Climate Scenario Considerations for US ORSA

Charlie Merz, Anna Bearrood Widman, and Seong-min Eom

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ORSA definition: Own Risk Solvency Assessment. Now required annually for all insurance entities in all states.

About the Speakers

- Moderator: Seong-min Eom, MAAA, FSA, Chairperson, Climate Change Joint Committee
- Speakers: Charles Merz, MAAA, FSA, Member, Climate Change Joint Committee
- Anna Bearrood Widman, MAAA, FSA, Member, Climate Change Joint Committee

The American Academy of Actuaries Climate Change Joint Committee

- **Purpose:** Provides actuarial insight on how climate change affects insurance, the actuarial profession, and the broader financial system through evolving climate risks and uncertainties.
- **Cross-Practice Collaboration:** Brings together actuaries from all practice areas (e.g., property & casualty, health, life, pension, and risk management) to address climate change as a systemic risk.
- **Policy & Public Engagement:** Develops nonpartisan resources (issue briefs, webinars, etc.) to inform policymakers, regulators, and other stakeholders on climate-related financial risks.

The American Academy of Actuaries Climate Change Joint Committee

Recent Relevant Publications:

- Policy Paper: Actuarial Perspectives on Quality, Challenges, and Effective Risk Quantification
- Issue Paper: Climatic Events, Inequities, and Risk Mitigation
- ORSA Climate Scenarios
- Attribution Science

Ongoing work due to be released soon

- Insurance Affordability
- Attribution Science – Methodologies
- AI Data Center Impact
- Emerging Climate Products

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Why Should We Consider Climate?

- Frequency and severity of climate-related catastrophes are increasing
- Situation not likely to improve in the foreseeable future
- No geographical area is excluded
- NAIC materiality can be easily met: 5% pre-tax income or 0.5% assets
- Climate is becoming a key consideration for regulators, investors, policyholders, and business leaders
- Better disclosures and risk management → lower risks and more opportunities

Alignment with TCFD Reporting: Leveraging ORSA Scenarios for Broader Disclosures

Strategy

- Describe resilience of financial performance and position.
- Consider multiple paths, including a 2°C or lower scenario and increased physical risks.

Risk Management

- Analyze both underwriting and investment risks.
- Identify specific risk factors, scenarios, and timeframes.

Metrics & Targets

- Consider the alignment of metrics with climate scenarios.

Topics

- Core Concepts
- Considerations
- Scenarios
- Resources

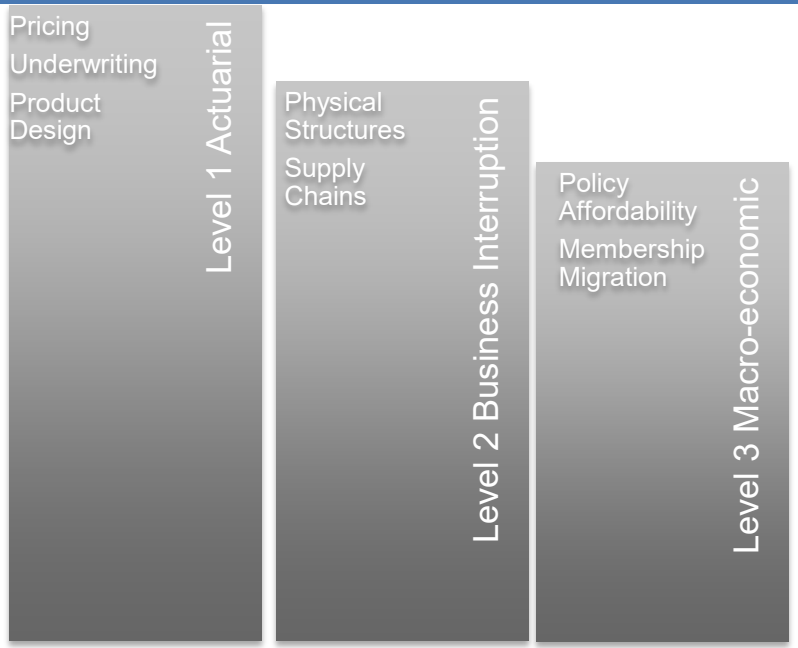
Core Concept: Climate Risk vs. Climate Change Risk

