



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

Friday, Nov. 4, 2022

12:00 – 1:30 p.m. ET / 11:00 a.m. – 12:30 p.m. CT / 10:00 – 11:30 a.m. MT / 9:00 – 10:30 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
Rajesh Bhandula	New York		

NAIC Support Staff: Dan Daveline

AGENDA

1. Opening Comments - Commissioner Kathleen A. Birrane (MD)
2. Other Insurance Regulators Approach and Experience with Climate Scenario Analysis
 - Bank of England-Jethro Green Attachment A
 - Austria-Felix Begun Attachment B
 - Barbados-Melissa Burrowes Attachment C
 - Bermuda-Ralf Kuerzdoerfer Attachment D
3. Any Other Matters
4. Adjournment

Bank of England

2021 Climate Biennial Exploratory Scenario

Workshop on climate scenario analysis and
stress testing

Jethro Green

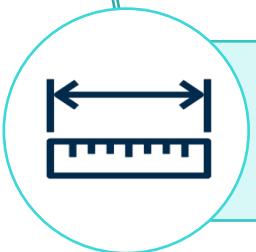


Plan of the presentation

- 1) Climate BES objectives
- 2) Comparing CBES to other Climate scenario exercise
- 3) Calibration and Scenario Design
- 4) Some Distinctive Features
 - Counterparty Analysis
 - Round 2
 - Climate Litigation
- 5) Conclusion

The CBES Objectives

Climate Biennial Exploratory Scenario Objectives

-  Assess and promote improvement of participants' **climate risk management capabilities**.
-  **Size the financial exposures** of participating firms and the financial system more broadly to climate-related risks.
-  **Understand the challenges to participants' business models** from these risks, gauge their likely responses, and the implications this carries for the provision of financial services.

CBES and other Climate exercises

How does CBES compare to other exercises?

	ACPR/BdF	APRA	BoE	BoC	DNB	ECB
Participation	Banks and insurers	Five largest banks	Banks and insurers	Banks and insurers	Banks and insurers + pension funds	Banks
Time horizon	30 years	30 years	30 years Physical risks 60 years	30 years	5 years	30 years
Balance sheet	Static for first 5 years Dynamic 6-30 years	Static Proportional (dynamic) element	Static Dynamic element in questionnaire	Static	Static	Static
Scenarios	3 NGFS scenarios + 1 other	2 NGFS scenarios	3 NGFS scenarios	3 NGFS scenarios + 1 other	3 shocks	3 NGFS scenarios
Types of risk	Transition, physical insurers only	Transition and physical	Transition, physical + litigation	Transition	Transition	Transition and physical
Firm-based	Bottom-up	Bottom-up	Bottom-up	Bottom-up	Top-down	Top-down
Granularity	Sectoral	Sectoral + some counterparty	Sectoral + counterparty	Sectoral + some counterparty	Sectoral	Sectoral
Insurance sector risks	Assets and liabilities	n/a	Assets and liabilities	Assets	Assets and liabilities	n/a - looks at impact on corporates

Scenario Design and Calibration

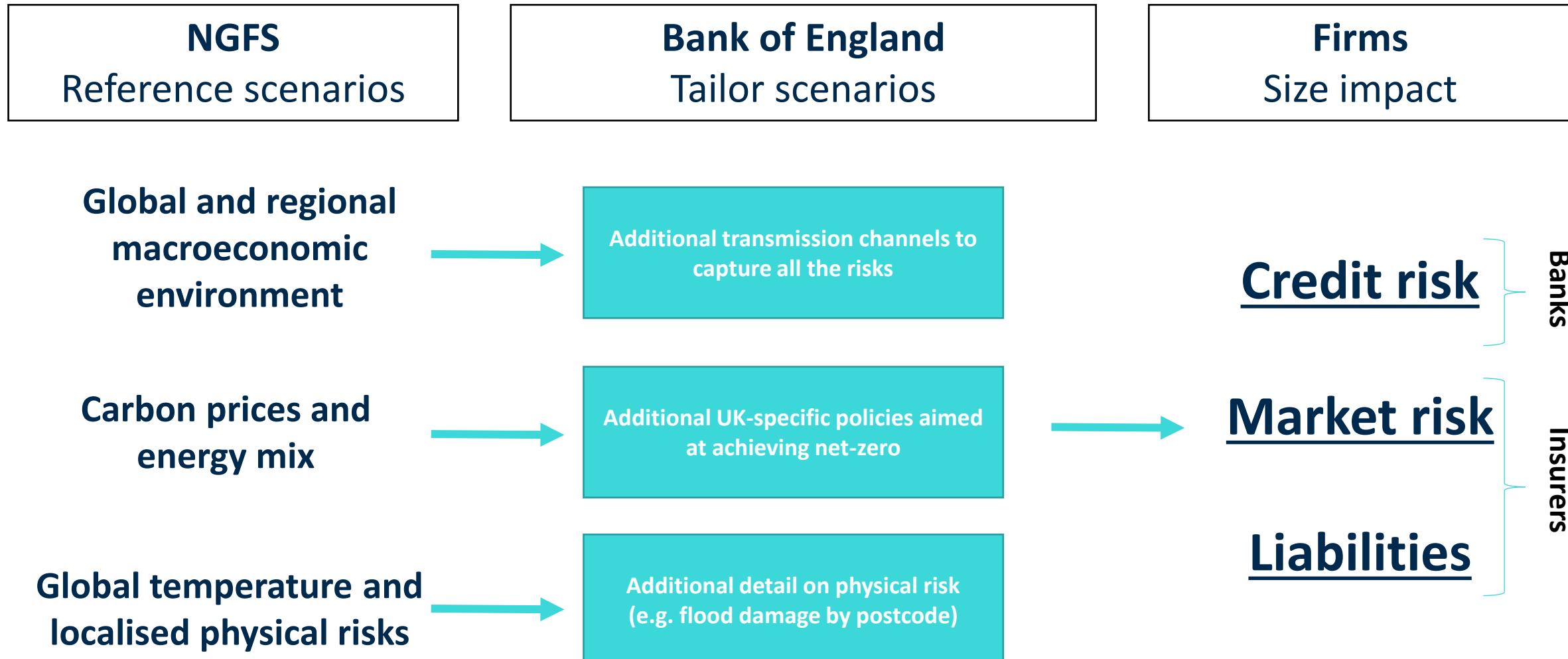
Snapshot of Climate BES variables

Physical risk variables	Transition risk variables	Macroeconomic variables	Financial market variables
Temperature pathways	Carbon prices	GDP	Government bond yields
Sea level rise	Emissions	Sectoral Gross Value Added (GVA)	Corporate bond spreads
Rainfall trends	Commodity/ energy prices	Unemployment	Equity indices and volatility index
Windstorm trends	Energy mix	Inflation	Policy rates
Wildfire trends		Property prices	Swap/Solvency 2 rates
Heatwave trends		All variables were supplied for the UK, and a smaller set for key regions: US, Euro Area, China, HK, Japan, Canada	
Agricultural crop failures		All variables were supplied for the UK, and a smaller set for key regions: US, Euro Area, China, HK, Japan, Canada	

The stylised scenarios used in this exercise are illustrations of possible paths for climate policy and global warming, not forecasts

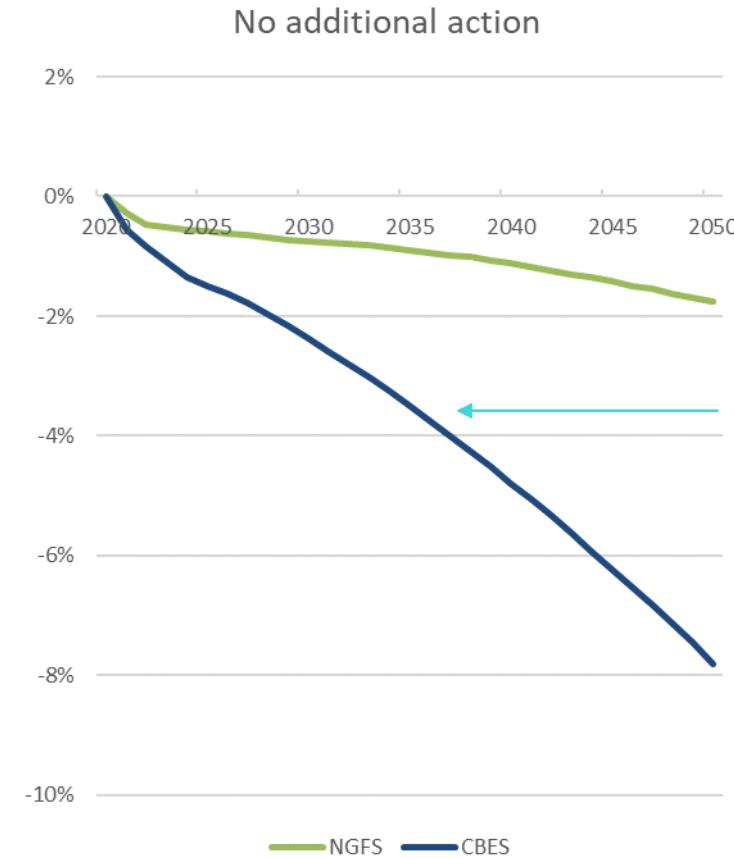
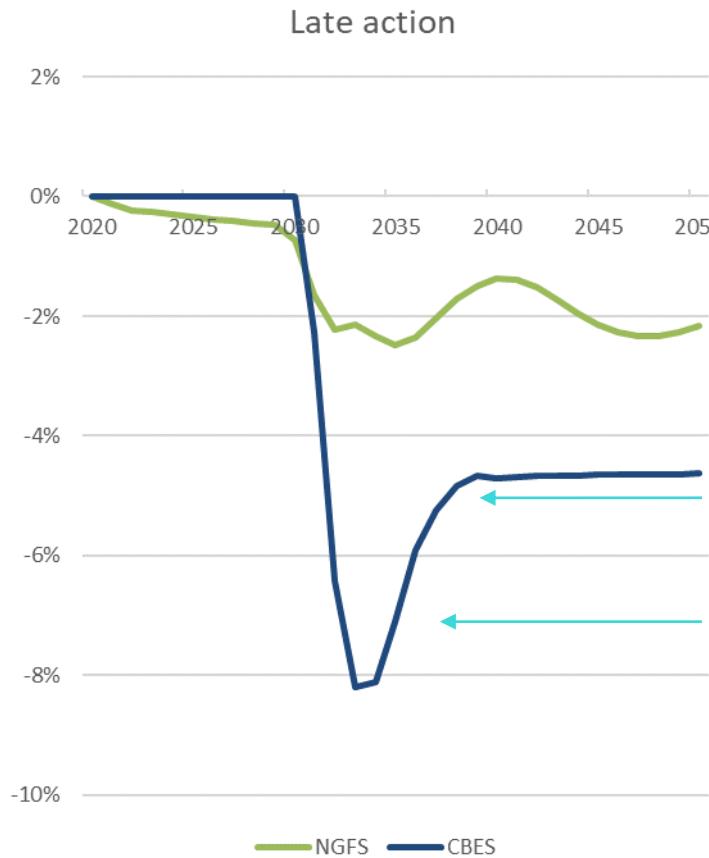
Key:	Early Action	Late Action	No Additional Action
Transition to net zero begins in	2021	2031	n.a
Nature of transition	Early and orderly	Late and disorderly	Only policies that were in place before 2021
Physical risks	● Limited	● Limited	● High
Impact on output	● Temporarily lower growth	● Sudden contraction (recession)	● Permanently lower growth and higher uncertainty
Average annual output growth in the UK	● Year 6–10 1.4% ● Year 11–15 1.5% ● Year 26–30 1.6%	● Year 6–10 1.5% ● Year 11–15 0.1% ● Year 26–30 1.6%	● Year 6–10 1.4% ● Year 11–15 1.4% ● Year 26–30 1.2%

