



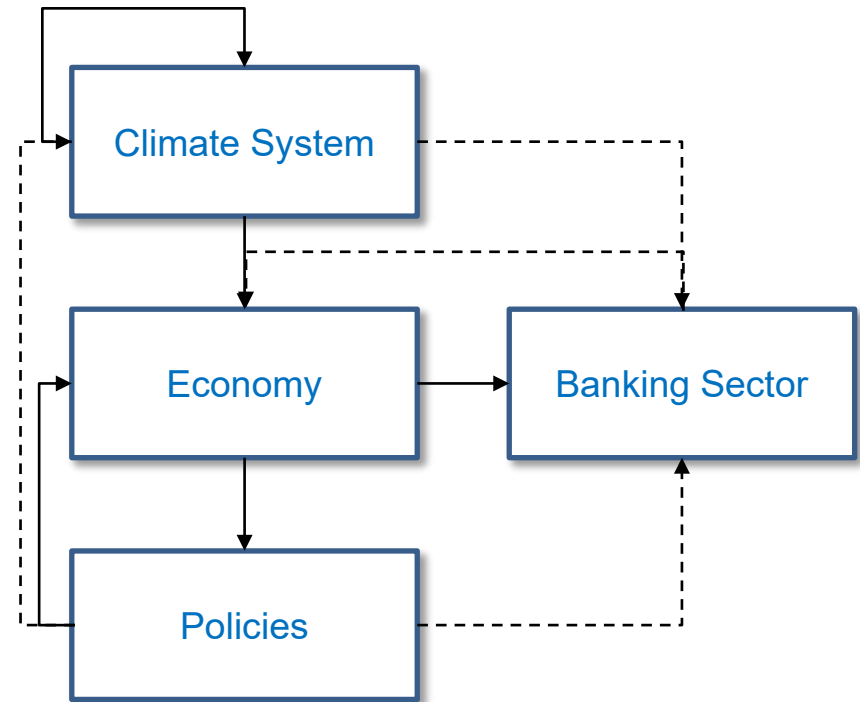
# Structured Scenarios for Measuring Climate Stress on Operational Risk

## Patrick Naim

# Climate Change and the Banking Sector



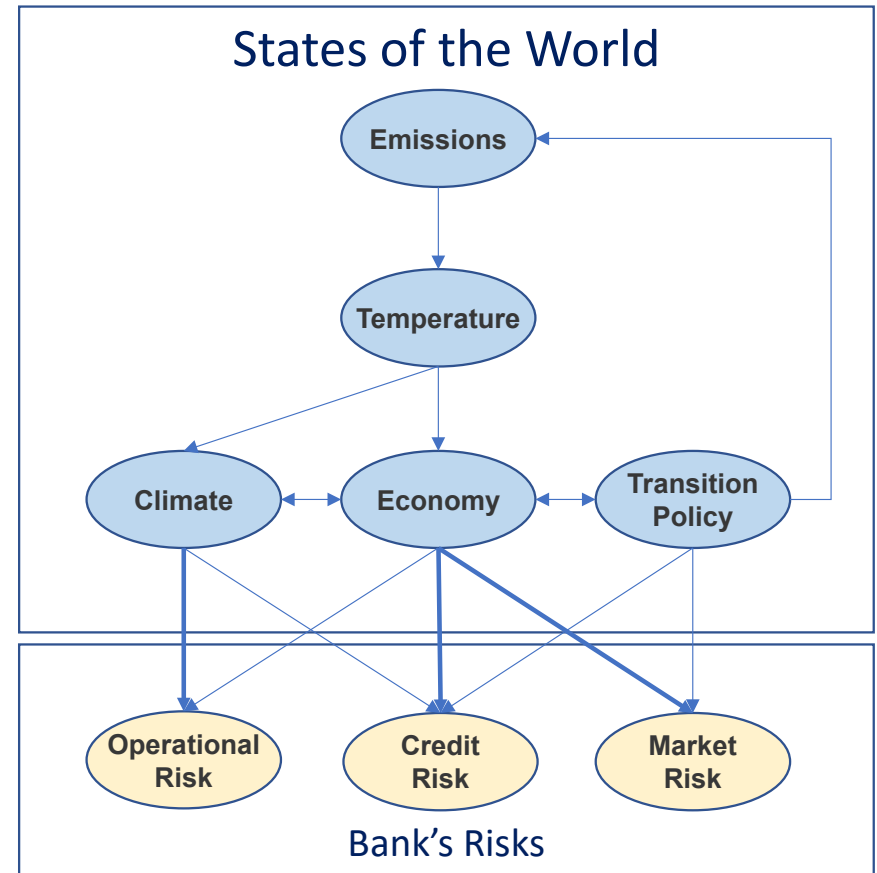
- Climate change is primarily an increase of physical risks
- The systemic nature of this increase will impact the economy.
- The anticipated impact on the economy will drive transition policies.
- Each of these changes will have an impact the banking sector.