Climate Risk	Climate Change Risk
Impact of single stress event	Increase in frequency and intensity of events
Experience-based	Forward-looking
Rigid + parameters	Scenario-based (subject to uncertainty with quantitative and qualitative assessments)
Mainly P&C Focus	All insurance lines focus

Core Concept: Physical Risk vs. Transition Risk

Physical Risk	Transition Risk
Physical impacts of climate-related events	Financial impacts of moving to low-carbon economy
Examples: • Property destruction / Displacement • Increased morbidity and mortality • Disruptions to supply chains • Loss of consumer confidence	Examples: • Costs of policy and regulation compliance • Technological advancements • Shifting market/societal sentiments • Devaluation of carbon-intensive industries

Impact Points—Physical Risk



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Impact Points—Transition Risk

Specific Considerations for Health Insurance

Morbidity/Health Impacts:

- Increased frequency of pandemics
- Heat-related illnesses, water-borne diseases, and
- Mental health challenges

Care Delivery Disruption: Disaster exposures and health-care supply disruptions

Macro Costs: Upward pressure on rising health-care costs

Transition Risks: Inflation and changing costs impacting operations and asset values

Key Assumptions

- Time Period
- Severity/Frequency
- Bottom-up or Top-down
- Affected populations/insurances
- Mitigation

Management Actions & Mitigation: Mitigating Impacts through Management Response

- **Product & Underwriting:** Changes in product offerings, pricing, and underwriting
- **Balance Sheet:** Asset-liability management and reinsurance strategies
- **Navigating Constraints:** Adapting to market and regulatory constraints
- **Seizing Opportunities:** Capitalizing on climate-related opportunities, such as portfolio investments

The Grid: Physical vs. Transition Risk

	Scenarios to Test	
Physical Risk		
HIGH	Current Policy	Dis-Functional (Non-Integrated / Non-Global)
LOW	Paris-Aligned (Swift/Global Scope)	Knee-Jerk Reaction (Delayed/Costlier)
Transition Risk	LOW	HIGH

The Grid: Pick Two Scenarios (For Forest Fire Risk)

	Scenarios to Test	
Physical Risk		
HIGH	Current Policy	Dis-Functional (Non-Integrated / Non-Global)
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Options on Climate Modeling: Premade or Make-Your-Own

Climate models will incorporate either physical risk and/or transitional risk. You can use premade models or make-your-own.

If Premade, then there are two best options:

- UN Environment Program (UNEP) Climate Models—to use as the core model for physical and transitional risks
- Network for Greening the Financial System (NGFS) Climate Models—to use to geographically adjust the UNEP model

- This requires making a correlation of the economic impact output to the insurance impact

UNEP Model

Use UNEP Climate Model link provided in the last slide of the presentation

Excel WS that can be down-loaded.

Good—5-year short-term model, includes Macro, Transitional risks, and Physical (Chronic and Acute) risks. Can do combined or separate risks.

Bad—Perils include only: heat wave, fire, flood, and drought, so had to use drought as proxy. Geography is only total U.S., gives impact on GNP only, so had to cross-walk to insurance impacts.

No Quadrant 4 scenario, but Quadrant 3 (“current policy” = NGFS current policies (high climate response)”) and Quadrant 2 (“Knee Jerk” = “Fragmented”) are available.

Alternative Scenario Frameworks

IPCC (Intergovernmental Panel on Climate Change)

- Provides probability calibration for global temperature and resulting weather events

Bank of England (CBES) & Canada OSFI (SCSE)

- Uses NGFS scenarios but adds considerations for counterparties, climate litigation, management actions, and sectoral/financial risks

IPR (Inevitable Policy Response)

- A single "most likely" long-term scenario with an investments focus

2°II (2° Investing Initiative)

