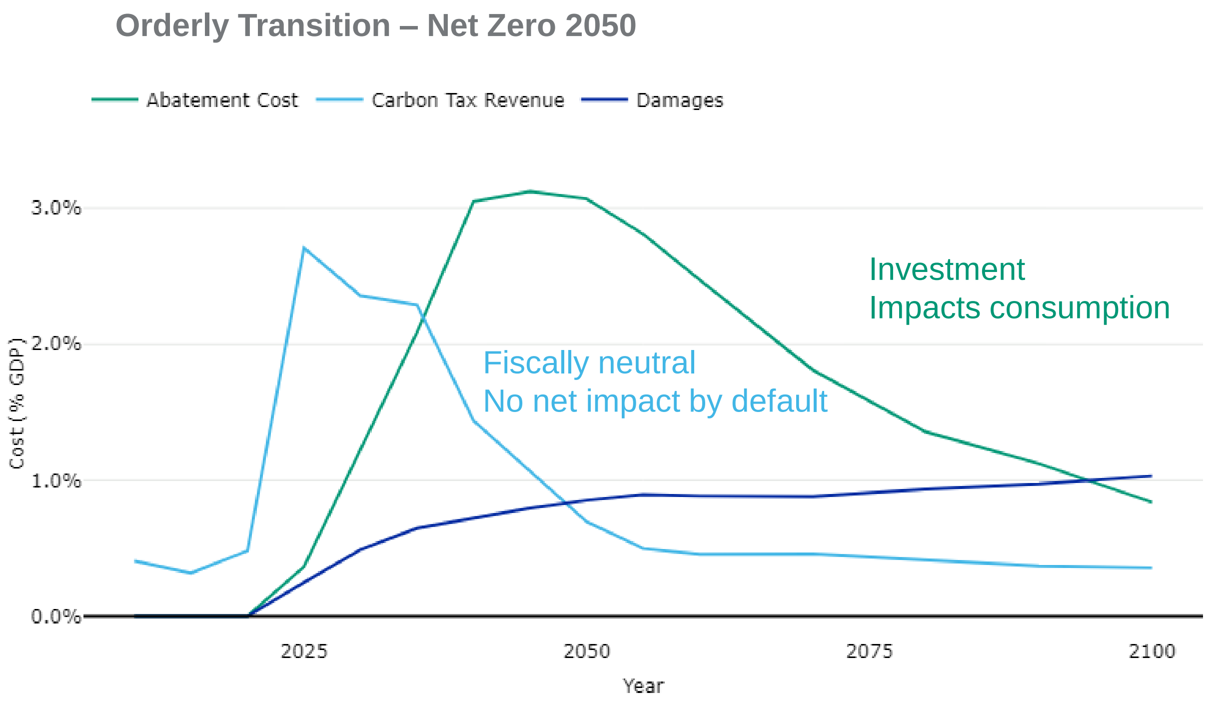
Decompose real returns to set expected paths for short rate, long rate, credit spreads and asset risk premia