# Climate Change and Bank Risks



1. Interactions between a modified climate, economy and transition policies will generate unexpected states of the world.
2. Climate, economy and transition will impact bank's risks, through various causal paths, such as:
  - Increased natural disasters will directly impact bank's operational risk
  - Increase of temperature will impact productivity, and the general economy, increasing credit risks
  - Transition policies will impact carbon intensive sectors, and credit risk on specific subportfolios
  - Disorderly transition will create geopolitical instability, and increase market volatilities



# Systemic Environmental Risks



Climate Change is an instance of Systemic Environmental Risk, as the Covid19 pandemic, or as biodiversity risks, with 3 main characteristics:

- **Forward looking**  
Environmental risks are not a shock on a steady-state economy, but a shift of steady-state. Past data is of little use for modeling.
- **Knowledge field**  
Environmental knowledge is outside the usual knowledge fields of economists. The link between climate change and the economy has only recently been formalized ([Nordhaus 1991]).
- **Policy-makers feedback**  
The reaction to the anticipation or occurrence of these risks create additional stress.





# Climate Change Impact on Operational risk

Event Type	Physical Risk	Transition Policy	Comments
Conduct		✓	New climate regulations will generate new obligations for banks and create new risks of misconduct.
Cyber		✓	Climate change will change the geostrategic balance and increase the risk of cyber-attacks, especially by states.
Disruption	✓		Climate change increases the risk of natural disasters, impacting not only banks but also their suppliers.
Error	✓		Increase of temperature and extreme meteorological events impacts productivity and increase the risk of error.
External Fraud	✓		Second order impact. A possible mechanism is the link between climate and conflict (both interpersonal and intergroup).
Internal Fraud	✓		Second order impact. A possible mechanism is the link between climate and conflict (both interpersonal and intergroup).
Legal	✓	✓	Climate change will expose some major companies to lawsuits, and may expose their financial partners to liability.

The relations described above are qualitative.

To quantify them, it will be difficult to rely on past data, even if the basic mechanisms can be substantiated by data: for example, the relation between climate and violence has been quantitatively measured ([Burke 2015]).

To use these relations in assessing future operational risks, it is necessary to represent these risks by “loss generation mechanisms”, rather than data.

