
S&P Global

Market Intelligence

IACPM 2023

*Empowering Financial Resilience: A Deep Dive Into
Integrating Climate Risk In Credit Portfolio Management*

November 7, 2023

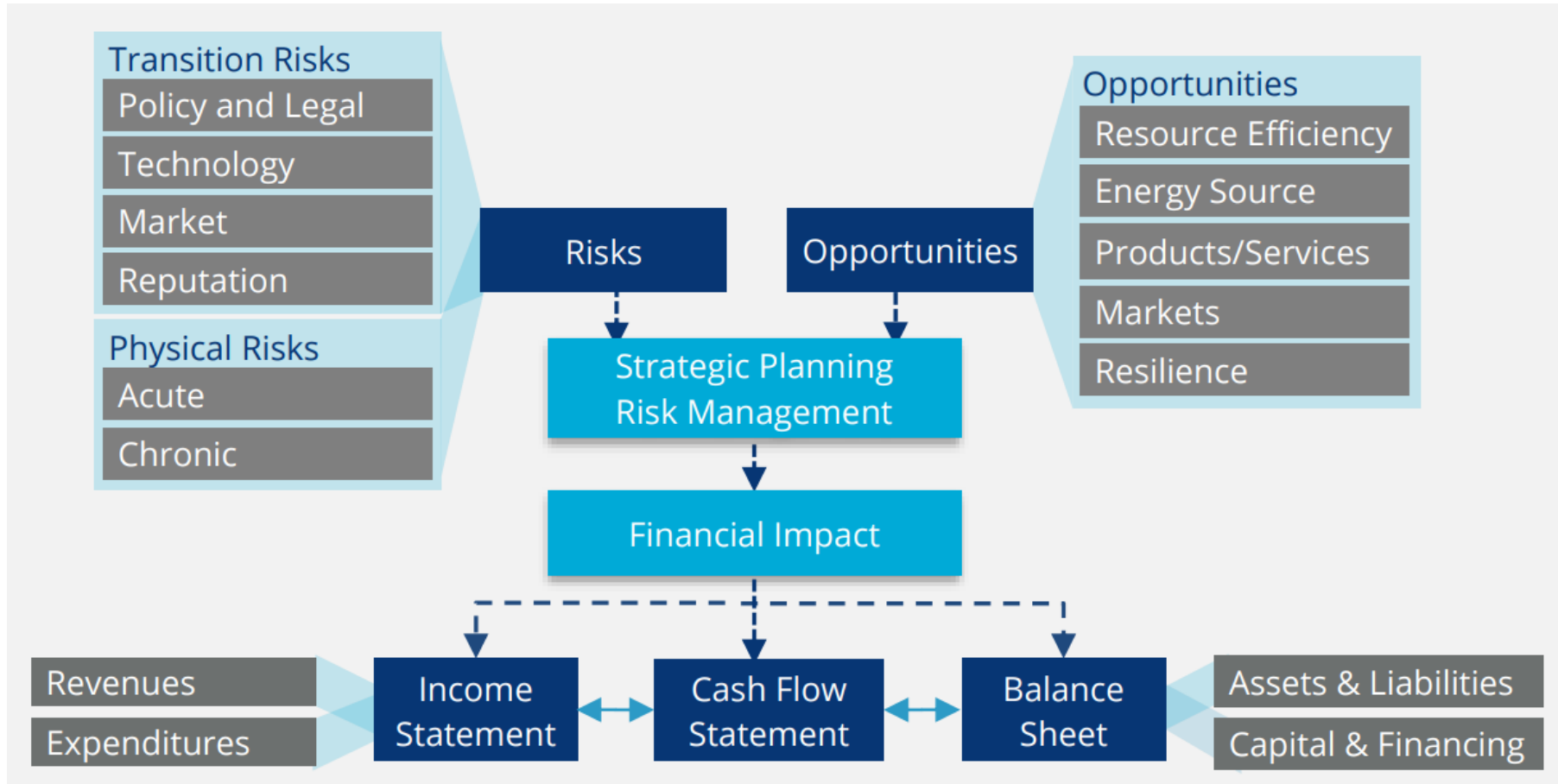
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Agenda

1. Transition Risk and Physical Risk
2. Impacts of Climate Change on Financial and Non-financial Institutions
3. Federal Reserve Pilot Climate Scenario Analysis (CSA) Exercise
4. Preparing for Future Regulatory Exercises Across Jurisdictions