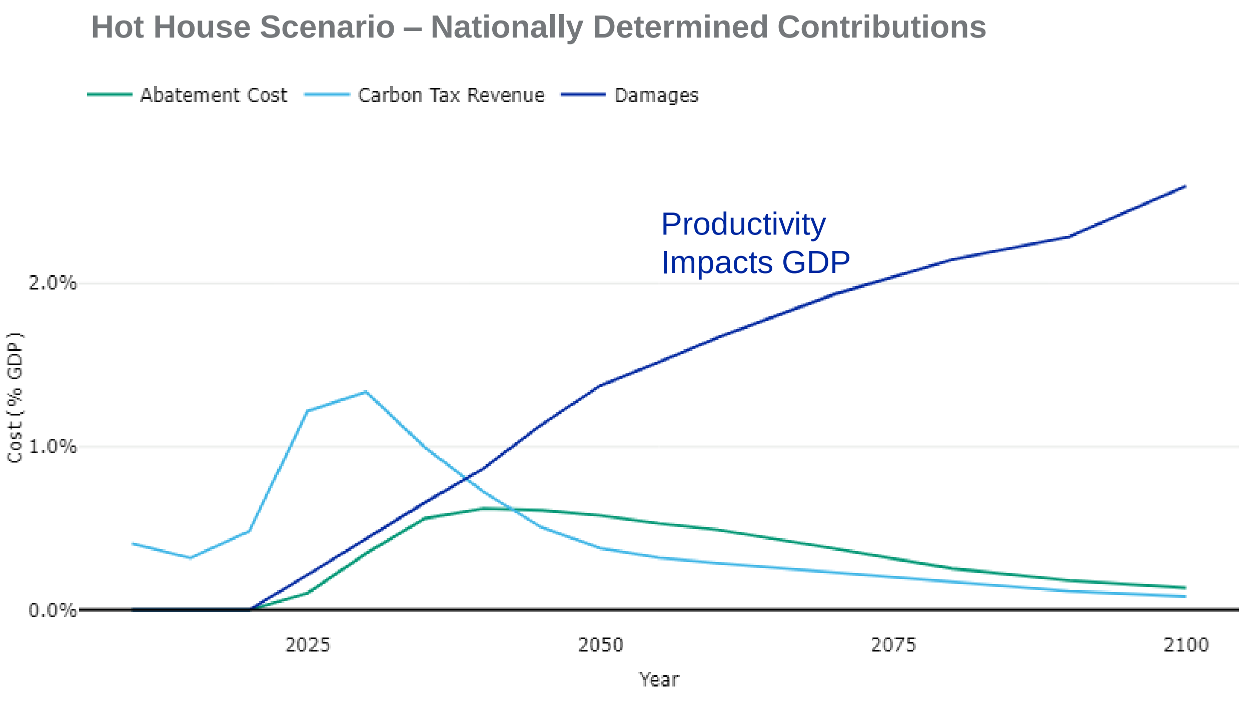
**Generate Scenario Sets**

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

# Three waves of Costs

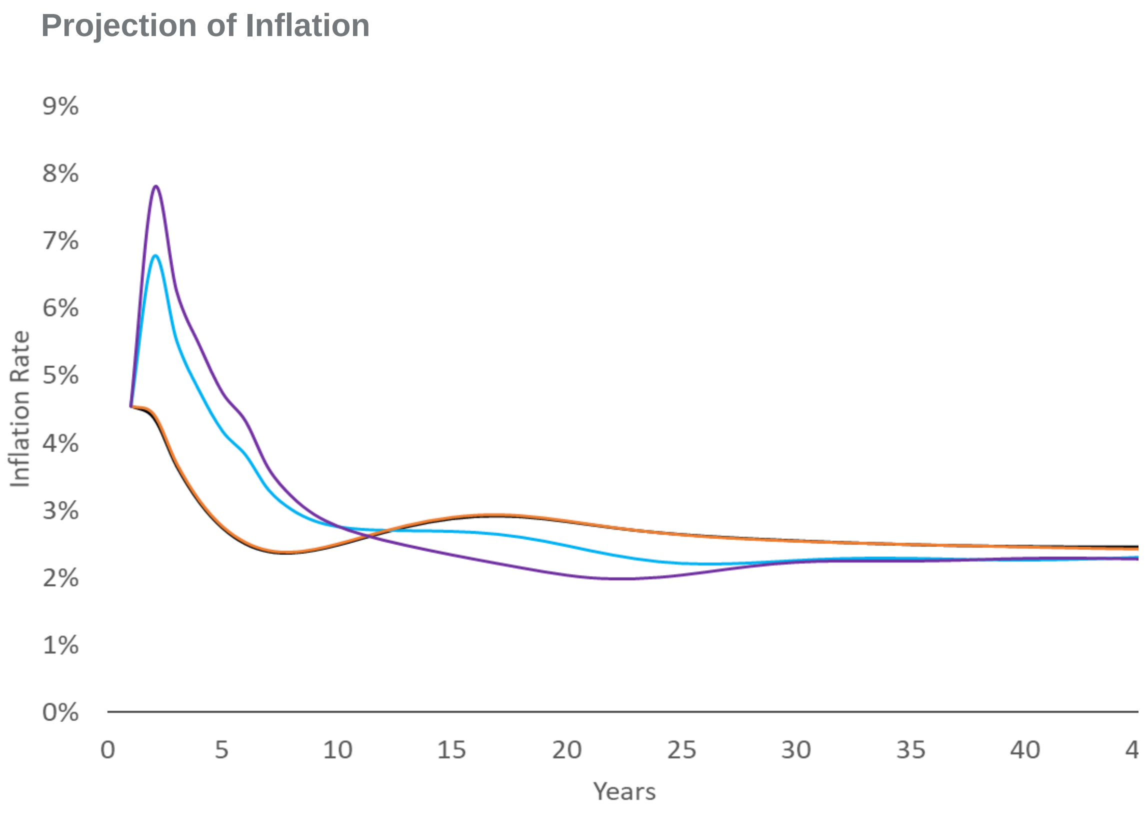
Costs vary across regions and scenarios