...and build on the quantitative NGFS scenario pathways



CBES vs NGFS GDP pathways

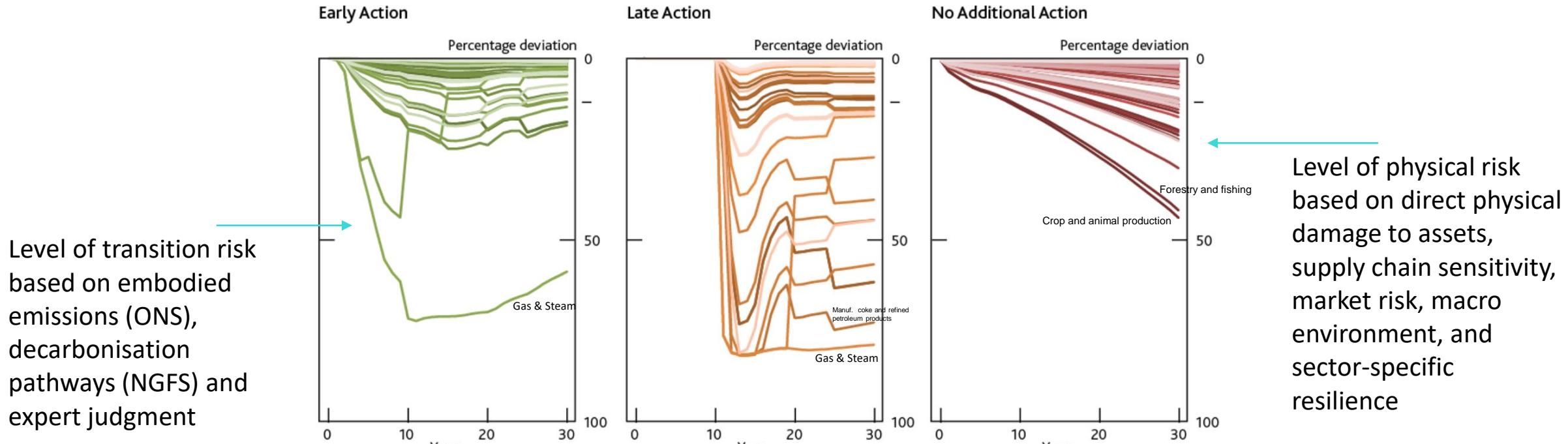
UK Real GDP – per cent deviation from the counterfactual by the end of the scenario*



*The counterfactual pathways assume there are no transition or physical risks and are therefore purely hypothetical. These counterfactual pathways do not represent the Bank's view of the long-run path for the economy.

Sectoral expansion of scenarios

Range of UK sectoral Gross Value Added pathways: deviation from the counterfactual (a)



Sources: [Burke et al.\(2015\)](#), Exiobase, Met Office, [Moody's ESG Database](#), Office for National Statistics, Organisation for Economic Co-operation and Development and Bank calculations.

(a) Even though the exact size and nature of risks from climate change is uncertain, some combination of physical and transition risks will materialise in the future with a high degree of certainty. The counterfactual GVA pathways take into account both the GDP growth that might be expected in the absence of climate risks, and the average historical sector-specific GVA growth rates (for the period 2000–19). The counterfactual pathways are purely hypothetical and do not represent the Bank's view of the long-run path for the economy.

Physical Risk

- In the **No Additional Action** scenario, absence of new climate policies means emissions fall only modestly. Global temperature levels continue to increase.
- **3.3°C** global warming, but large variation across the world
- **Increased likelihood of acute and chronic physical risks crystallising.**

CBES aims to explore impacts on physical perils including:



Inland and coastal
flooding



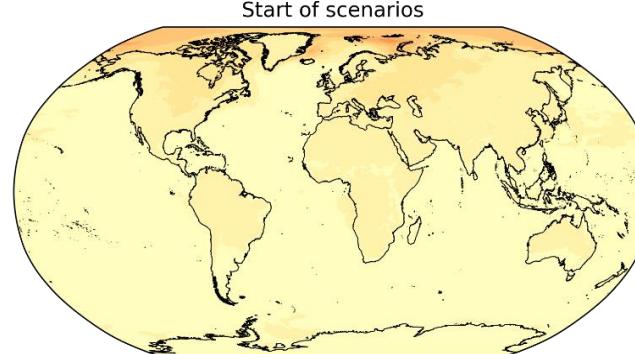
Tropical cyclones



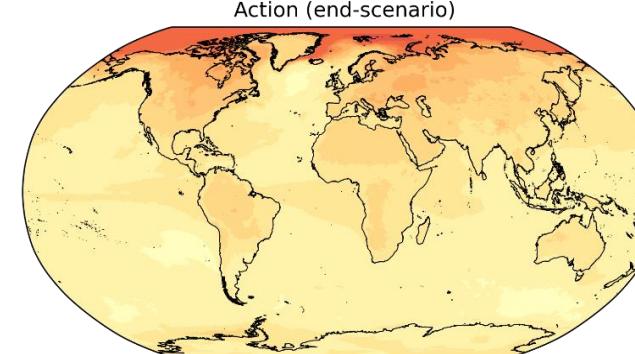
Freeze, drought,
heatwaves



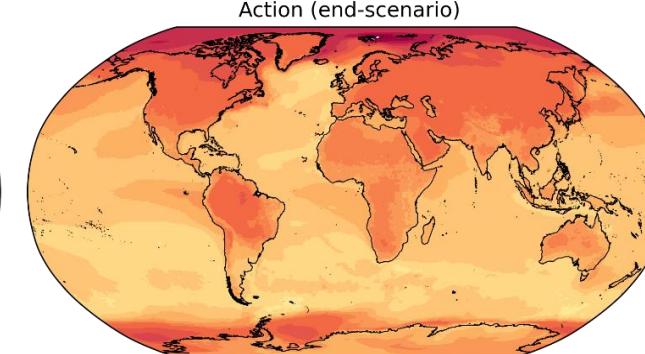
Wildfires



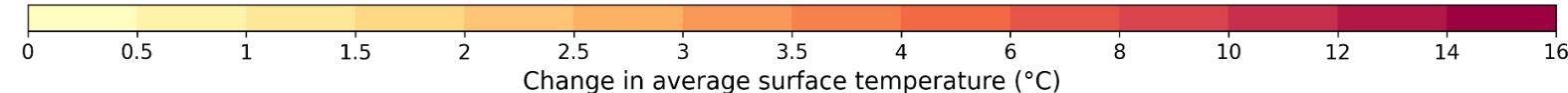
Start of scenarios



Early and Late
Action (end-scenario)

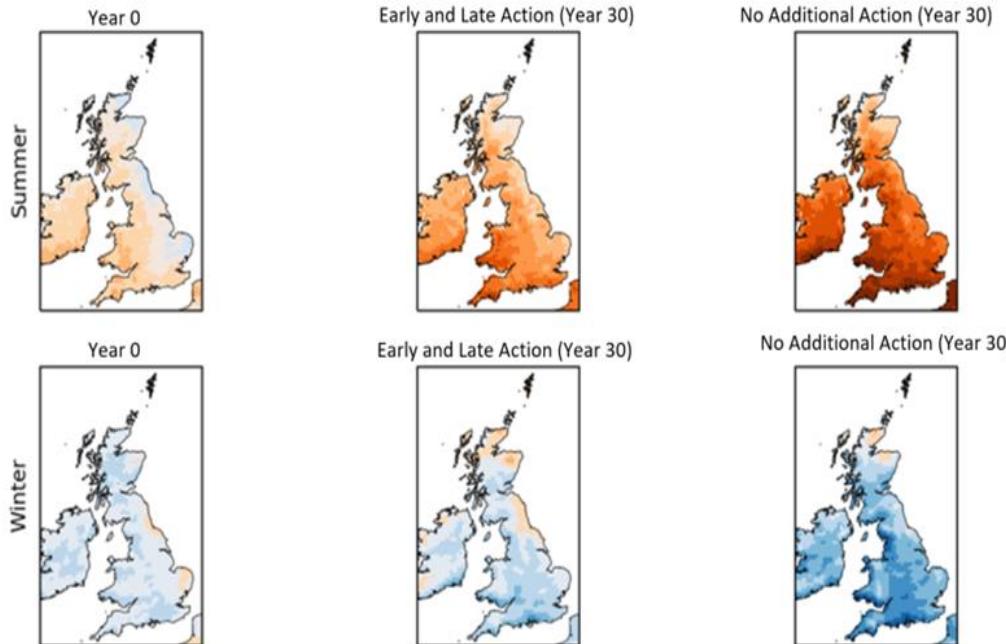


No Additional
Action (end-scenario)