Transition and Physical Risks

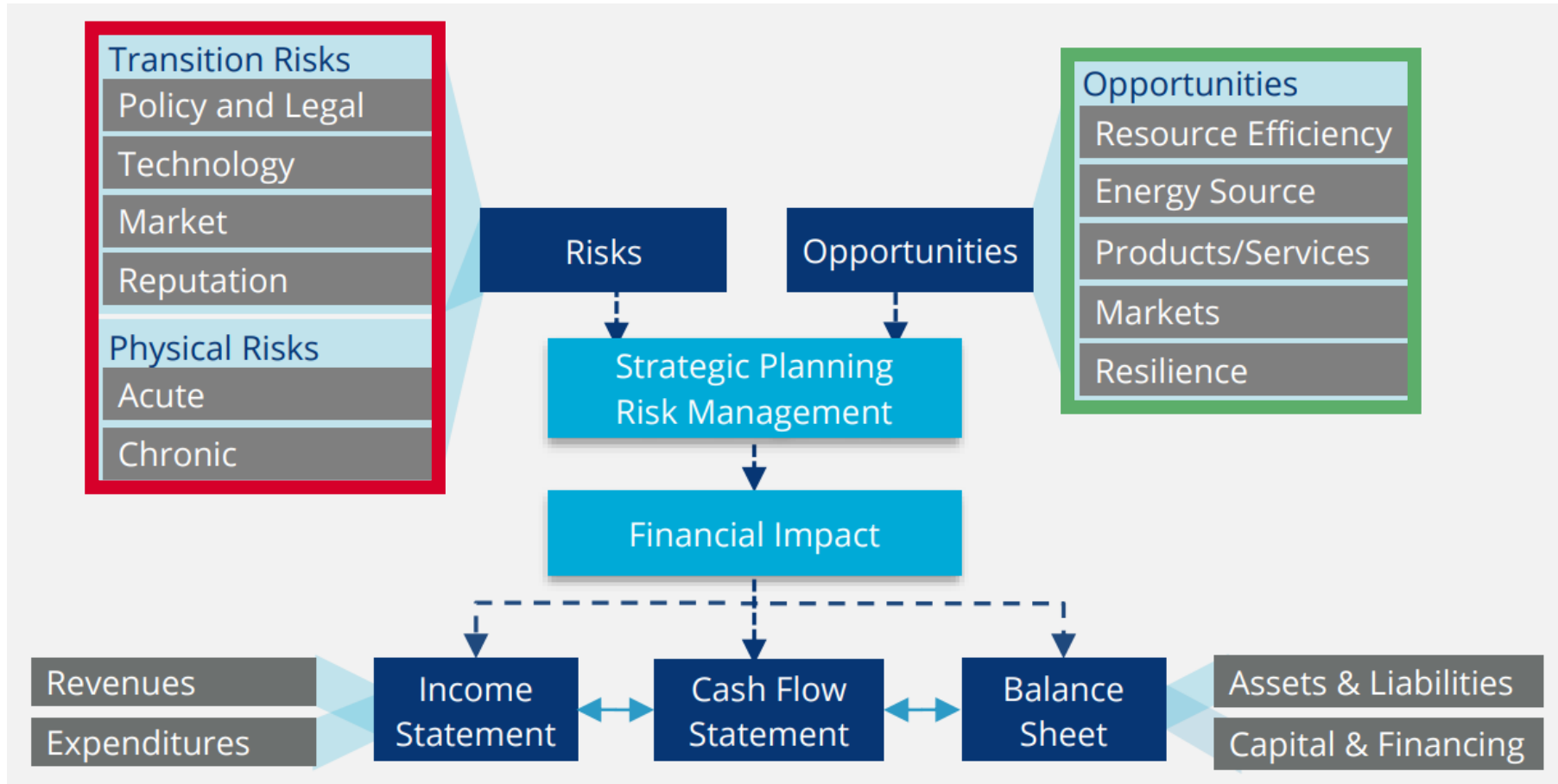
1. Risks related to the *transition* to a lower-carbon economy
2. Risks related to the *physical* impacts of climate change



Source: [Recommendations of the Task Force on Climate-related Financial Disclosures](#)

Transition and Physical Risks

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Transition and Physical Risks

Transition Risks

Questions to Consider in the context of your portfolio

Policy and Legal

How will operating costs change if taxes on GHG emissions are enacted?

Technology

Will technology advancements due to climate change make existing products/services obsolete?

Market

How will changes due to climate change affect supply and demand for certain products/services?

Reputation

Will changes in consumer preference cause changes in underlying assets/reserves of companies?

Physical Risks

Acute

How will climate change affect the severity of extreme weather events?

Chronic

How will rising temperatures and sea levels impact the assets of a company?

Source: [Recommendations of the Task Force on Climate-related Financial Disclosures](#)

Transition and Physical Risks

An **ETS** – sometimes referred to as a cap-and-trade system – caps the total level of greenhouse gas emissions and allows those industries with low emissions to sell their extra allowances to larger emitters. By creating supply and demand for emissions allowances, an ETS establishes a market price for greenhouse gas emissions. The cap helps ensure that the required emission reductions will take place to keep the emitters (in aggregate) within their pre-allocated carbon budget.

A **carbon tax** directly sets a price on carbon by defining a tax rate on greenhouse gas emissions or – more commonly – on the carbon content of fossil fuels. It is different from an ETS in that the emission reduction outcome of a carbon tax is not pre-defined but the carbon price is.