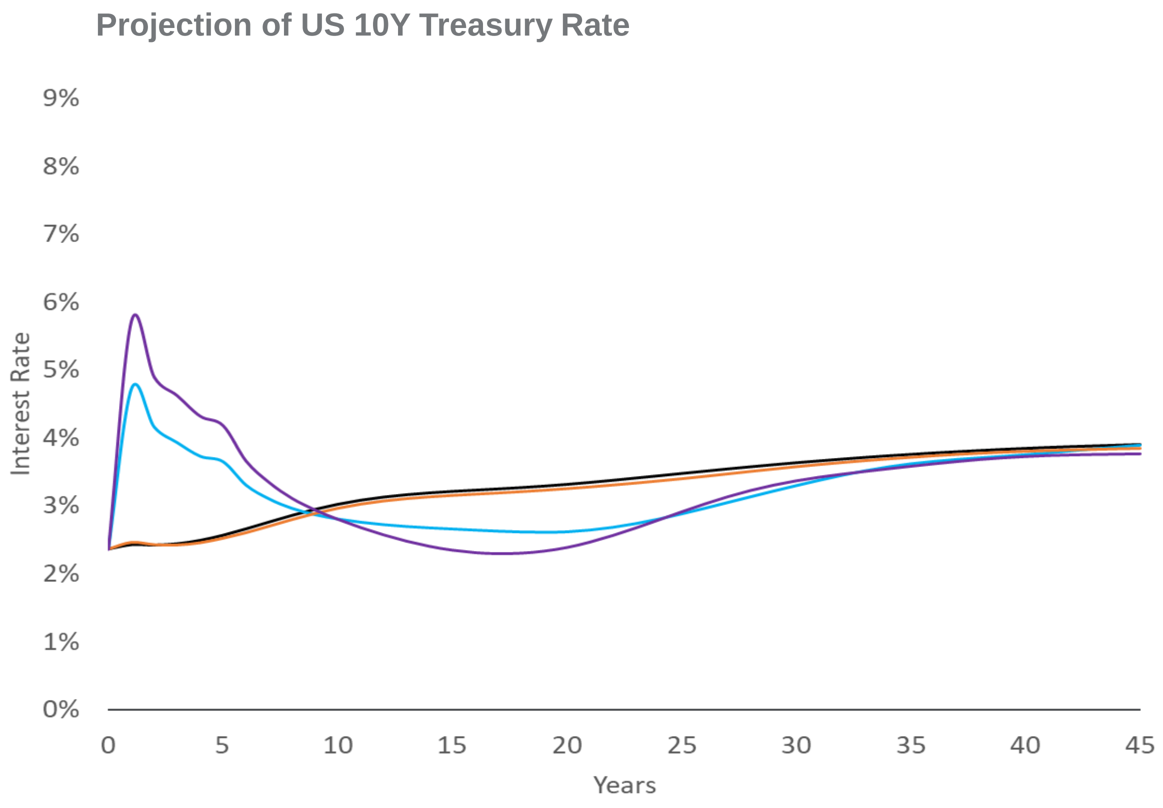


# Projecting financial variables

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

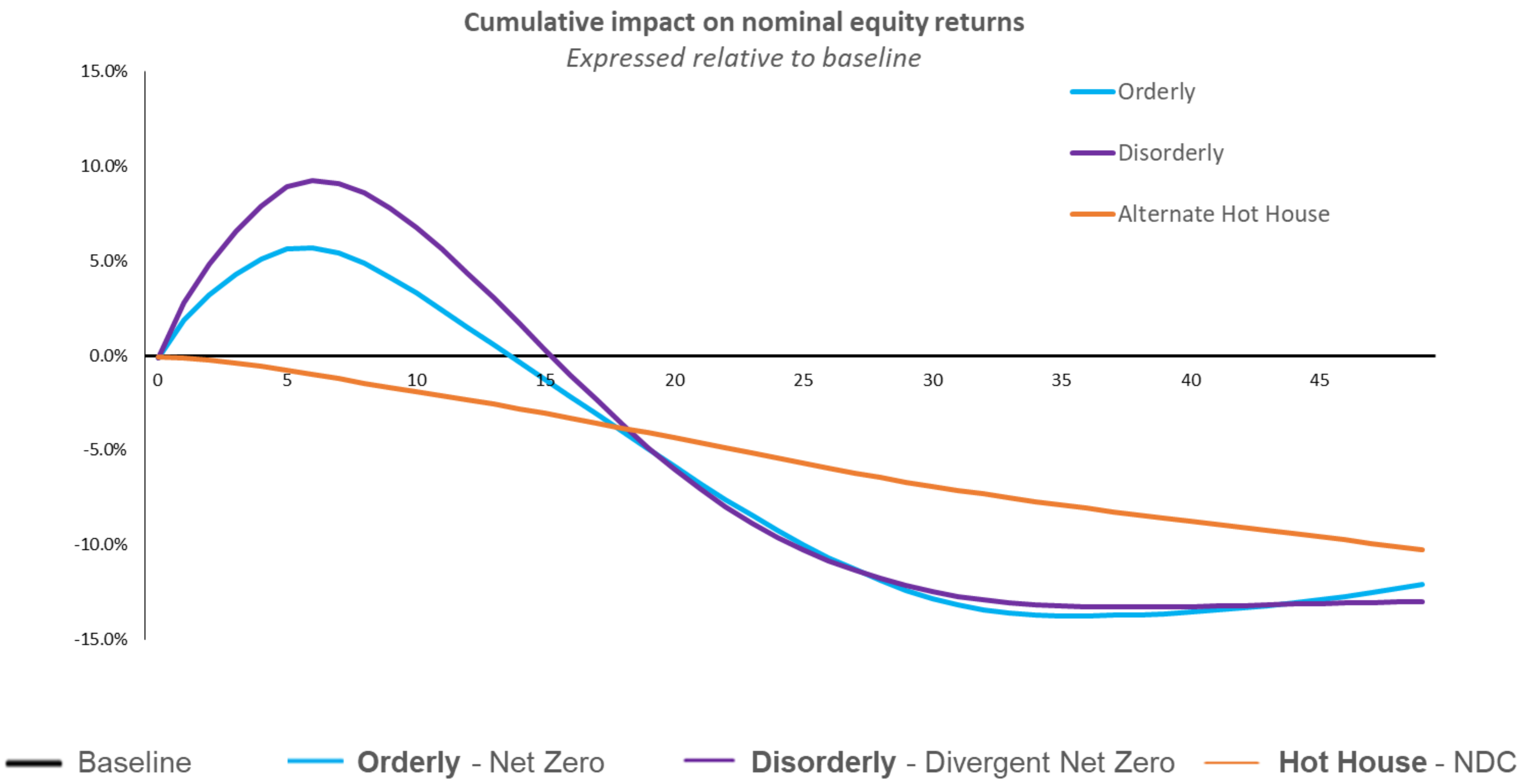



Baseline **Orderly** - Net Zero **Disorderly** - Divergent Net Zero **Hot House** - NDC