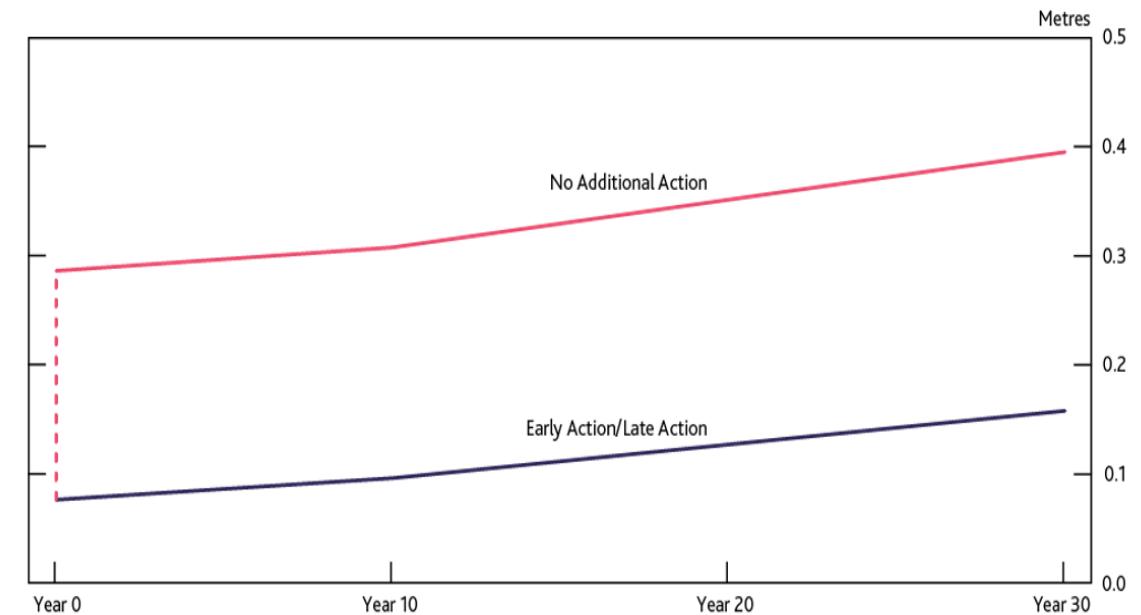


Material change in precipitation rates and sea-level-rise in the No Additional Action scenario increases flood risk for some territories

Change in the average summer and winter precipitation in the UK since the late 20th century



Mean sea level rise for the UK since 1981-2000



source: Met Office and Bank calculations

Distinctive features

Distinctive Features of CBES

- **Wider scope and participation** – covering both banks and insurers (aim to cover 60%+ of each sector), and the interaction between them.
- Exercise was designed to assess and **improve participants' risk management** and build on their climate risk modelling capabilities, including by requiring participants to **model their risks in a granular way**.
- A **second round of submissions** focussing exclusively on exploring in greater depth banks' and insurers' strategic responses to climate risks.
- An exploration of **insurers' risks from climate-related litigation**.

Counterparty level analysis

- To meet the sizing the risks and improving risk management objectives, CBES requires **counterparty level analysis** for corporate exposures.
- Participants are encouraged to **engage directly** with their counterparties to gather relevant data.
- Participants should assess their counterparties' **mitigation and adaptation** plans, and are allowed to factor those plans into the analysis under strict conditions.

Participants must report at counterparty level, at least:

- **Top 100** non-financial non-sovereign corporate counterparties,
- **Top 3** corporate counterparties from each specified sector of interest (e.g. 'Air transport', 'Car manufacturing')
- **Top 5** banks and **top 5** non-bank financial institutions,
- **Top 10** CRE and **top 10** housing associations.

Scenario design interacts with analysis choice

Tier	Coverage	Approach
Tier 1	At least: <ul style="list-style-type: none"> Top 100 non-financial corporate exposures. <u>Plus</u> 3 largest companies in each of the sectors most impacted in the CBES scenarios (e.g. airlines; oil and gas, car manufacturers) if not already in the top 100. <u>Plus</u> 5 largest financial exposures 	Counterparty-level analysis. Participants are encouraged to use, for example, cash-flow analysis, publicly reported firm-level data, data counterparties publish to meet the recommendations by the Task Force on Climate-related Financial Disclosures, detailed climate scenario variables for physical and transition risks, and judgements based on directly engaging with the counterparties.
Tier 2	Corporate exposures not captured in Tier 1.	Some extrapolation and portfolio-level analysis would be expected. For example, firms may split their exposures into segments of corporates facing similar risks. Within each segment, firms would conduct client engagement for a subset of counterparties; and extrapolate their findings to the rest of the segment. Some thematic modelling would also be allowed for smaller exposures and SMEs.

Source: BoE 16.12.2020 publication [link here](#)

Tier 1: ‘Counterparty’ analysis

- Firms are expected to undertake analysis at counterparty level – ie individual asset level.
- Firms need to derive shocks from direct variables: carbon price or physical risk shocks.

→ *challenge*: consistency of projections across firms, immature datasets and tools.

Tier 2: sector-level analysis

- Shock is based on asset type and sector.
- Firms are provided Gross Value Added by sector as well as overall equity and spread paths.

→ *challenge*: GVA to asset-price relationship is not obvious in literature.

Second round: interactions and feedback effects

- The CBES captures **bank-insurer interaction** with respect to residential property insurance

Banks

...consider the impact of potential reductions in insurance coverage on mortgage portfolios

Insurers

...indicate which proportion of their UK residential property insurance portfolio remains within underwriting appetite

- Participants set out their **expected management actions** in a qualitative questionnaire

- This helps the Bank understand the challenges to participants' business models from climate risks, gauge likely responses and the implications this carries for the provision of financial services.
- Second round could be used to explore the impacts of potential fire-sale dynamics or other feedback effects

Climate litigation for insurers: understanding contract coverage

Identify coverage to sectors
with elevated or direct
exposure to climate risk



Focus on
Professional Lines



D&O /
General Liability

Likelihood of successful
recoverability
(hypothetical cases)

1. Fundamental rights
2. Greenwashing
3. Misreading the transition
4. Directors' breach of fiduciary duties

Estimate of exposures

Probable
Maximum Loss /
Total Limits

***Assume underlying insured
successfully sued***

Insured?

Insurer?

Findings from litigation risk

Key finding: material share of policies may pay out if selected hypothetical legal cases were successful



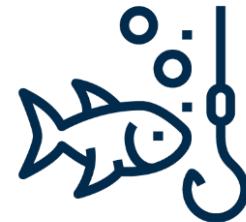
- (a) Data from ten participating general insurers. For seven hypothetical legal cases brought against their insureds, Insurers were asked what percentage of their directors & officers, professional indemnity, and general liability insurance policies would be likely to pay out in the event that these legal claims were successful. Table 1 provides an overview of the hypothetical legal cases.
- (b) General liability figures not shown as a smaller number of firms submitted figures for this category.

Feedback from firms:

- Overall, a valuable exercise for participating firms
- Most firms at an early stage of thinking about exposure to climate-related litigation
- Most did it entirely in-house (UW/Claims/Risk/Legal). Limited use of external consultants
- Data challenges: difficulty in extracting sector-level data from systems and hence carry out effective sectoral and product level exposure management
- High-level scenario definition resulted in variety of approaches and incr. complexity

Conclusion

Conclusion

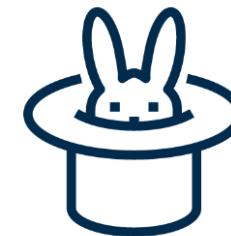


Keep the objectives in mind

- Design choices follow from the objectives
- There is no one ‘right answer’ – but some choices fit naturally with some objectives.
- Some objectives are in tension with each other.

Be aware of limitations

- Data sources and modelling tools
- Expertise with the regulators and within firms
- Challenges over communication





Project management Framework

I Identify objective for carrying out stress test



- Assessing climate risks to individual insurers
- Assessing climate risks to the insurance sector
- Assessing climate risks to the financial system
- Assessing risks to policyholders
- Sizing the risk
- Encouraging capacity building
- Speak to other global regulators to gain insights in running scenario analysis and reduce inconsistencies

II Create a project plan



- Produce timelines for project
- Identify which departments are required
- What aspects of the balance sheet will be stressed
- Sets up governance forums

III Allocate sufficient resourcing to meet objectives



- Planning considerations need to consider a diverse range of skills, from traditional stress testing experience to technical specialists on various aspects of stress

IV Produce and publish discussion paper



- Produce a discussion paper outlining the framework of scenario analysis
- Issue timelines
- Gather feedback from firms and third parties on feasibilities

VI Analyse and publish findings



V Produce scenario from Discussion Paper feedback



- Incorporate discussion paper feedback to produce scenario
- Issue data templates and scenario to firms

- Analyse results to come up with conclusions against scenario objectives
- Publish findings

Stakeholder management

It is important to understand the compatibility of the various communication methods to strategic objectives. Communication strategies differ:

- Reflecting upon our decisions
- Managing internal expectations
- Communication of individual firm vs. aggregate results
- Broader stakeholder communication
- Promote capacity-building through targeted stakeholder engagement

Results of the 2021 Climate Biennial Exploratory Scenario (CBES)

The Bank of England (Bank) has today published the results of the Climate Biennial Exploratory Scenario to explore the financial risks posed by climate change for the largest UK banks and insurers (participants).

Communication

Managing internal expectations

- “4-headed beast” (Climate Hub, Insurance Supervision, Banking Supervision, Financial Stability)
- Managing expectations across Prudential Regulation and Financial Stability pillars was challenging.
- Exploratory nature of exercise meant material time was spent educating upwards and managing expectations.