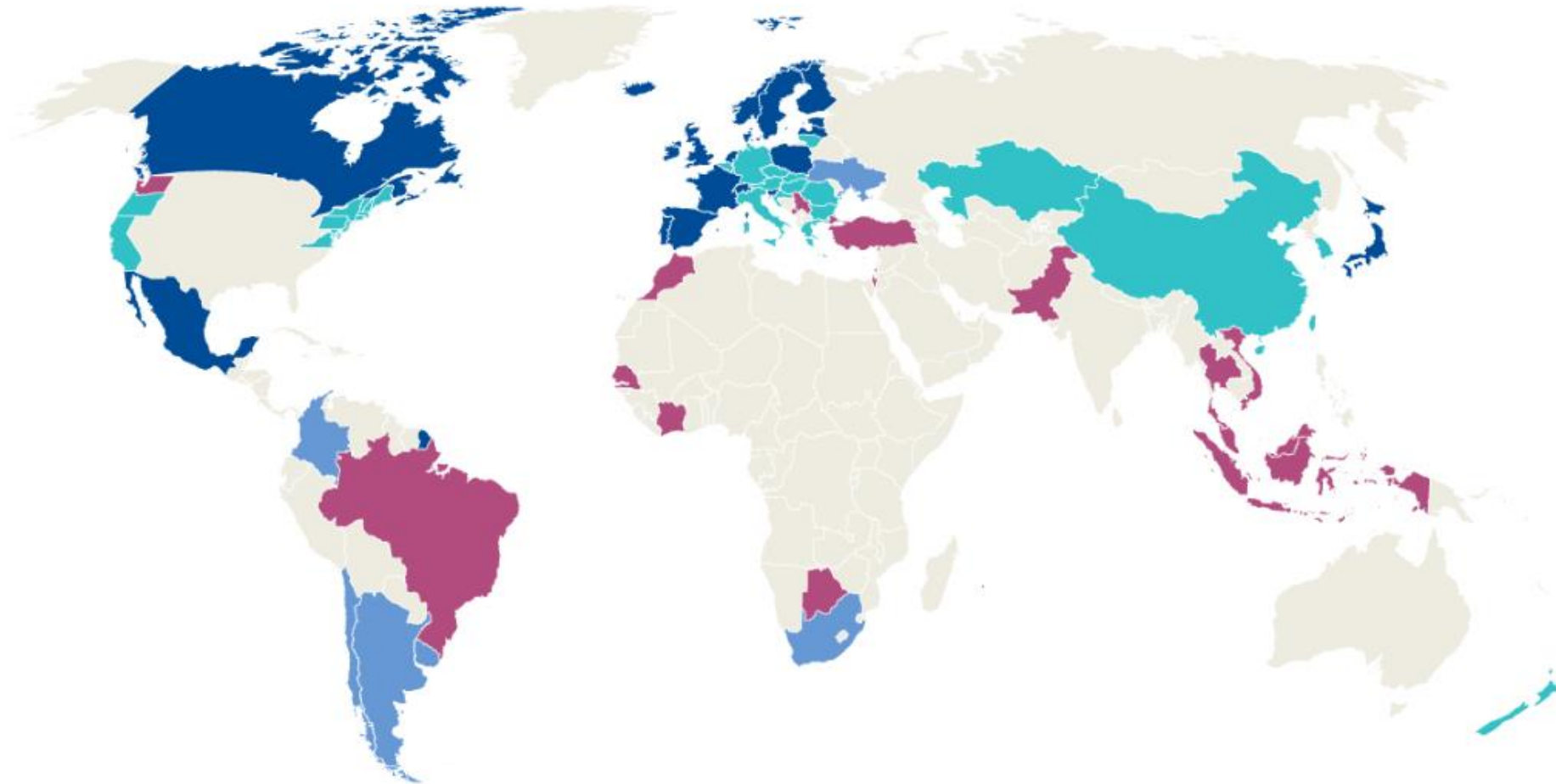
Source: [World Bank Group: State and Trends of Carbon Pricing 2023](#)