# Projecting equity returns

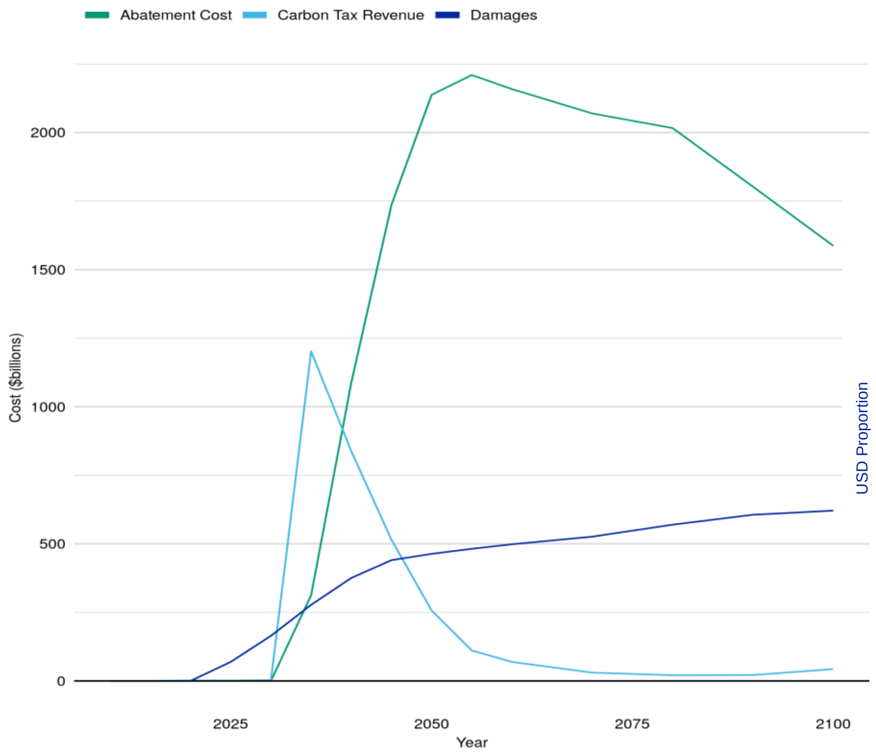
Impact on Equities relative to baseline



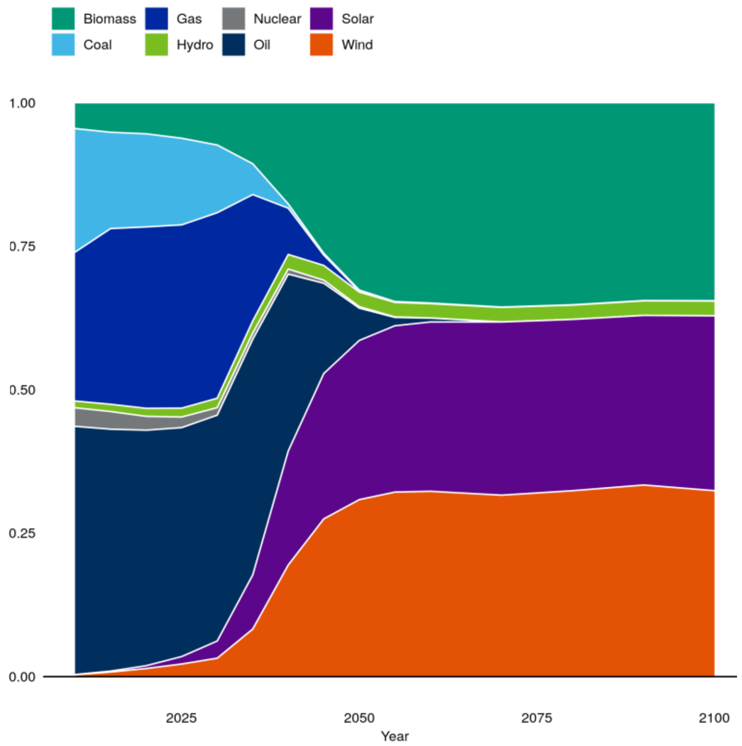
# Illustrative results

## Delayed Transition scenario

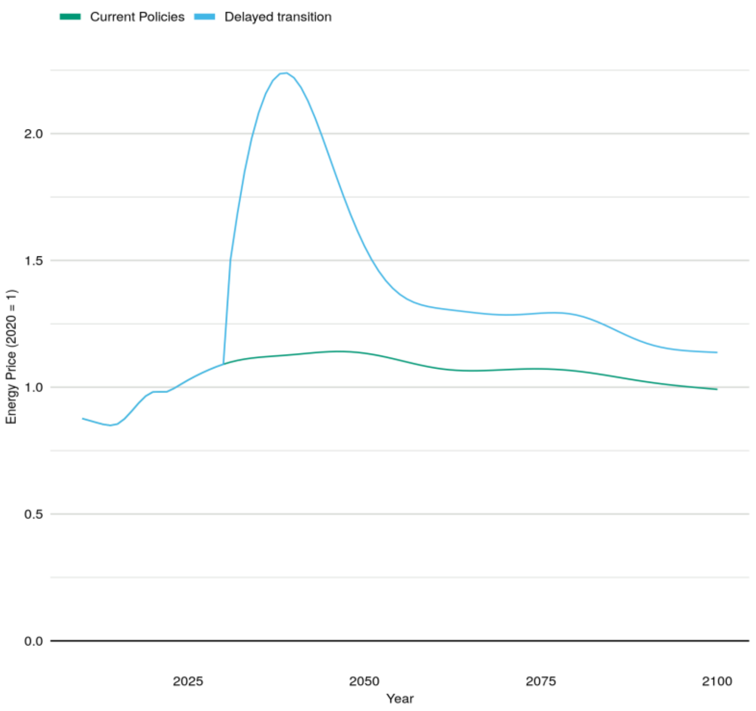
### Projected Costs




### Projected Energy Mix



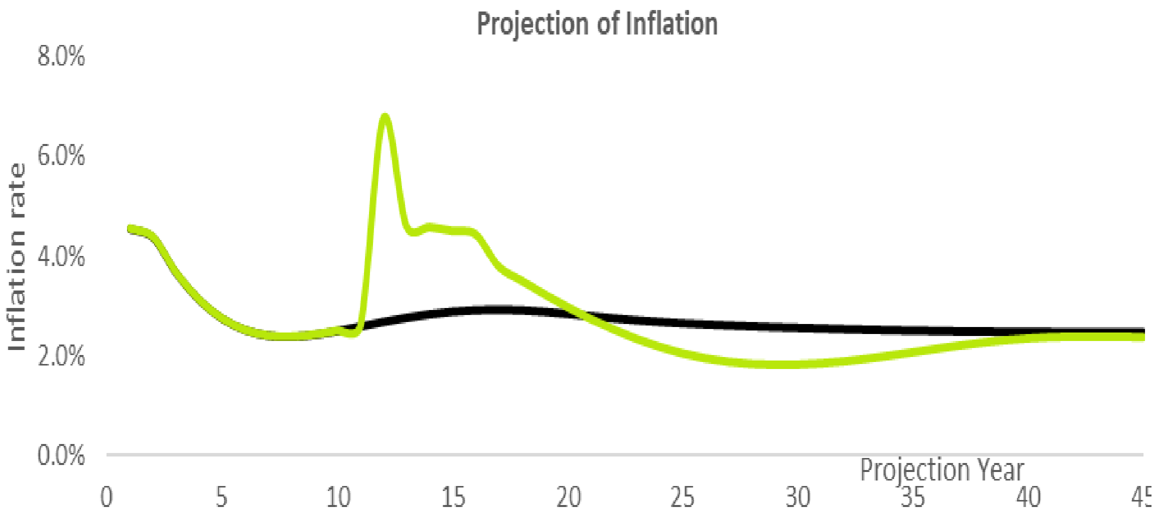