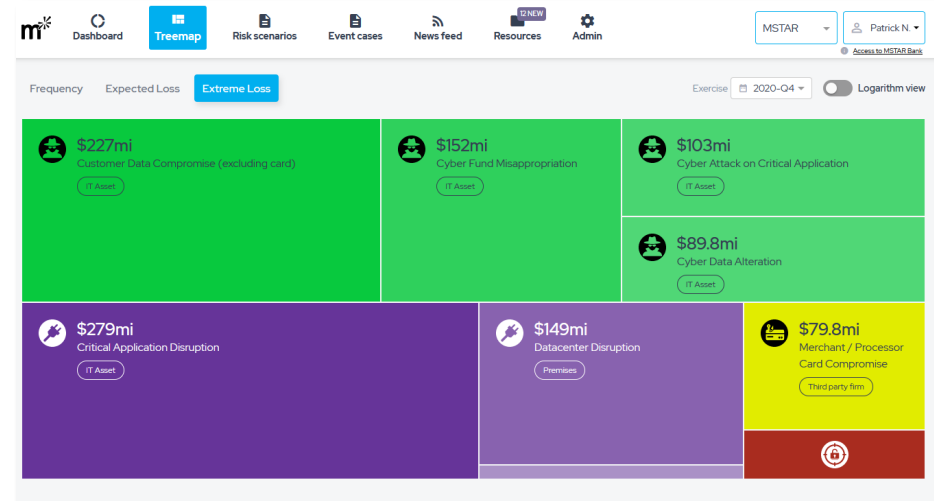
[Burke 2015] Burke, Marshall ; Hsiang, Solomon M. ; Miguel, Edward, *Climate and Conflict*, Annual Review of Economics, Vol. 7:577-617, August 2015  
<https://doi.org/10.1146/annurev-economics-080614-115430>



# The ABA Initiative on Structured Scenarios



- In 2018, ABA has launched an initiative to build and quantify structured scenarios with a group of 6-8 banks, using the « Exposure, Occurrence, Impact » method.
- This has been in particular applied to Cyber Risk in 2019 and to Climate Stress of Oprisk Scenarios in 2020
- In 2020, an « ABA SSA Portal » hosting the scenarios and data has been developed and is now online.



Screenshot of the ABA SSA Portal (<https://ssa.aba.com>)  
Cyber risk Treemap





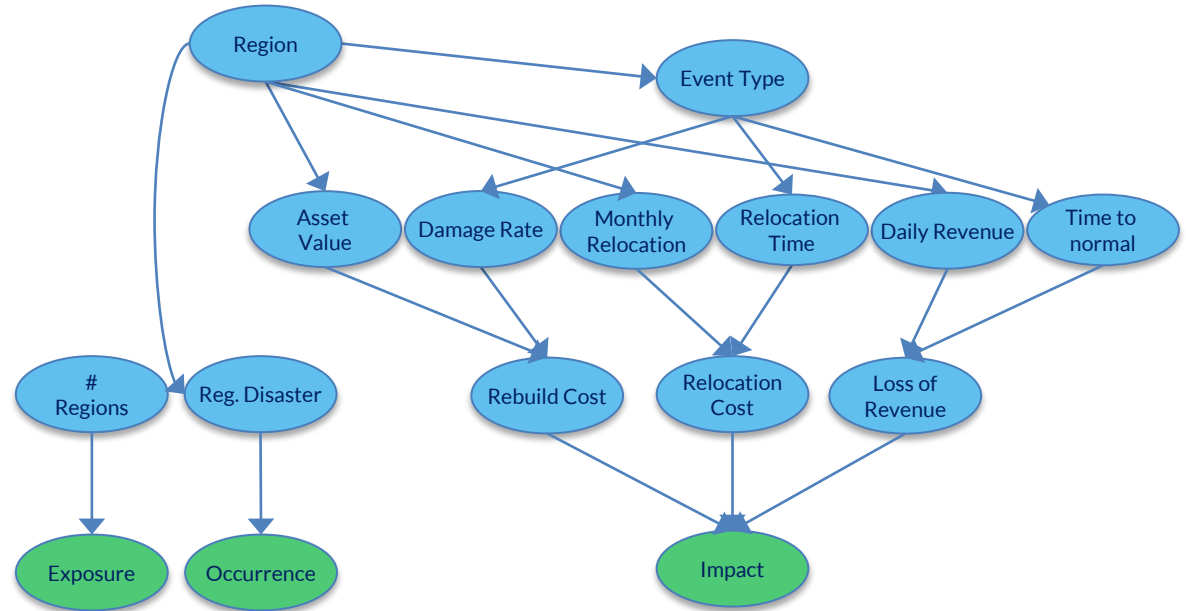
# Selection of Climate Sensitive Scenarios