Capacity building

- Regulator/Central Bank typically lacks the specialised skills required to understand and assess climate change risk
- Significant effort to upskill internal teams – retention risk

Broader stakeholder management

- Very wide audience, spanning financial sector specialists, journalists, activists, charities, academics, think tanks and general public. For some, their first interaction with the Bank.
- No single communication type will be able to reach out to these audiences
- Technical team vs. Press office view

Firm communications

- Difficult to run events with banks and insurers given different experiences
- More frequent touch points are better
- Regular expert group through the analysis phase to improve consistency



CLIMATE SCENARIO ANALYSIS FINANCIAL MARKETS AUTHORITY AUSTRIA

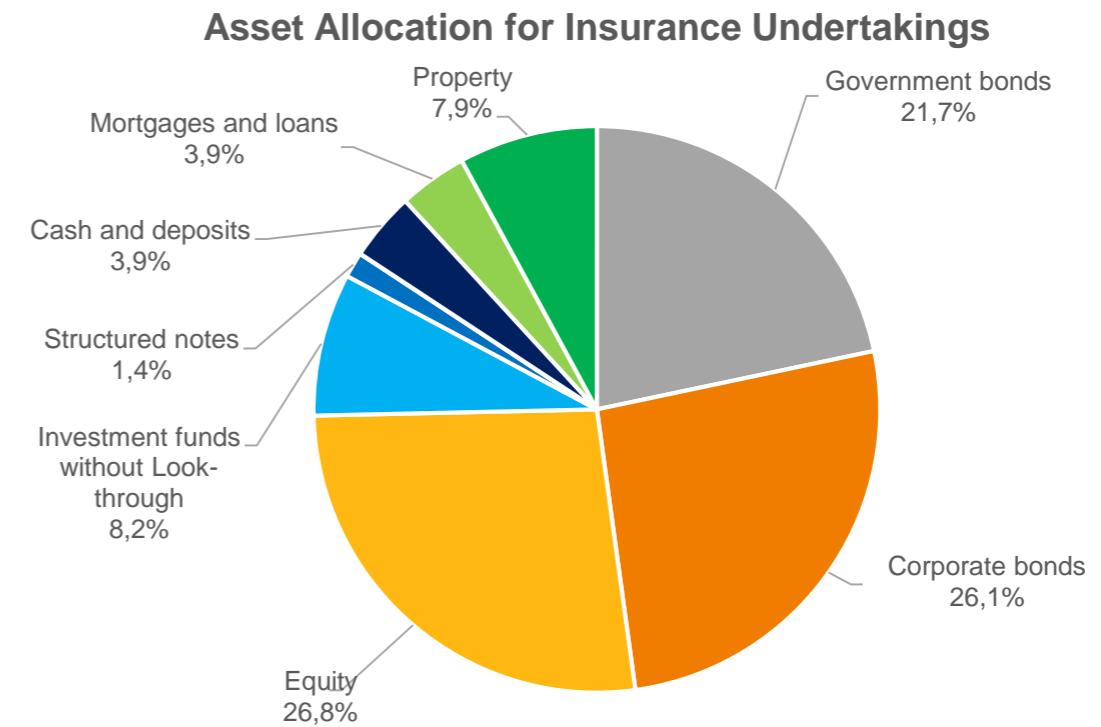
Felix Begun
Vienna, November 4th, 2022



OVERVIEW

FMA analysis of asset portfolios

- NACE sector analysis according to Prof. Batiston
- Climate stress test for
 - Government bonds,
 - Corporate bonds,
 - Equities
- according to methodology from European Systemic Risk Board (ESRB)
- ESG scores
- PACTA Tool from 2° Investing Initiative for
 - Listed Equities
 - Corporate bonds



Asset Allocation of Insurance undertakings for year end 2021
according to reported Complementary Identification Codes (CIC)

1. NACE SECTOR ANALYSIS

Methodology

- Prof. Battiston's **NACE sector analysis** is a methodology of identifying assets which can be mapped to **Climate Policy Relevant Sectors** (CPRS).
- Assets are mapped according to their NACE codes to 6 predefined CPRS.
- **In addition** assets with **Complementary Identification Code** (CIC) 32, 45, 55, 65, 84, 91-99 can be directly mapped to the sector buildings (regardless of their NACE code) because of their direct reference to real estates.
- In this way, it is possible to **identify assets** which would be **affected by a change in value** as a result of a **transition to a more carbon neutral economy**.
- This method was published initially in 2016 and was updated in 2021. The usage of CICs is taken from the Financial Stability Report 2019 from EIOPA.

CPRS sector	NACE codes
1-fossil-fuel	05, 06, 08.92, 09.10, 19, 35.2, 46.71, 47.3, 49.5
2-utility electricity	35.11, 35.12, 35.13
3-energy-intensive	07.1, 07.29, 08.9, 08.93, 08.99, 10.2, 10.41, 10.62, 10.81, 10.86, 11.01, 11.02, 11.04, 11.06, 13, 14, 15, 16.29, 17.11, 17.12, 17.24, 20.12, 20.13, 20.14, 20.15, 20.16, 20.17, 20.2, 20.42, 20.53, 20.59, 20.6, 21, 22.1, 23.1, 23.2, 23.3, 23.4, 23.5, 23.7, 23.91, 24.1, 24.2, 24.31, 24.4, 24.51, 24.53, 25.4, 25.7, 25.94, 25.99, 26, 27, 28, 32
4-buildings	23.6, 41.1, 41.2, 43.3, 43.9, 55, 68, 71.1
5-transportation	29, 30, 33.15, 33.16, 33.17, 42.1, 45, 49.1, 49.2, 49.3, 49.4, 50, 51, 52, 53, 77.1, 77.35
6-agriculture	01, 02, 03

Updated mapping table according to Battiston from 2021

1. NACE SECTOR ANALYSIS

Procedure

- Usage of our reporting data from our supervised undertakings
- Data from extern providers where neither NACE nor CIC was available

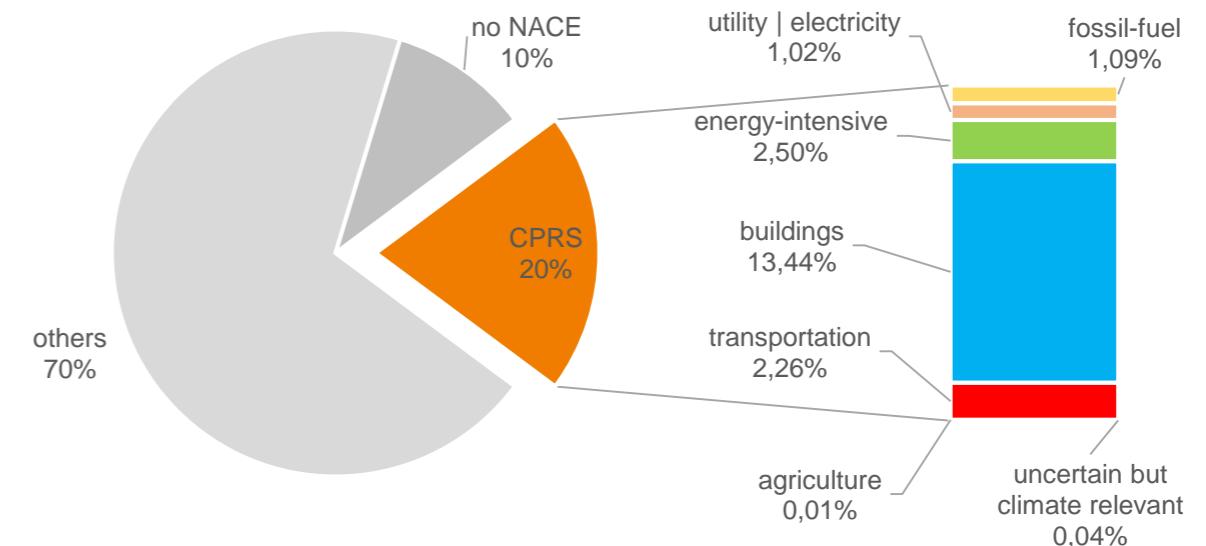
Overview of the results

- Identified 20% of all assets as invested in CPRS
- Neither NACE nor CIC for only 10% of all assets
- Variation of CPRS between 0.6% and 47.6% per undertaking

Restrictions

- As a result we **only get the amount of assets** invested in climate-relevant sectors without any information how these assets might be affected.
- The **4-digit NACE code is required**, what **creates data quality problems** because we usually don't get it reported in this granularity.

Climate Policy Relevant Sectors (CPRS)



Climate Policy Relevant Sectors (CPRS) for Insurance undertakings for year end 2021



2. CLIMATE STRESS TEST

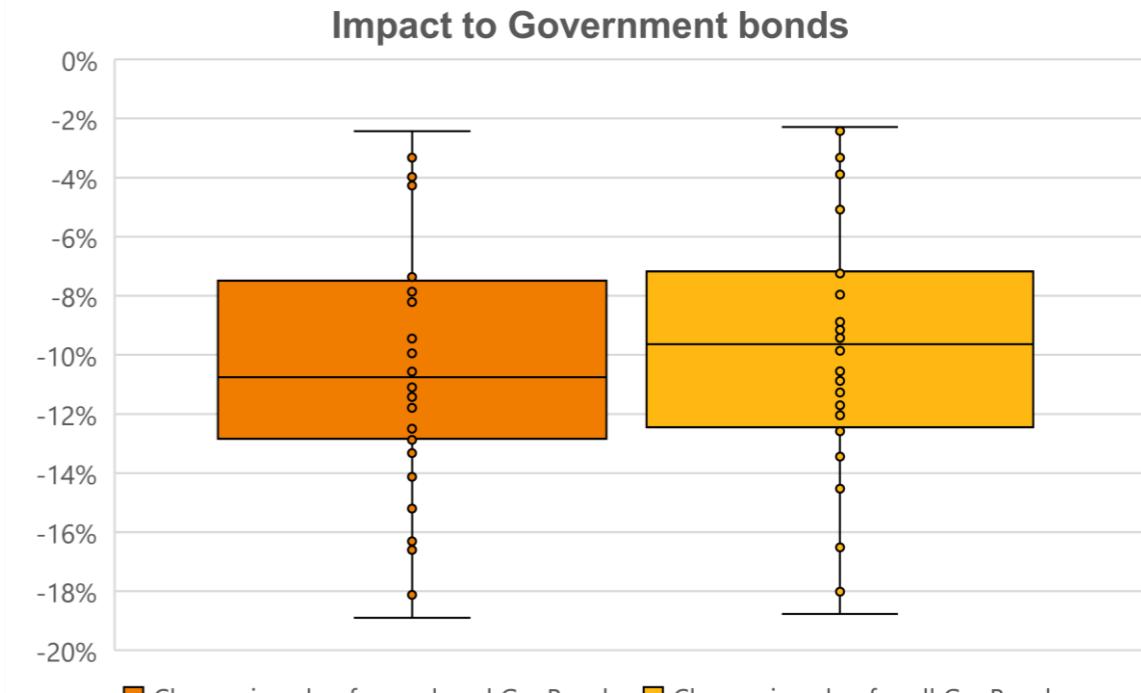
Scenario

- A sudden and sharp increase in carbon prices is assumed due to delays in the respective measures to reduce carbon emissions and to make fossil less attractive.
- This is based on scenarios from the NGFS, which assume an increase in carbon prices over three years (2030 - 2032) in order to achieve the targets of the Paris agreement.
- However, this stress test assumes that the increase would occur as early as December 31st, 2021.
- The stress test was calculated for
 - Government bonds,
 - Corporate bonds and
 - Equities.
- The allocation to the individual assets is based on the CICs.