### Projected Energy Prices

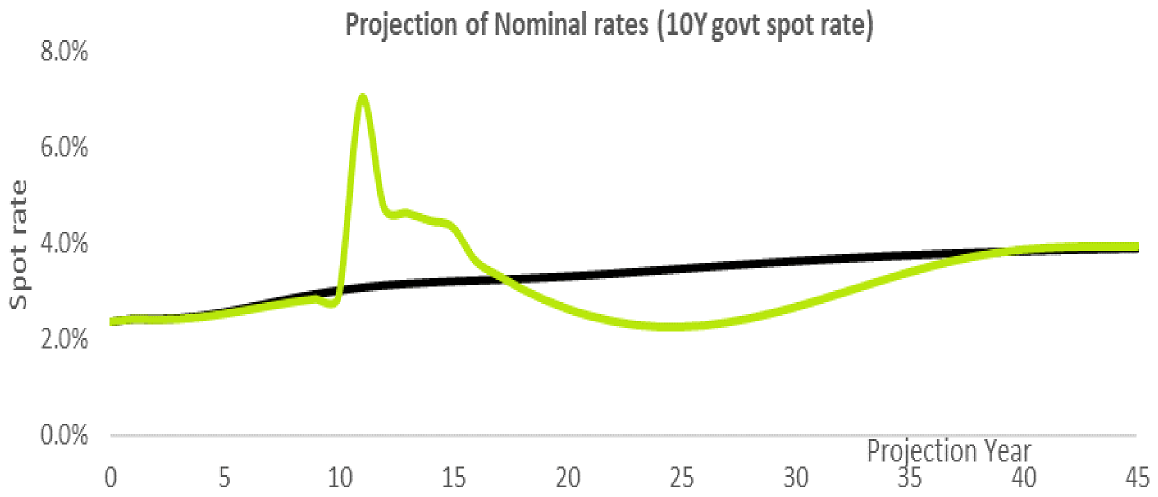


# Illustrative results

## Delayed Transition scenario

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



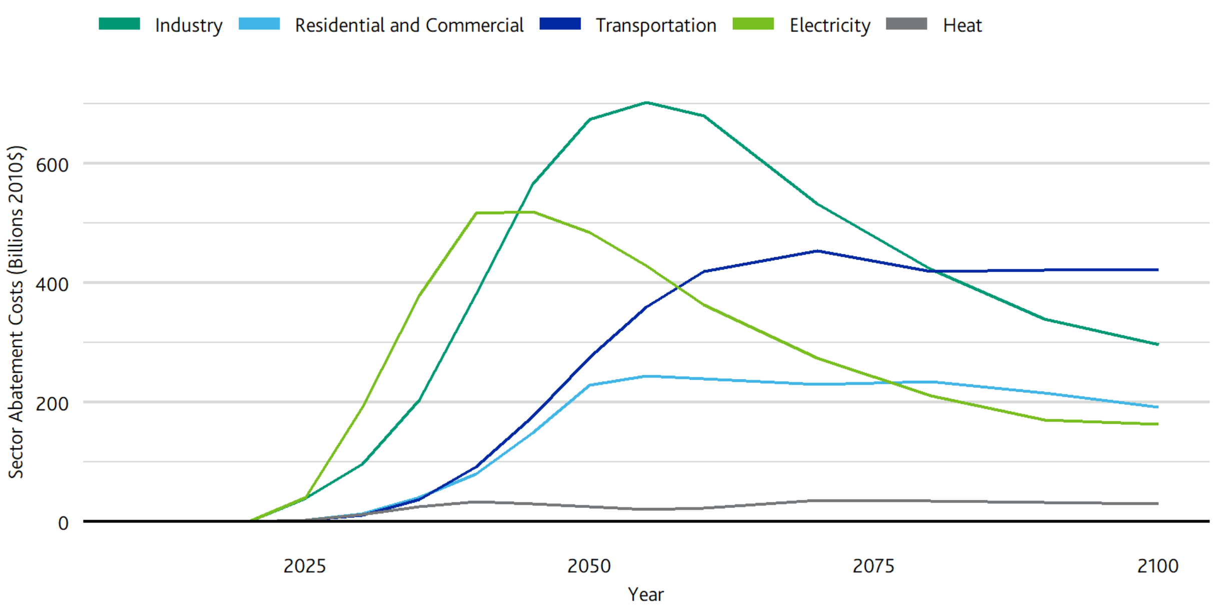




Baseline **Disorderly** – Delayed Transition

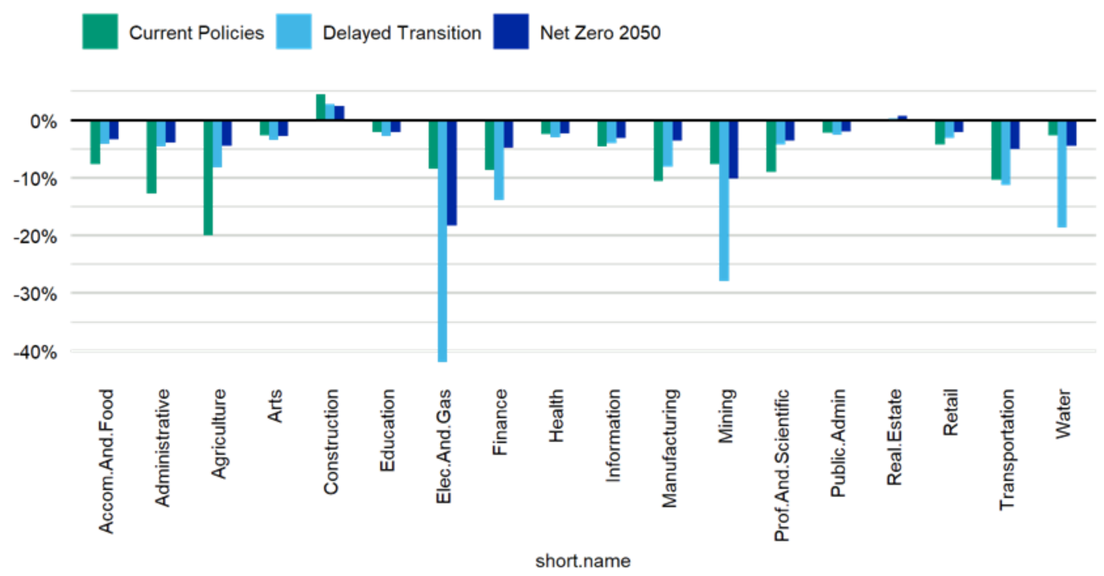
# Sector Costs

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**