- Focuses on a delayed action (high-transition-risk) scenario impact on assets

UNEP Example—Scenario 3—Forest Fire/Asset Devaluation —INPUT

	Shock	Stress level
Macro shock	Inflation	High
Shock description	Sudden rise in inflation affects economic activity and asset prices.	
Transition shock	Stranded assets	High
Shock description	Adjustment in the energy mix away from fossil fuels adversely impact the valuation of fossil fuel asset	
Physical shock	Chronic impacts	Current policies scenario (NGFS)
Shock description	Short-term increase in chronic physical risks due to climate change adversely impacting economic activity and triggering shifts in asset valuations.	
Acute physical shock	Drought	Current policies scenario (NGFS)
Shock description	Increase in the frequency and severity of droughts due to climate change	

Confidence Interval	70 Percent
Region	United States of America
Variable	Gross Domestic Product (GDP)
Unit	% difference, country base year; local currency

	2022	2023	2024	2025	2026	2027
Inflation shock in United States of America	0	-1.67336	-4.53184	-4.62829	-4.2136	-3.95739
Stranded assets shock in United States of America	0	-2.08974	-3.65046	-4.19208	-4.6991	-5.12893
Chronic impacts shock in United States of America	0	-0.45336	-0.6085	-0.756	-0.90606	-1.04875
Drought acute physical shock in United States of America	0	-0.46537	-0.5002	-0.53532	-0.52721	-0.62061
Combined shocks in United States of America	0	-4.68182	-9.29099	-10.1117	-10.346	-10.7557

UNEP Example—Scenario 3—Forest Fire / Asset Devaluation—OUTPUT GNP Impact

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NGFS Example

Use NGFS Climate Impact Explorer link provided

Use Guest login

Pick from menus for: region, peril (indicator), and scenario

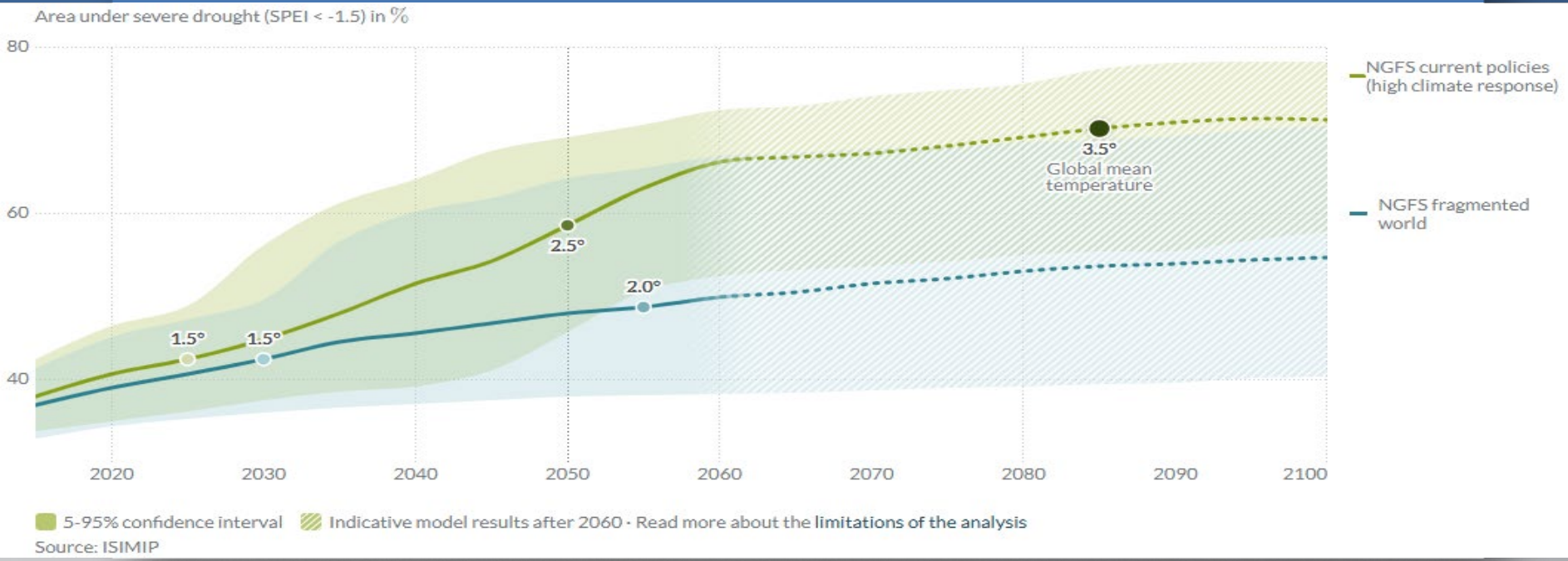
Perils include heat wave, fire, flood, and drought