Under consideration
or planned

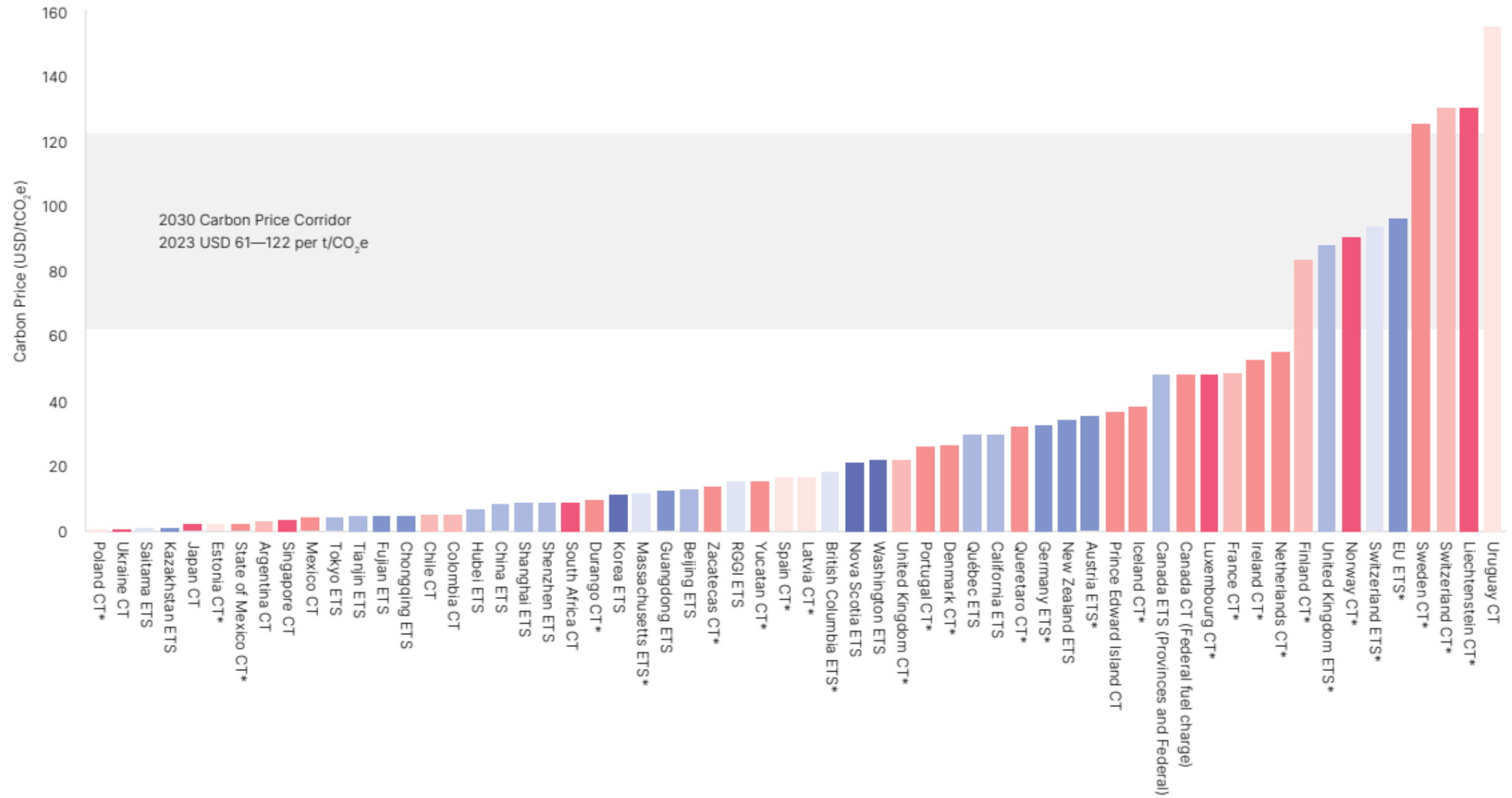
Carbon tax

Emissions trading
scheme (ETS)