2. CLIMATE STRESS TEST

Overview for Government bonds

- Calculation of a **yield shock** was performed which depended on **maturity and issuer country**.
- As far as possible, we tried to **calculate the relevant fields** like Yield and Modified Duration.
- Where reporting data was not available or data could not be calculated we tried to get data from an **extern provider**.
- First and foremost, we **recalculated the present value**. Where this was not possible, we **attempted an approximation using the modified duration**.
- For the overall market, **98% of Government bonds were analyzed**.
 - Per undertakings the share varies between 30.8% and 100%.

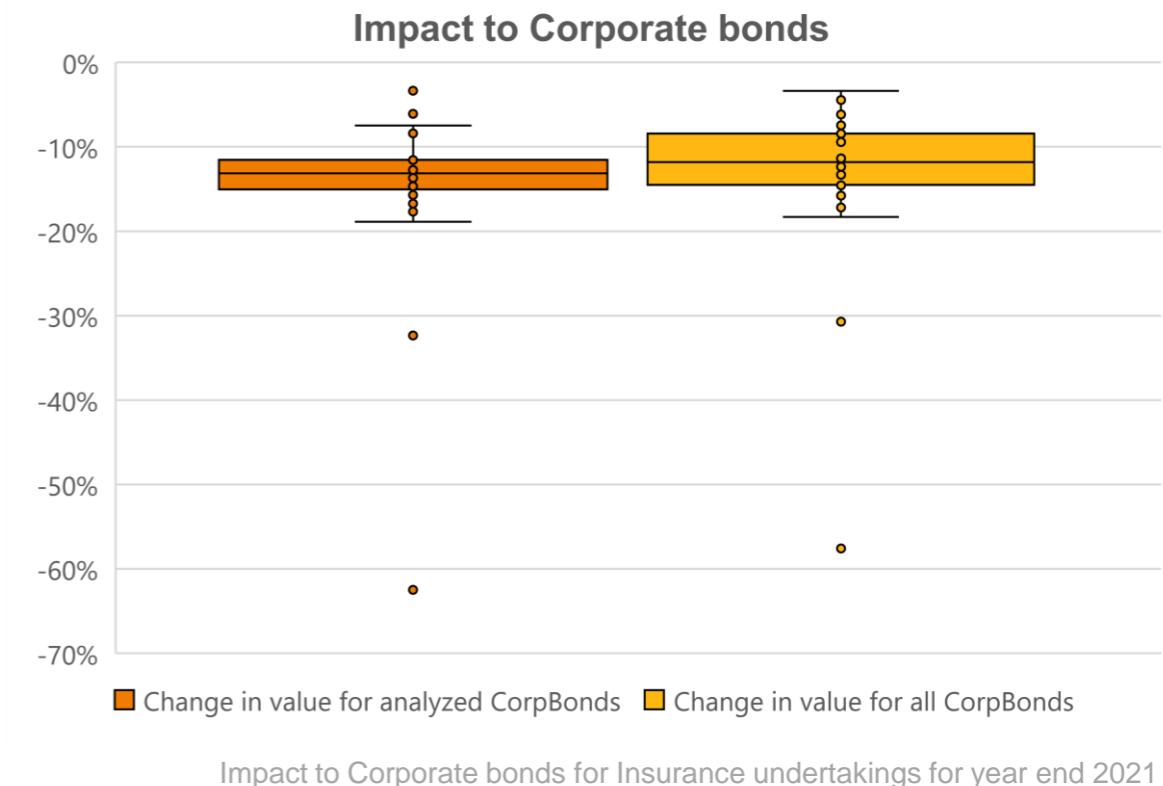


Impact to Government bonds for Insurance undertakings for year end 2021

2. CLIMATE STRESS TEST

Overview for Corporate bonds

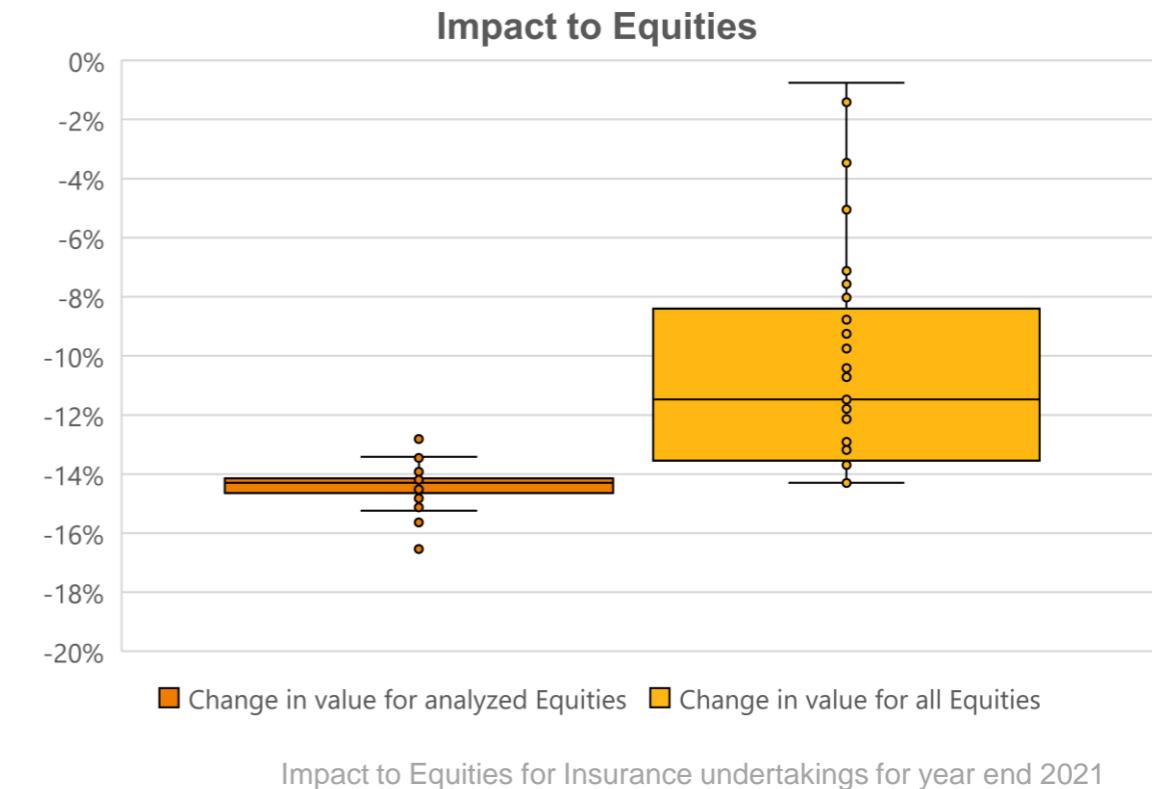
- Calculation of a **yield shock** was performed consisting of two parts.
 - The first part was a shock to the risk-free rate which depended on **maturity** and **currency**.
 - The second part was a shock to the corporate credit spread which depended on the **NACE** code.
- As far as possible, we tried to **calculate the relevant fields** like Yield and Modified Duration.
- Where reporting data was not available or data could not be calculated we tried to get data from an **extern provider**.
- First and foremost, we **recalculated the present value**. Where this was not possible, we **attempted an approximation using the modified duration**.
- For the overall market, **93% of Government bonds were analyzed**.
 - Per undertakings the share varies between 43.6% and 100%.



2. CLIMATE STRESS TEST

Overview for Equities

- Calculation of a **price change** which depended on the NACE code.
- Where reporting data was not available we tried to get data from an **extern provider**.
- For the overall market, **84% of Government bonds were analyzed**.
 - Per undertakings the share varies between 5.1% and 100%.



3. ESG SCORES

Methodology

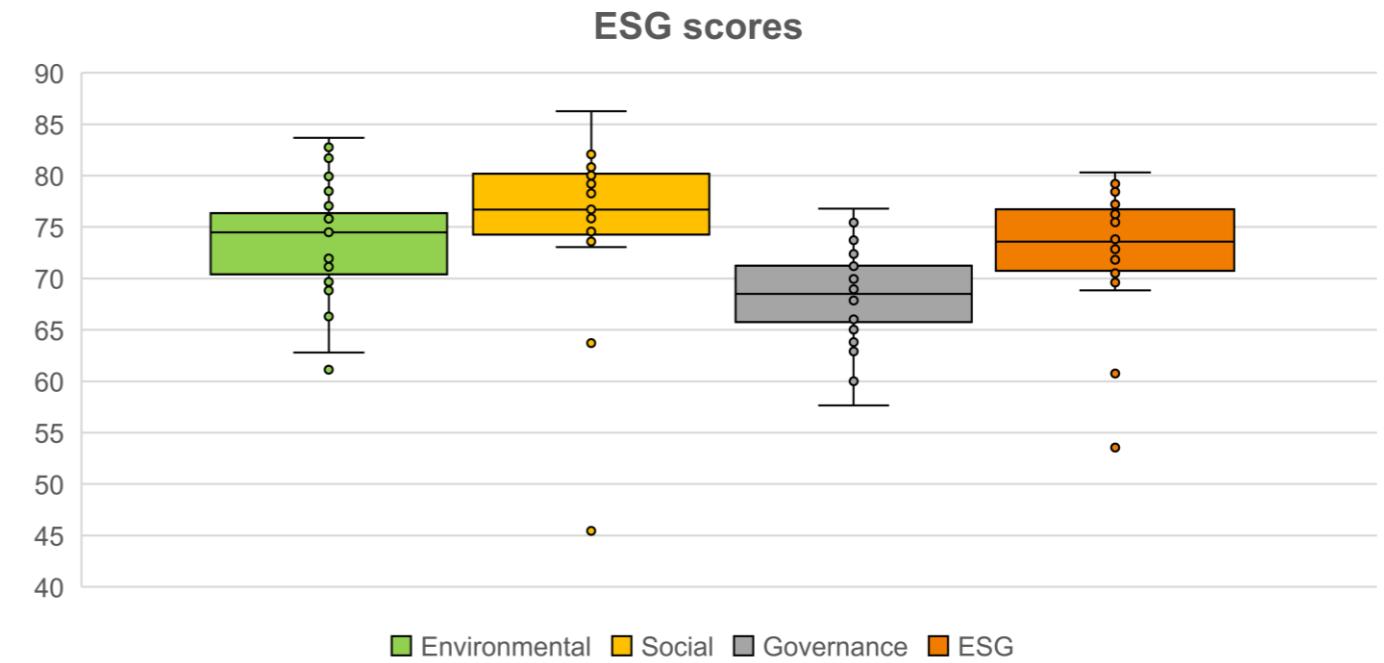
- Usage of **ESG scores** provided by an **extern provider** for Environmental (E), Social (S) and Governance (G).
- The result is to be interpreted as **best-in-class** score with a range between 0 (worst) and 100 (best).