Scenario 3 (“current policy” = NGFS current policies (high climate response)”) and Scenario 2 (“Knee Jerk” = “Fragmented”) are available.

Look at forest fire risk

NGFS Example—New Mexico—% Under Severe Drought (Scenario 3 vs. Scenario 2)

NGFS Example—USA—% Under Severe Drought (Scenario 3 vs. Scenario 2)



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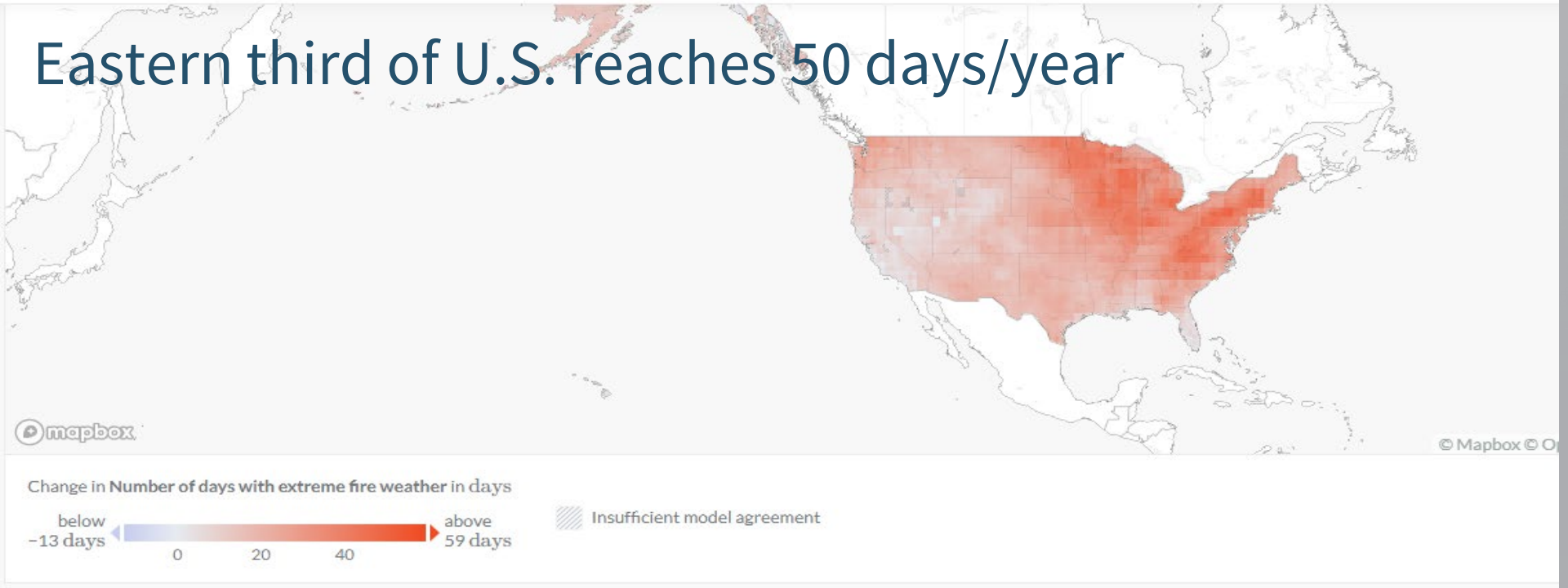
Develop Adjustment Factor (for UNEP Model)

You can get exact data point by scanning over the graph output in NGFS model:

Severe Drought %--Scenario 3			
Projection Year	New Mexico	USA	Ratio
2030	55.8%	44.9%	1.24
2050	84.9%	58.7%	1.45