Carbon tax
and ETS

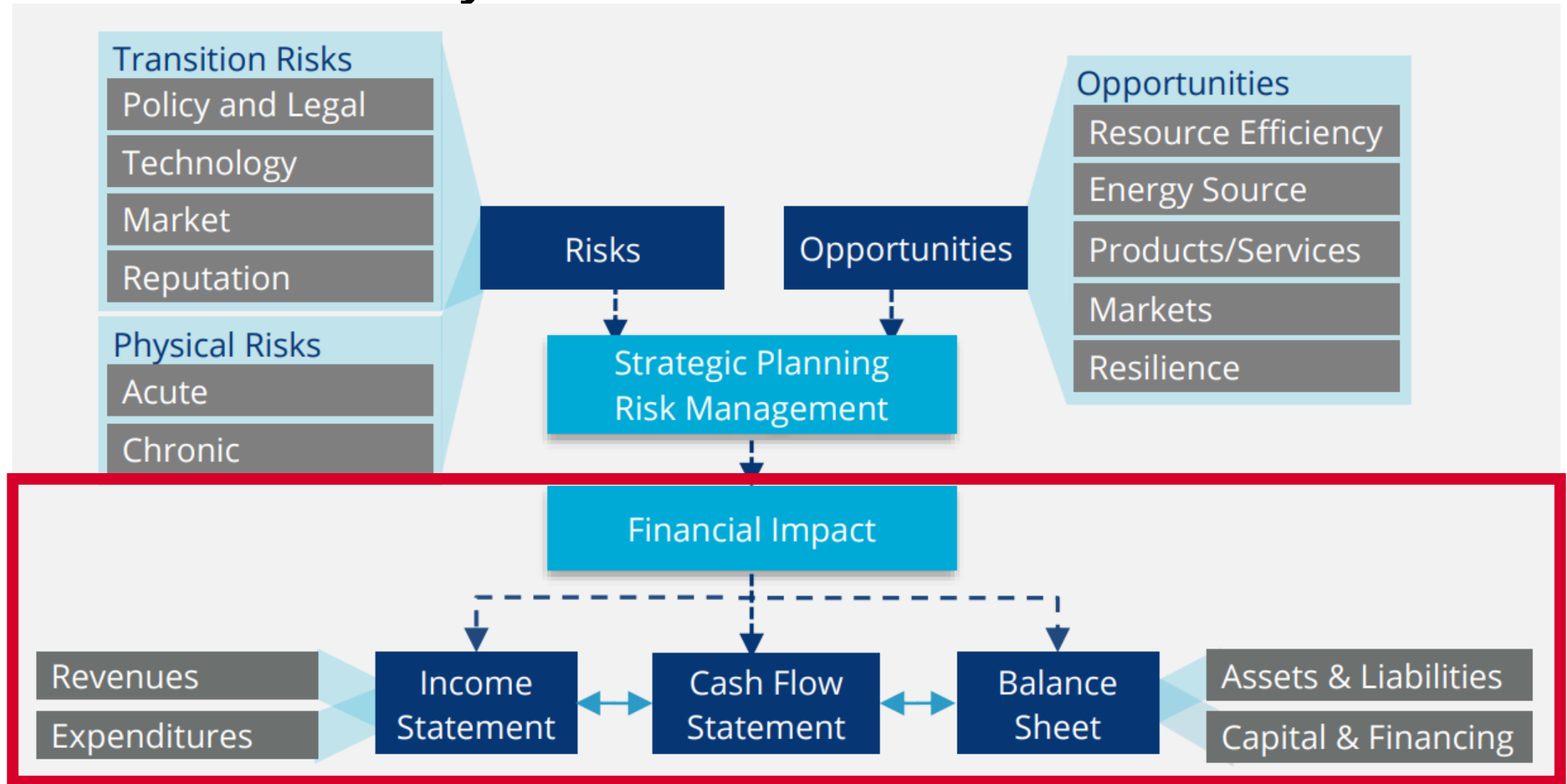


Source: [IMF: More Countries Are Pricing Carbon, but Emissions Are Still Too Cheap](#)



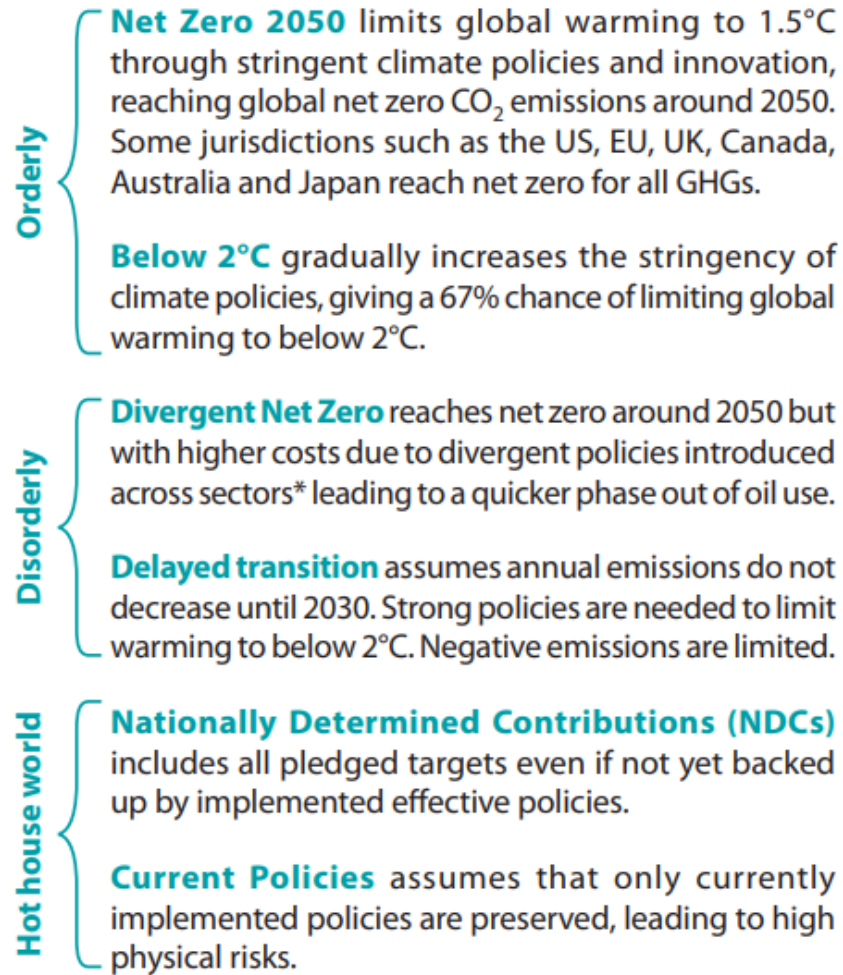
Source: [World Bank Group: State and Trends of Carbon Pricing 2023](#)