Name	Short Narrative
CMR Corporate Client Misrepresentation	Large shareholder lawsuit consecutive to the bankruptcy of a large corporate client The examples of such situations are ENRON or WorldCom.
FID Fund Improper Disclosure	The firm has allegedly omitted or misrepresented material facts to the investors of the fund, fraudulently or not, and is sued by a class of investors or the justice department, or the fund trustee or any regulatory agency who seek for compensation.
MSW Mis-selling Wholesale	The firm has allegedly misrepresented or omitted material facts about a product designed by the investment banking department. The product might have been sold to many clients or to few wholesale clients, depending on its nature.
BLD Building Destruction	A local adverse event impacts one of the buildings critical to the firm that would lead to a business disruption. This scenario covers in particular a Terrorist Attack.
NDR Natural Disaster – Regional	This scenario considers the occurrence of a natural disaster with a regional impact: hurricane, earthquake.
SPF Supplier Failure	This scenario considers the situation of technical failure or financial default of a key supplier of the firm.
TRE Trading Error	This scenario considers an error in manual capture or execution of a single market trade.
TAE Trading Algorithm Error	A trading algorithm malfunctions and therefore accumulates abnormal market exposure, leading to market losses when the position is closed out.



# Scenario Example – Structure and Drivers

## Natural Disaster - Regional



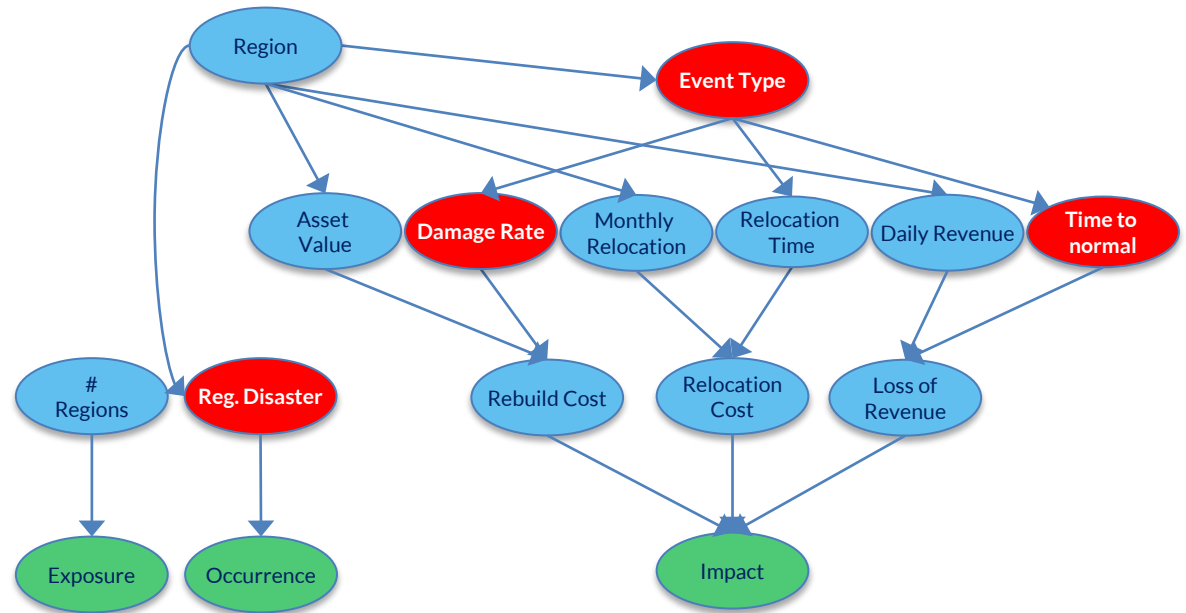
	Main Drivers	Bank Assessment	External Assessment
Exposure	Regions of Operations	Key Regions	
Occurrence	Type of disasters/ region		USGS ; GEM NOAA
Impact	Rebuild	Damage Rate Asset Value	Damage Rate
	Relocation	Time to Normal Relocation Cost	Time to Normal
	Revenue	Dependent Revenue / Region	