NGFS Example—Number of Days with Extreme Fire Weather (@ 3.5C temperature increase)

Eastern third of U.S. reaches 50 days/year



Build-Your-Own Model

- Excel WS which can build a simple projection model with three sub-sheets: input, logic, and output
- Good—Flexibility—can set risks and time-frames to company's unique circumstances. You can calculate true anticipated $ impact to the company. Assumptions are explicit and may be more explainable
- Bad—Can take much more effort and may be hard to justify some assumptions
- Example shown depends on a combination of IPCC information, trends from other studies, and judgement

Build-Your-Own—INPUT

Inputs	Health Insurance Climate Impact Model				
Physical Risk					
Scenario	3	1-4			
Population	ALL	CM/MC/MD/ALL			
Time Period	20	Number of years			
Peril	WF	heat wave (HW)/wildfire(WF)/flood(FL)/ALL (acute)			
		sea level rise (SL)/drought (DR) (chronic)			
Region	SW	NW/SW/MW/NE/SE			
Migration	N	Y/N			
Business Interruption		N	Y/N		
Average Commercial PMPM Claims			$400		
Transition Risk					
Asset Devaluation		Y	Y/N	Total Assets	$500,000,000
Compliance costs		Y	Y/N	Compliance Dept Cost	$4,000,000
Regulation		Y	Y/N		
Consumer Risk		Y	Y/N		

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Build-Your-Own—LOGIC

Physical Risk

Relativity Factors (Per IPCC + Judgement)

Scenario	Description	Physical	Transition
1	Paris	1	1
2	Knee Jerk	1	1.5
3	Current Policy	2	1
4	Disfunctional	3	2

Population	Heat	Wildfire	Flood	Annual HC Trend	Adm Cost
CM	1	1	1	8%	4%
MC	1.5	2	2	4%	4%
MD	2	3	3	3%	4%

Forest Fire By Year	Burn 5%	Psych 20%	Lung 5%	Cancer 3%	pmpm impact	Claims pmpm	% Diff	New Mexico Frequency	# mems	$ Impact
	$ 500	$ 500	$ 25	$ 2,250	$ 55	$ 400	14%	0.33	10000	$2,186,250
Amortized	20 yrs	each year	each year	20 yrs						

Transition Risk	Weight			
Asset Devaluation	8%	% Assets in Fossil Fuels	Devaluation	30%
Compliance costs	10%	of current Compliance Dept Costs		
Regulation	1%	of premium		
Consumer Risk	5%	policy lapsation	Lost Profit	5%

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Build-Your-Own—OUTPUT

Output								
Wildfire / Scenario 3 /ALL Populations								
Impact ($ Millions per 10000 members)								
	Projection Year							
PHYSICAL RISK	1	2	3	4	5	10	15	20
Commercial	$2	$3	$3	$3	$4	$7	$12	$21
Medicare	$2	$3	$4	$5	$5	$10	$16	$25
Medicaid	$2	$4	$5	$6	$7	$14	$22	$33
Total	$7	$10	$12	$14	$16	$30	$50	$79
TRANSITIONAL RISK	1	2	3	4	5	10	15	20
All Population	$0	$1	$3	$4	$5	$12	$22	$35
Total	$7	$11	$15	$18	$21	$42	$72	$114

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References

UNEP Climate Model:

https://www.unepfi.org/wordpress/wp-content/uploads/2024/07/Short-term-climate-scenarios-viewer.xlsx

https://www.unepfi.org/themes/climate-change/scenarios-for-assessing-climate-related-risks-new-short-term-scenario-narratives-by-unep-fi-and-niesr/

NGFS Climate Impact Explorer:

https://climate-impact-explorer.climateanalytics.org/

Key IPCC Information:

https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf

Climate Scenario Considerations for US ORSA paper:

https://actuary.org/wp-content/uploads/2025/11/risk-paper-orsa-11052025.pdf?_zs=LT9cf&_zl=7pii4

Questions?

For more information, please contact

Will Behnke

Risk Management and Financial Reporting

Policy Project Manager

behnke@actuary.org

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