Transition and Physical Risks

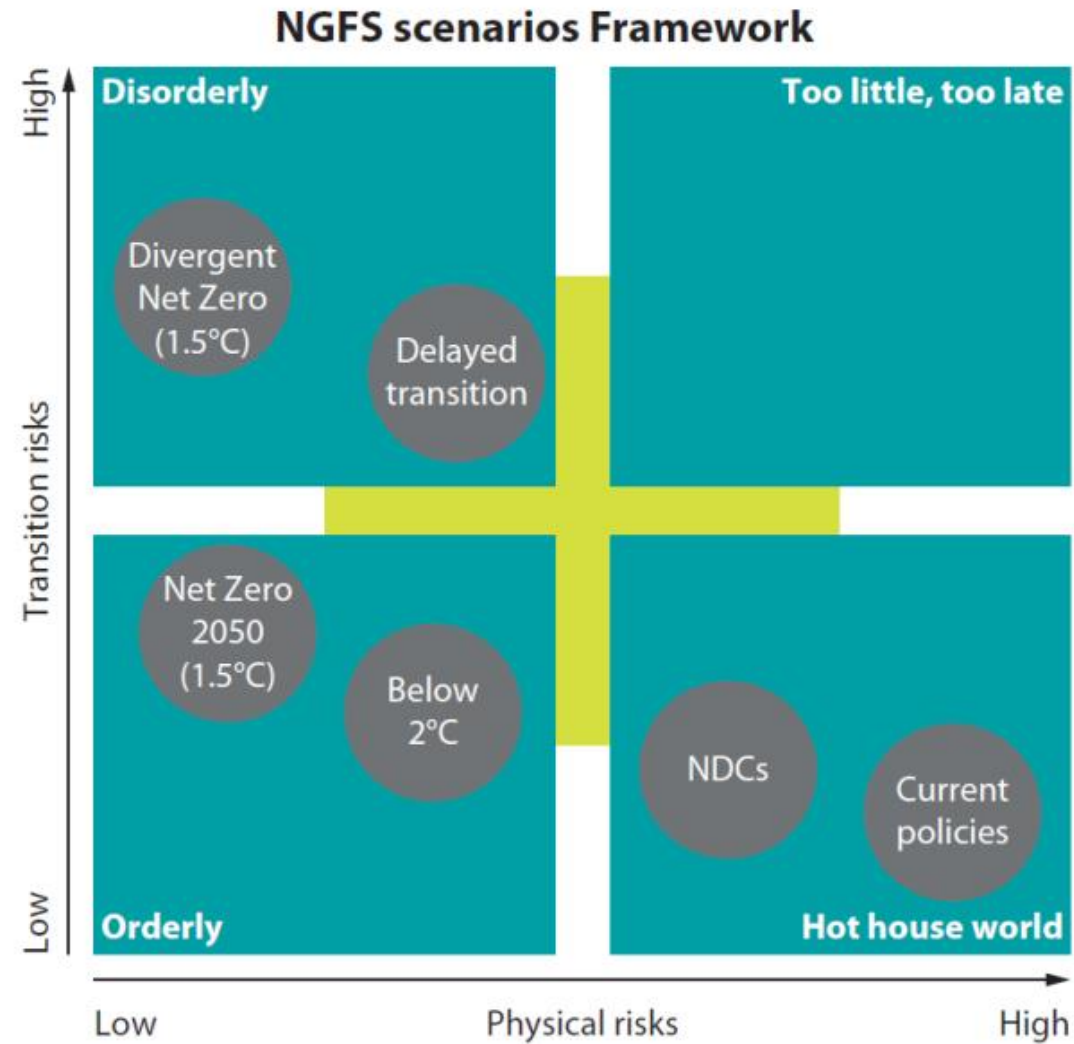


Source: [Recommendations of the Task Force on Climate-related Financial Disclosures](#)

Assessing the impact of Transition Risk and Physical Risk

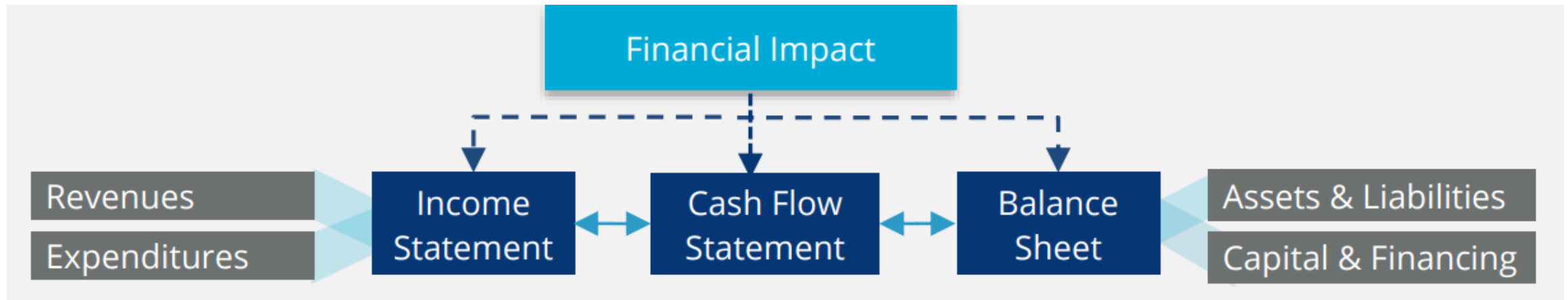


* Therefore, carbon prices vary across sectors.