Results

- For all assets where ESG scores were available, **96% were Equities and Corporate bonds.**
- For the overall market, ESG scores were generated for **28% of all Equities and Corporate bonds.**
 - Per undertakings the share varies between 0.1% and 61.1%.

Restrictions

- The analysis only includes assets with existing International Securities Identification Number (ISIN)



ESG scores for Equities and Corporate bonds from Insurance undertakings for year end 2021



4. PACTA TOOL

Methodology

- PACTA is an open-source tool developed by 2° Investing Initiative.
- It enables the valuation of **listed Equities** and **Corporate bonds** according to different transition sectors related to the decarbonization of the economy.

Key components

- climate-relevant exposure compared to global benchmarks
- climate path for the next five years per sector
- Transition Disruption Metric

Restrictions

- The analysis only includes listed Equities and Corporate bonds with existing ISIN.
- The expected development of the portfolio is based on the companies' published production plans and should therefore not be interpreted as an extrapolated forecast. Given the time horizon of 5 years, it is even likely that the companies' plans will change.

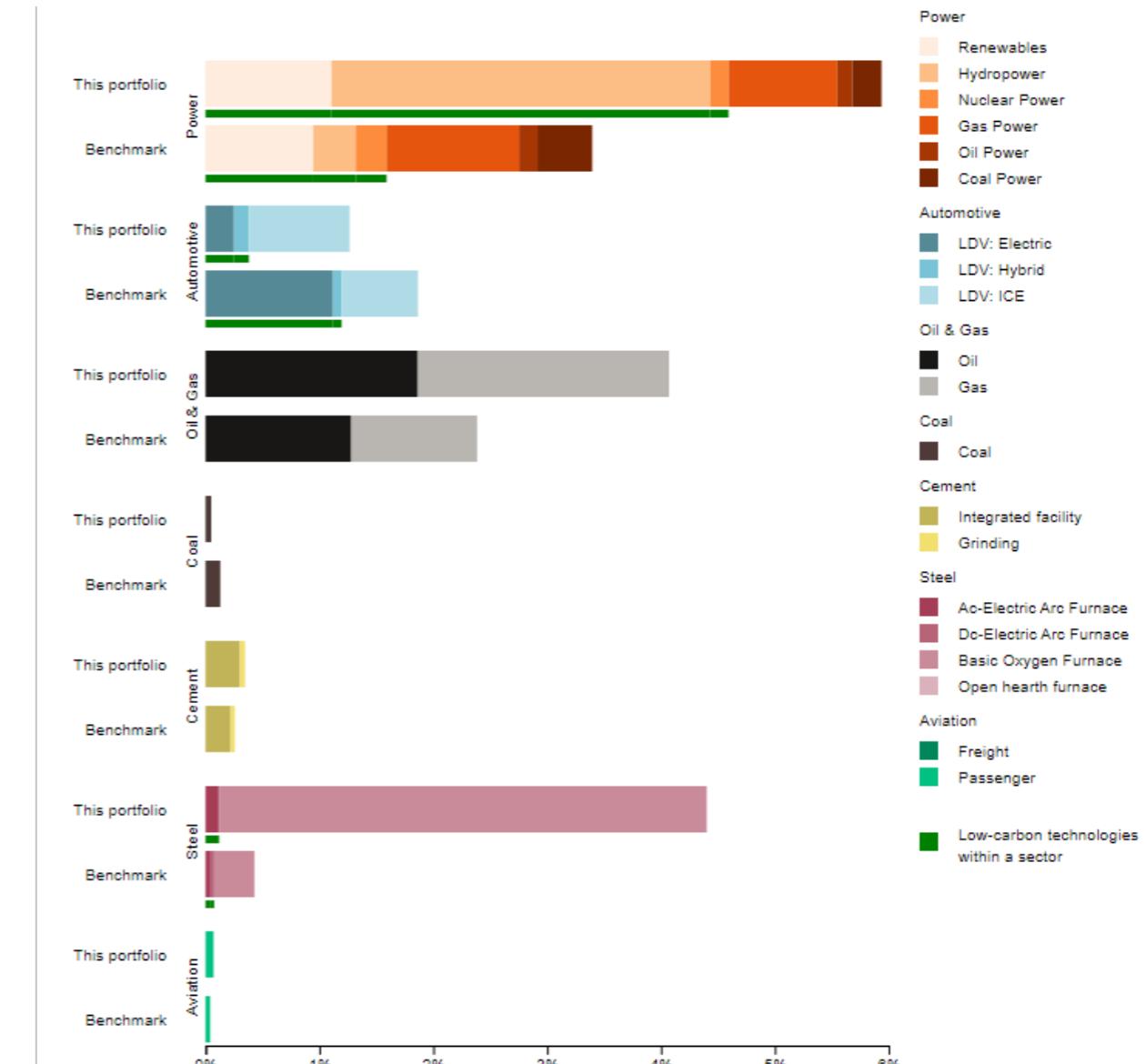
PACTA TOOL: CLIMATE-RELEVANT EXPOSURE

Description

- visualization of climate-relevant share per sector for Power, Automotive, Oil & Gas, Coal, Cement, Steel and Aviation
- share of low-carbon technologies per sector
- comparison to global benchmark (MSCI ACWI used)
- available separate for listed Equities and Corporate bonds (listed Equities used)

Results

- 16.1% of listed Equities and 12.3% of Corporate bonds are invested in climate relevant sectors.
- 5.1% of listed Equities and 2.8% of Corporate bonds are green assets (low-carbon technologies).



Climate-relevant exposure for listed Equities according to PACTA for year end 2020

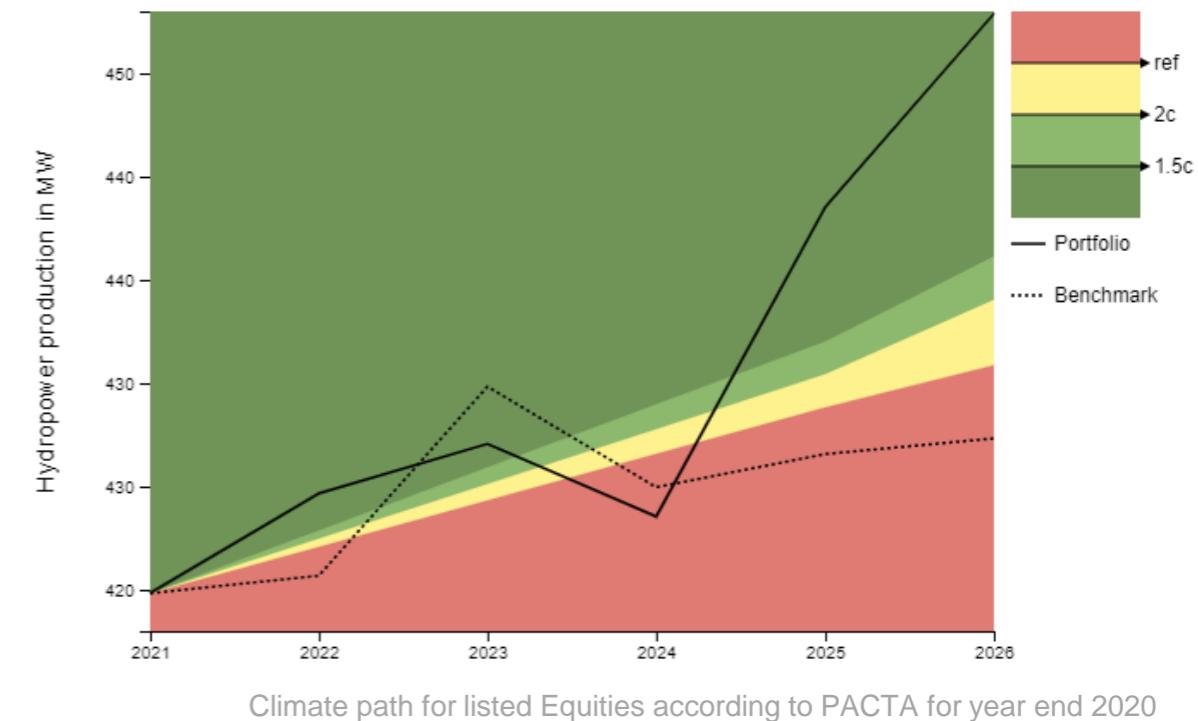
PACTA TOOL: CLIMATE PATH

Description

- The chart shows the alignment of Hydropower relative to the Global Energy and Climate Outlook (GECO) 2019 scenario (listed Equities used).
- The solid line indicates the projected production trajectory for the portfolio under the status quo for the next 5 years.
- The lines separating the background areas represent the portfolio's "target production" per technology under the GECO scenarios.
- The dashed line indicates the planned production development for the benchmark (MSCI ACWI used) according to the status quo for the next 5 years (scaled to the same starting point as the portfolio).

Results

- If there were only the analyzed companies on the market, the global warming would be limited to 1.5°C.