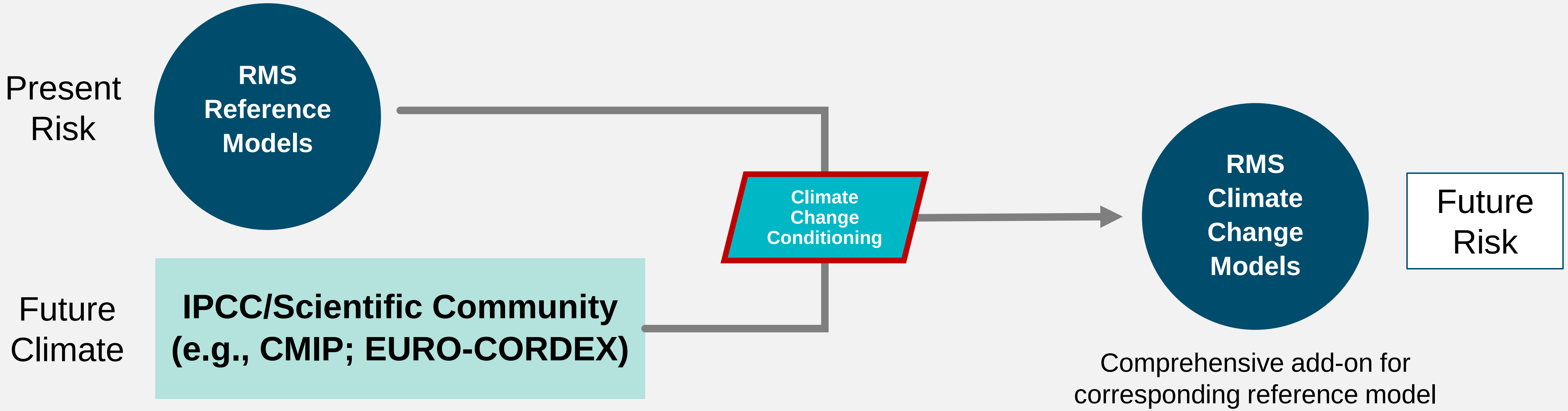



**Impact on Equities by sector (relative to baseline)**



# 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

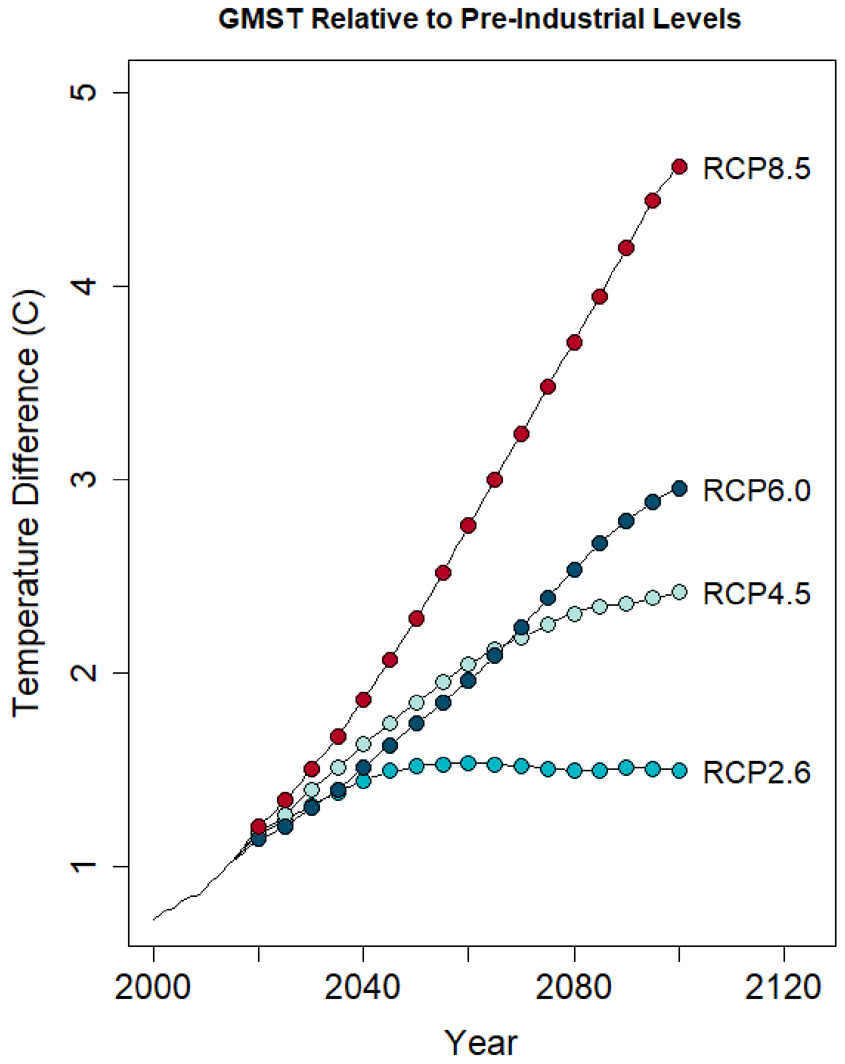
# Full Range of RCPs and Time Horizons

- Representative Concentration Pathways (RCPs) are <u>pathways not snapshots</u>

- 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