Source: [NGFS Scenarios for central banks and supervisors](#)

Transition Risk Assessment: Fed Pilot Study



Scenario Narratives

For the transition risk module, the Federal Reserve has selected two scenarios from the Phase III vintage of climate scenarios from NGFS: Current Policies and Net Zero 2050.¹⁶ The scenarios posit different policy designs, ambition levels, and patterns of technological change. The NGFS produces macroeconomic, financial, and transition variables consistent with each scenario narrative. These variables are available in the NGFS Scenarios Database hosted by the International Institute for Applied Systems Analysis (IIASA).¹⁷

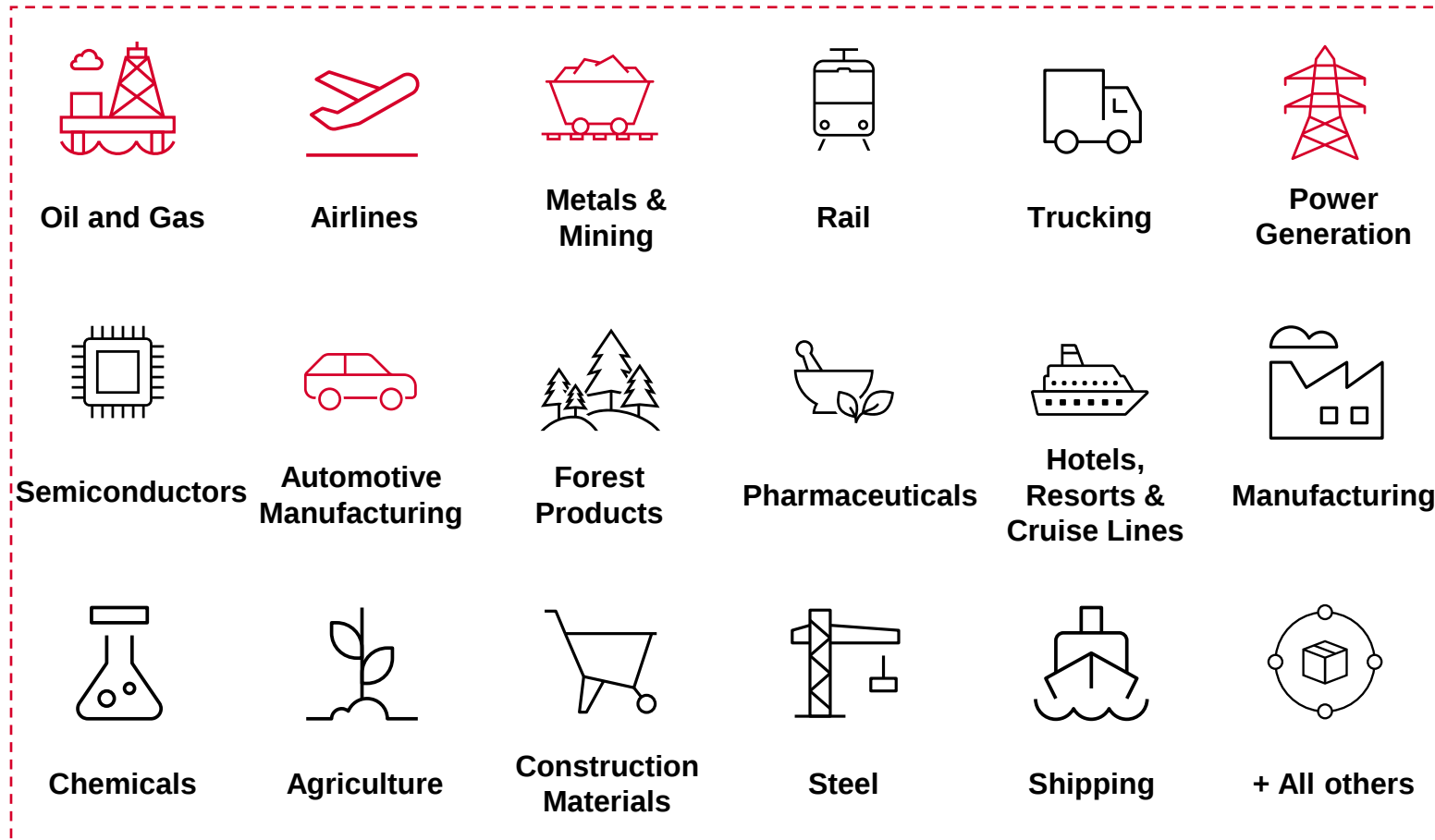
The NGFS scenarios represent different levels of physical and transition risk. For this module of the pilot exercise, participants should use NGFS variable paths that only capture transition risks. Participants should consider physical risks separately in the physical risk module of the exercise.

Current Policies assumes that only currently implemented policies are preserved, leading to high physical risks.

Net Zero 2050 limits global warming to 1.5°C through stringent climate policies and innovation, reaching global net zero CO₂ emissions around 2050. Some jurisdictions such as the US, EU, UK, Canada, Australia and Japan reach net zero for all GHGs.