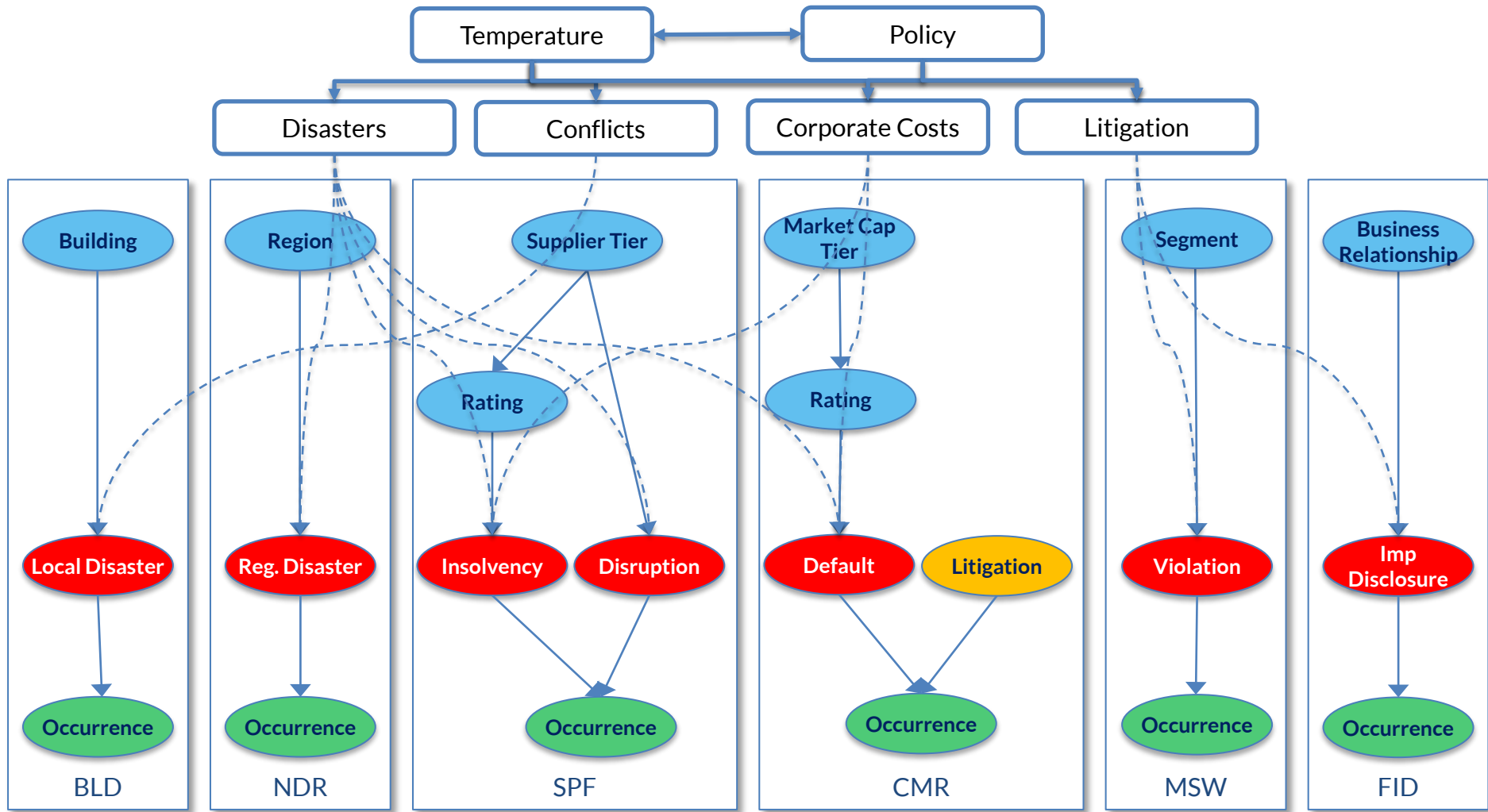
# Scenario Example – Climate Stress

## Natural Disaster - Regional



	Earthquake	Hurricane
Transition	N/A	N/A
Physical	N/A	Global warming is increasing the frequency of the most violent hurricanes (Cat 4-5). It also causes a rise in sea level and increased precipitation during hurricanes. These two factors combined increase the damage caused by hurricanes.