  - <u>Total of 68 RCP/Time Horizon conditioned views</u>

- 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*

NGFS Central Banks and Supervisors Network for Greening the Financial System

BANK OF ENGLAND PRUDENTIAL REGULATION AUTHORITY

PARIS2015 UN CLIMATE CHANGE CONFERENCE COP21·CMP11

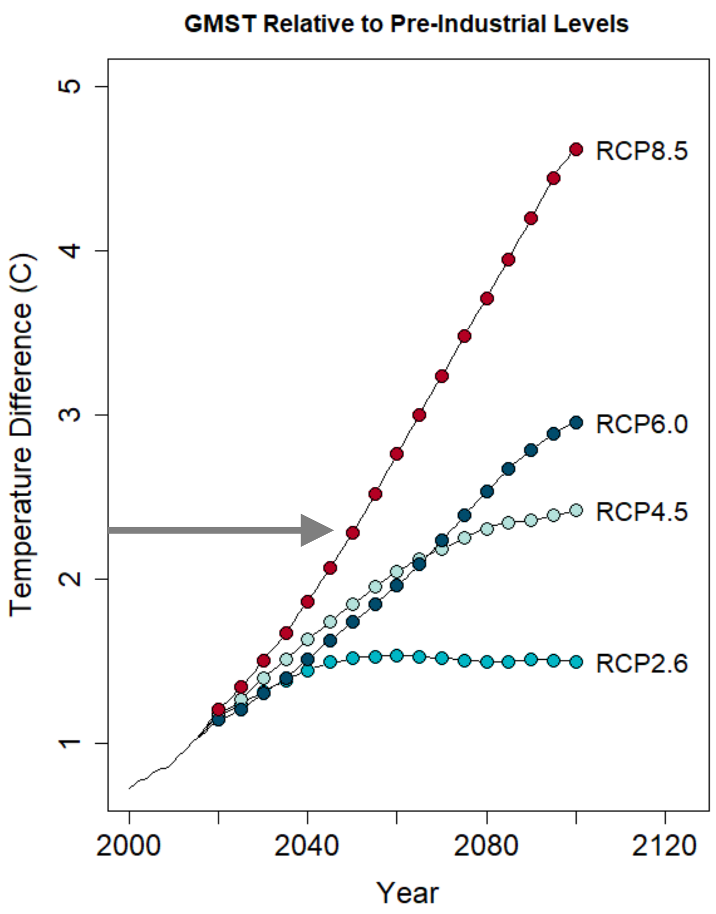
TCFD TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES