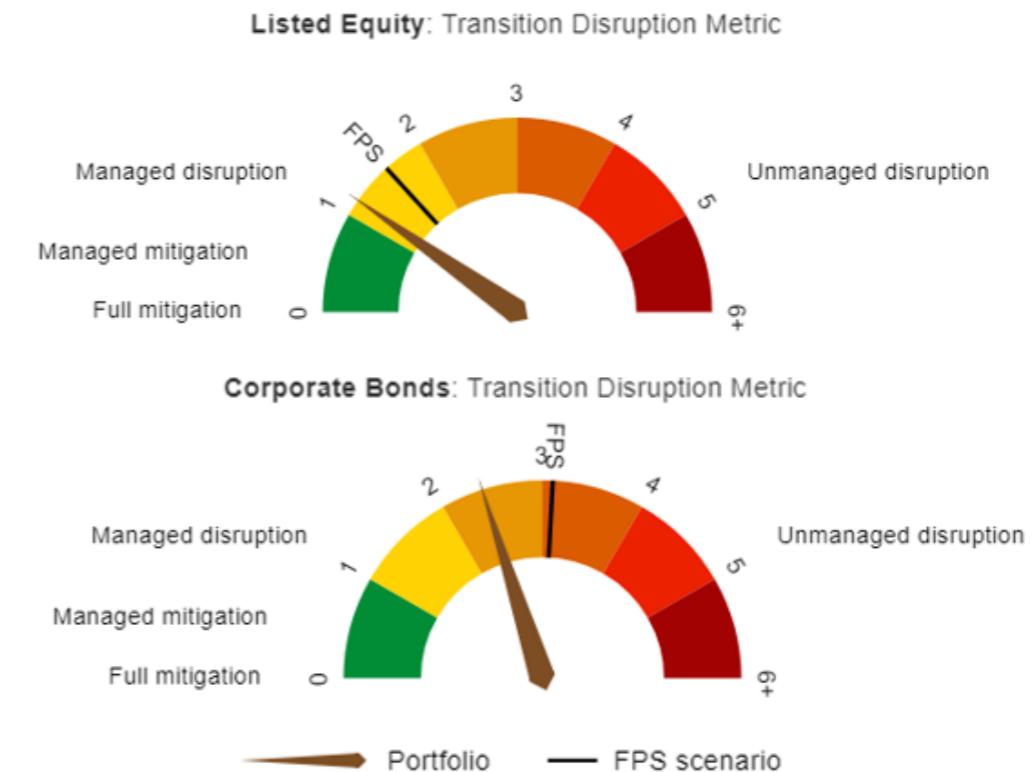
PACTA TOOL: TRANSITION DISRUPTION METRIC (TDM)

Description

- The TDM indicates the degree of disruption of the portfolio.
- This metric measures the adjustments needed in the portfolio from 2026 - 2030 relative to the portfolio's pace from 2021 - 2025, in order to be aligned with required decarbonization levels by the FPS (Forecast Policy Scenario) scenario by the end of 2030.
- A high number means that companies in the portfolio will need to significantly adjust their decarbonization pace to meet the 2030 goals of the FPS.
- Thus, the higher the number, the higher the likely portfolio disruption in the medium-term.

Result

- According to the TDM the analyzed portfolios will be exposed to disruption as their values are over 1 so that a smooth transition is not possible.
- The Equity portfolios transition should be less disruptive as the transition of the Corporate bonds portfolio.



Transition Disruption Metric according to PACTA for year end 2020

CONCLUSIONS

Overview of the results

- Climate-relevant exposure
- Stress tests
- ESG Scores
- Focus on Equities, Government bonds and Corporate bonds

Known issues

- Coverage
 - (only) up to 75% covered in analysis
- Data quality and data availability
 - 4-digit NACE code
 - Calculation parameters for Stress tests

Usage of results

- Insight into our market and an overall view from a supervisory perspective
- Monitoring of assets of our supervised entities on a regular basis
- Incorporation of the results into our supervisory process and risk scoring
- Publication of the results on a yearly basis
- Dialogue with the supervised entities about our findings

FINANZMARKTAUFSICHT ÖSTERREICH

■ Kompetenz

■ Kontrolle

■ Konsequenz



Insurance Stress Testing for Natural Disasters- A Caribbean Perspective

Melissa Burrowes
Manager, Research & Policy, Financial Services Commission Barbados



Small Island Context

- Industry comprised on some small to mid-sized indigenous insurers + large companies with regional footprint
- 1 SIFI
- Stress Testing not a requirement prior to 2021
- Annual Hurricane Season from June-November



Costliest Hurricanes in the Caribbean

Date	Tropical Cyclone	Affected Area	Overall Losses (US\$M, 2016 values)	Insured Losses (US\$M, 2016 values)	Fatalities
Sept 6 th – 14 th 2017	Hurricane Irma	Anguilla, Antigua and Barbuda, Bahamas, British Virgin Islands, Cuba, Dominican Republic, Florida, Haiti, Puerto Rico, Saint Martin, Sint Maarten, St Barthelemy, St. Kitts and Nevis, Turks and Caicos, US Virgin Islands	67,000	32,000	128
Sept 19 th – 22 nd 2017	Hurricane Maria	Bahamas, Dominica, Dominican Republic, Guadelope, Haiti, Martinique, Puerto Rico, Turks and Caicos, US Virgin Islands	63,000	30,000	108
Sept 20 th – 30 th 1998	Hurricane Georges	Antigua and Barbuda, Cuba, Dominican Republic, Haiti, Puerto Rico, St. Kitts and Nevis, US Virgin Islands	14,700	3,800	3,661
Sept 6 th – 14 th 2008	Hurricane Ike	Cuba, Dominican Republic, Haiti, Turks and Caicos	7,600	39	82
Sept 7 th – 21 st 2004	Hurricane Ivan, storm surge	Barbados, Cayman Islands, Cuba, Dominican Republic, Grenada, Haiti, Jamaica, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago	5,900	2,300	67

Natural Disaster Stress Testing

Setting
Objectives and
Scope

Technical
Design
Decisions

Data
Considerations

Timelines

Scenario Analysis, Stress Testing, Sensitivity Testing

- Scenario Analysis
 - Data 
 - Capacity 
 - Realistic 
 - Context 
- Stress Tests
 - Data 
 - Capacity 
 - Realistic 
 - Context 
- Sensitivity Testing
 - Data 
 - Capacity 
 - Realistic 
 - Context 

Setting Stress Testing Objectives and Scope

- Started with the “Why?”
- What is the gap I'm trying to fill?
- How does this output impact the functions of the supervisor ?
- Does the industry have the capacity for this exercise?
- Does my team have the capacity?
- Does proportionality matter?
 - What is the target market?
 - Do I need to treat branches differently?
 - What about small insurers?
- Micro vs Macro
 - A microprudential approach may allow initial focus on the undertakings' individual risks.
 - A macroprudential approach allows for assessing vulnerabilities and resilience of overall insurance sector and potential systemic climate change risks.

Setting Stress Testing Objectives and Scope

- Focus primarily on physical risks
- To build capacity
 - Exposure to thematic stress testing for Regulators and Insurers
- To test the resilience of the insurance industry to a specific event
- Detailed assessment of reinsurance programs
- Identify current gaps in terms of data and resources (staff numbers, training needs, analytical capabilities, etc.)
- Links to risk assessments
- Think Tanks

Technical Design Decisions

- Keys steps were the review of the NGFS scenarios to determine if they could be adapted to reflect appropriate scenarios for the jurisdiction.
- Review and finalization of the Scenarios was led by a unit responsible for stress testing and analytics
- After careful review of the scope and defining the exercise, it is important to understand the technical needs of the exercise. E.g. data, catastrophe models, etc.

Key Considerations: the size of the team and the access to data and information are key in determining the length of time it takes to assess the initial scenarios. Considerations of materiality and proportionality are also key.

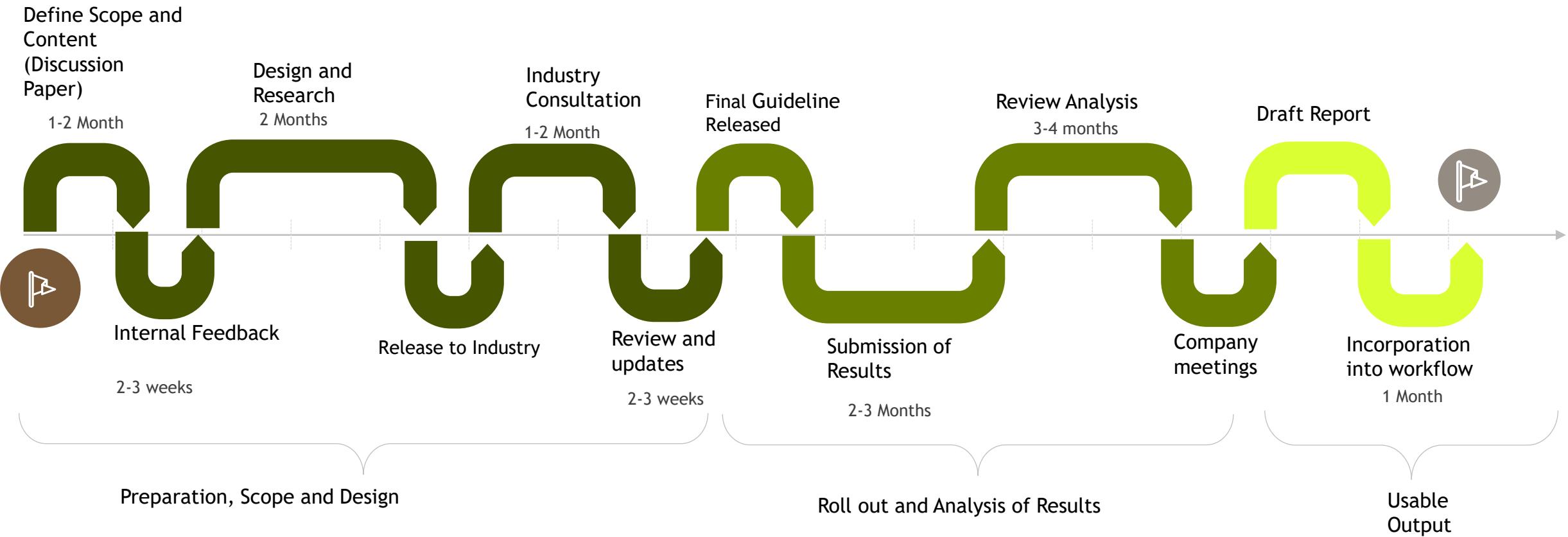
Technical Design Decisions

- Sensitivity Test
 - Used for calibration
- Submission of routine stress tests (based on your internal risk assessment)
- Simulate a Category 5 hurricane
 - For entities in multiple jurisdictions what happens if that goes on to other countries
- Financial condition post-shock
- Projections

Data Considerations

- Identification of gaps
- Validating data and tests
- Top-down vs Bottom-up
 - Quality of data at the insurer vs the regulator.
 - Granularity of the data at the insurer vs the regulator.
- Assumptions
- Differing modeling techniques (dependence on reinsurers)