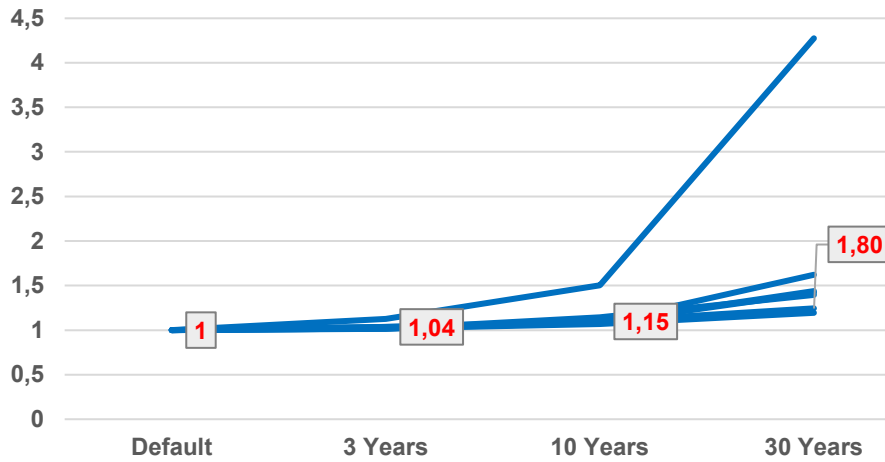
# Main Climate Dependencies (Occurrence)



# Overview of Results

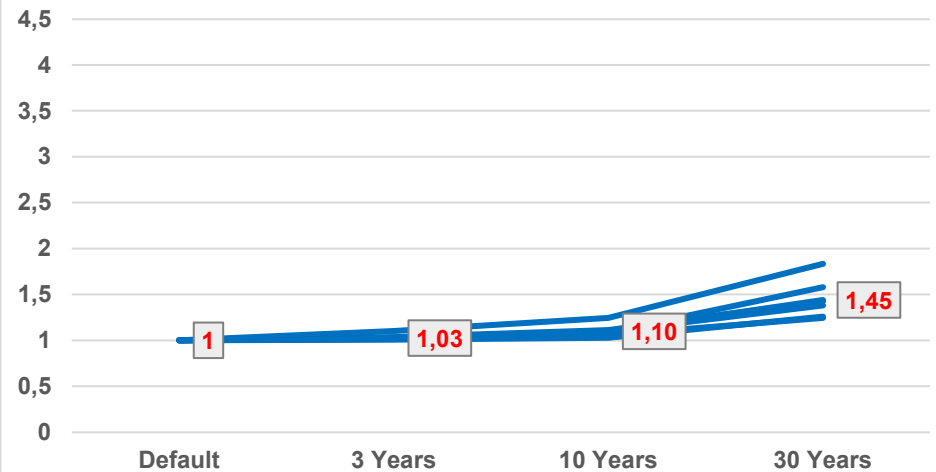


### Trends of Oprisk (Conduct)



*VaR index for Conduct climate-sensitive scenarios  
Each line represents a bank.  
On average, Conduct risk VaR is expected to increase  
by 80% in the conditions of 2050.*

### Trends of Oprisk (Disruption)



*VaR index for Disruption climate-sensitive scenarios  
Each line represents a bank.  
On average, Disruption risk VaR is expected to increase  
by 45% in the conditions of 2050.*

**Thank you!**