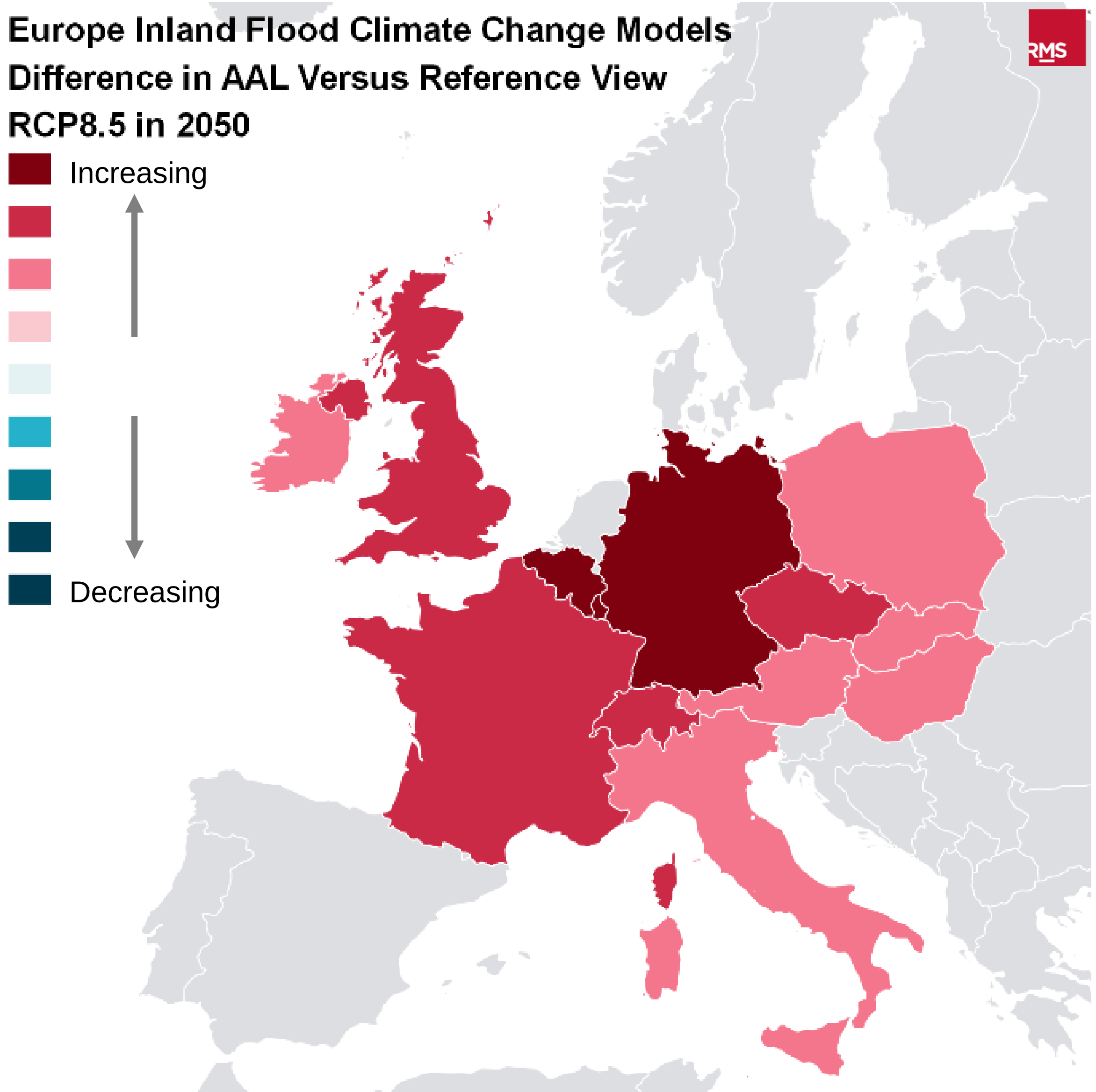
BMA BERMUDA MONETARY AUTHORITY

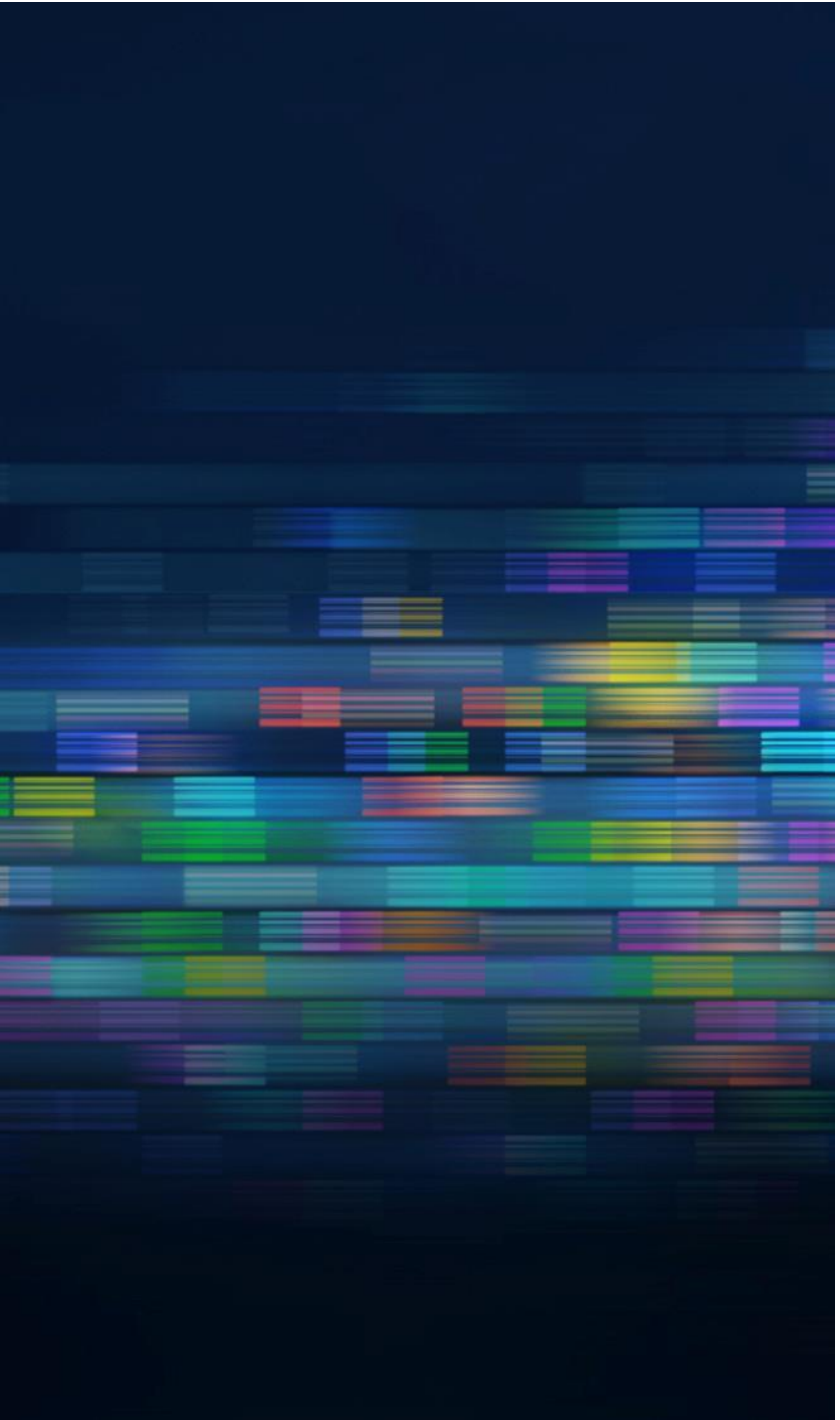


*confidential*

# European Flood: Future Climate Impacts





Moody's Analytics | Better, faster decisions

# Thank You

ENTER TITLE OF EVENT OR PRESENTATION HERE