Full Timeline

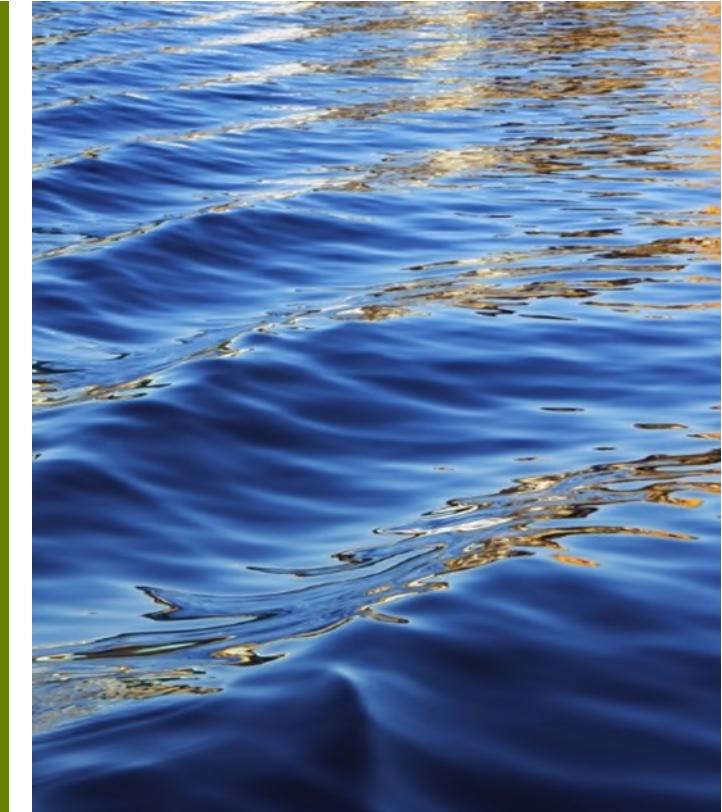


Supervisory Takeaways

- Capacity Building
- Context is key
- Improvements in data gathering processes
- More intimate knowledge of Insurers
- Reasonable Expectations
- Ensure that the output can be used to enhance supervisory work e.g. risk assessments, financial stability analysis
 - Modifying scenarios
 - Incorporation into workflow
 - Do they form part of the risk assessment profile?
 - Do we aggregate the output for public consumption? e.g Financial Stability Report



Thank You
FSC Barbados





Climate Exposure Assessment/Scenario Analysis – BMA Experiences

Ralf Kuerzdoerfer

Date: November 2022

Agenda



Climate exposure assessment
in the context of our work plan
on climate risk



Results



Principles and overarching
goals



Important lessons learned

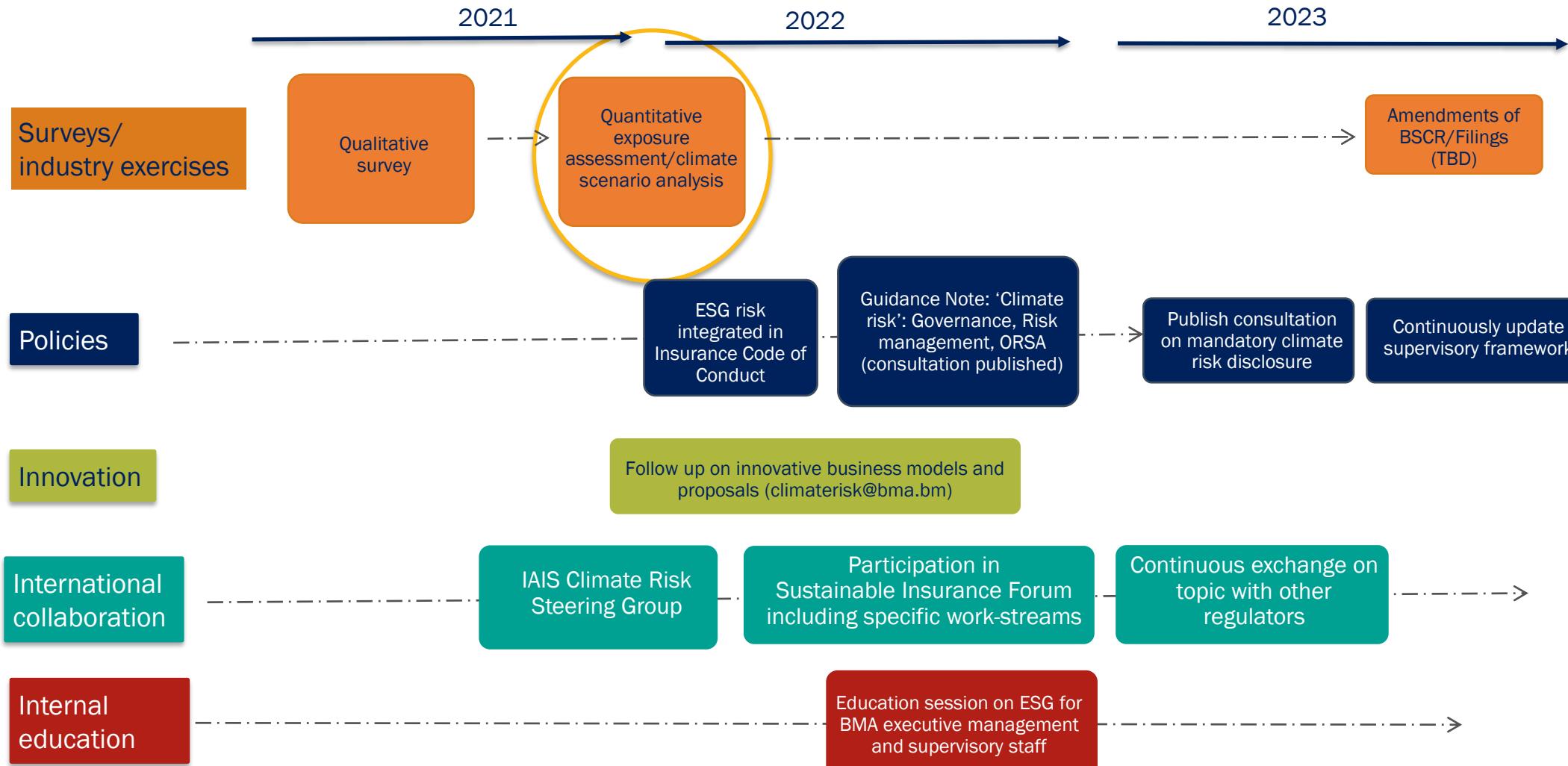


Specifications

1. BMA: Climate exposure assessment in the context of our work plan on climate risk

Attachment D

Strategic Objective: Integrating key Environmental Social Governance (ESG) considerations, particularly climate change, into the regulatory and supervisory approach considering risks, opportunities and innovation.



2. Principles and overarching goals

- **Market view**
 - Based on microprudential risk-based view (individual firm), but focus on aggregated results rather than results of individual firms
 - Identification of exposures and strategic impacts, key challenges and common themes for the Bermuda (re)insurance market
 - Inform our future policy approach
- **Achieve high participation through simplicity**
 - The exercise should be based on clear instructions and remain feasible to complete even for smaller commercial insurers
 - Keep physical risk exercise and transition risk exposure assessment separate
- **Technical design tailored to the Bermuda (re)insurance market**
 - Bermuda is a centre for commercial (re)insurance and on Property & Casualty (P&C) side for Natural Catastrophe (Nat Cat) reinsurance
 - Leverage existing models: the sector is very sophisticated in Nat Cat management, using NatCat models from recognised vendors and their own models for NatCat exposure management, pricing, risk capital purposes
- **Time horizon that allows for strategic action**
 - Physical risk side: around 10 years
 - Transition risk side: stop at exposure analysis stage
 - Static balance sheet

3. Specifications

- **Target Group**
 - The climate assessment was rolled out to insurance groups and large commercial insurers and select SPIs
- **Objective**
 - Obtain quantitative and qualitative footprint of exposures
 - Identify challenges (e.g., data collection) and best practices
 - Encourage the sector to further develop its own quantitative tools and expand qualitative assessments
 - Enhance understanding of climate change risks and implications for business models
 - Inform the BMA as to the nature of information that can be requested through future annual filings
 - Align BMA initiatives on climate change with other regulatory bodies

3. Specifications (cont.)

- Components
 - P&C (physical risk): calculation of NatCat losses (TVar) for key perils under a certain mid-term climate scenario (RCP 4.5, 10 to 15 years): hurricane, flood, wildfire and storm
 - Investments (transition risk, P&C and long term): obtain information on their asset exposure (coal, fossil fuel, transport, green etc.)
 - Firms to describe strategic implications from their exposure to transition and physical risks, such as changes in risk appetites, reduction of exposures, expansion of green underwriting and investment in green bonds

4. Results

Key messages:

- **Overall:** 104 groups and legal entities participated in the assessment
- **Data collection:** wide variety in the quality of data provided particularly on the investment side, showing a different level of preparedness and influence of still-evolving standards
- **Physical risk (P&C only)**
 - Over the years, the industry has developed high modelling expertise for short-term NatCat events. Nevertheless, the modelling of mid to long-term physical climate risk is still under development
 - The gathered information demonstrated that while almost all insurers use vendor models for modelling Nat Cat risk, the majority of insurers (77% to 82%) do not yet utilise additional capabilities of vendor catastrophe models for long-term climate-related risk exposure projections
 - Results: a relatively stable increase (ranging between 16-17%) in climate change exposures (NatCat losses) over the medium term, across a range of return periods (100, 250 and 1,000-year events). Hurricane losses are expected to increase above 20%. Due to current model limitations the increase is most probably underestimated

4. Results (cont.)

Key messages:

• Transition risk

- Overall, the market has moderate exposure to carbon-intensive assets (weighted average of 9.7%) and climate-relevant assets (25.6%). Exposure to fossil fuel and power generation (coal, gas, oil) is around 4%
- Certain simplifications have been made for allocation purposes. Companies should perform a more detailed analysis and derive risk management actions that are tailored to their own portfolio

• Strategy and Green/Carbon Intensive Underwriting

- Investments: focus still on assessing investments, minority is already actively reallocating
- Lines of business (P&C): notable minority changed risk appetite and reduced certain lines due to physical risk
- Limited concentration and dependency on carbon-intensive underwriting (fossil fuel, power, manufacturing) with a small number (4%) of P&C insurers and groups with high carbon-intensive underwriting exposure of over 20%, with the majority (63%) of insurers with exposures of less than 5%. Green underwriting, although still a small market with a low share of the overall business, is also an evolving area but strongly increasing and indicating some untapped potential for insurers

5. Some important lessons learned

- Be specific about scope and target right from the start as it defines the design, roll-out and shortens the execution time
- Preparation is key: it is particularly important to have discussions with stakeholders (e.g., select firms, vendor providers) during the design phase to ensure that the exercise and instructions are concise
- No need to reinvent the wheel: leverage certain material from international organisations, standard setters and learn from peer regulator experiences; built on existing modelling capabilities from the (re)insurance market (e.g., NatCat)
- Overall, the exercise took around six to seven months, which includes preparation, roll out and analysis of the results including data quality assurance. Data quality assurance took longer than planned particularly driven by investment data collection and allocation

For the complete report, please follow the link below:

<https://cdn.bma.bm/documents/2022-05-10-12-17-46-2021-Climate-Risk-Exposure-Survey-Report.pdf>