Source: [Pilot Climate Scenario Analysis Exercise: Participant Instructions](#); [NGFS Scenarios for central banks and supervisors](#)

Transition Risk Assessment: Fed Pilot Study



Depending on the characteristics of the sector and availability of information, different approaches can be applied:

- **Product-specific:** typically suited for high-emitting sectors (e.g., Oil & Gas, Airlines, Metals & Mining, Power Generation, etc.). This is advisable when data available from scenarios and from teams can be modelled out from a product level.
- **Emissions-based:** relies on company-specific **emissions**, industry-specific **elasticities**, and scenario-dependent **emission pathways**
- **A top-down approach** which enables extrapolation from the population of **bottom-up results** to the remainder of the portfolios where information is unavailable

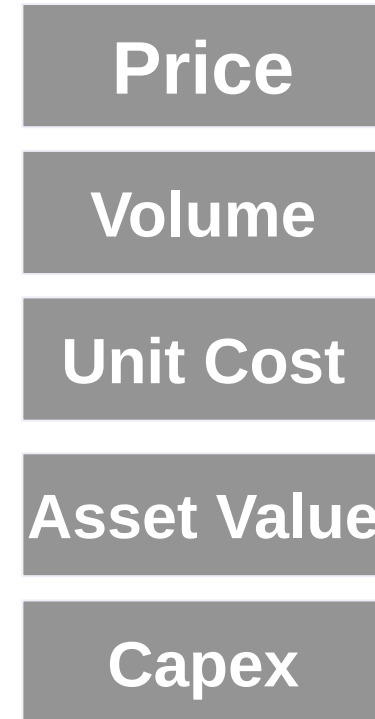
Source: S&P Global Market Intelligence; Oliver Wyman

Transition Risk Assessment: Power Generation

TCFD

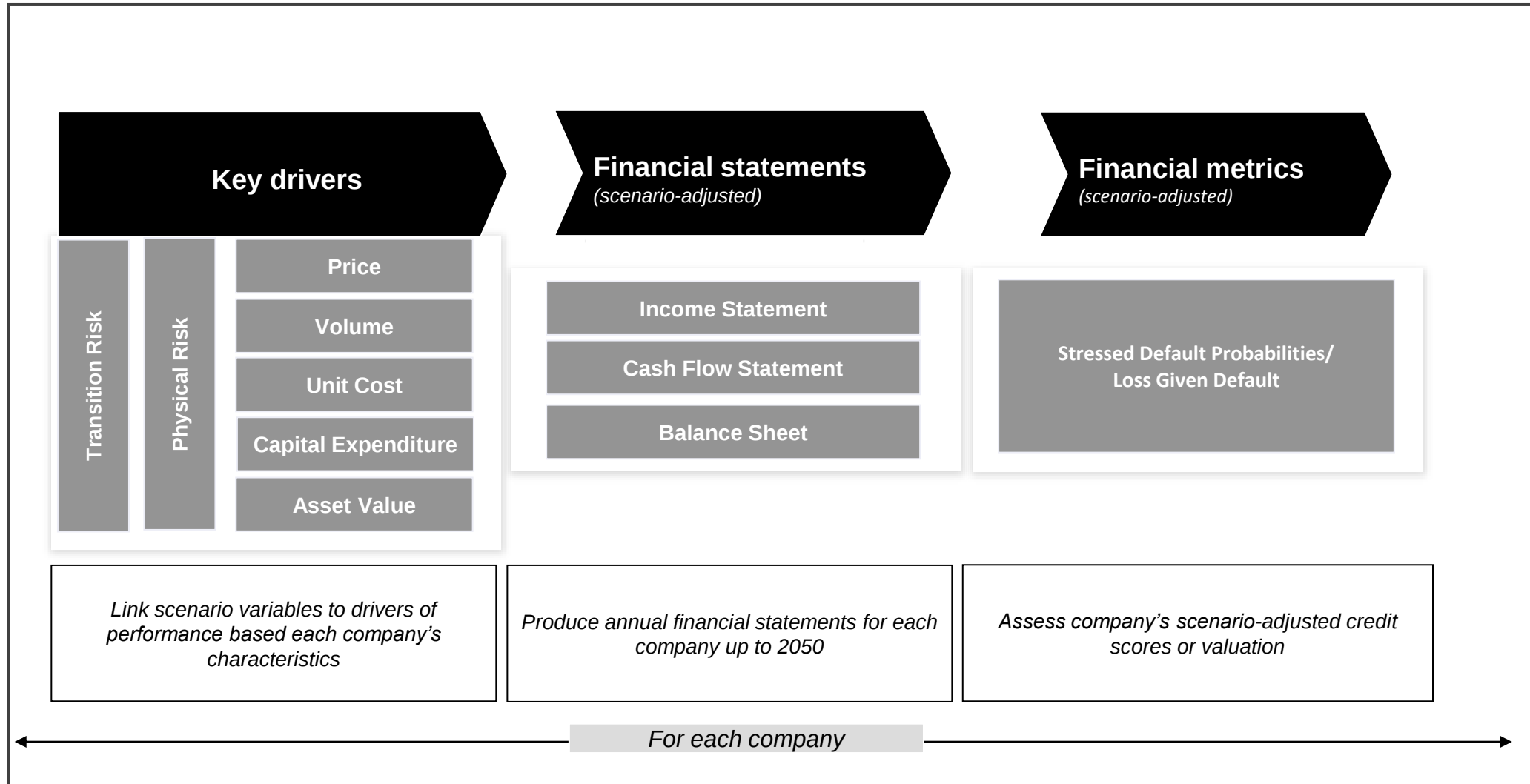


Practical Application



Source: S&P Global Market Intelligence; Oliver Wyman

Transition Risk Assessment: Power Generation



Source: S&P Global Market Intelligence; Oliver Wyman

Transition Risk: Power Generation Example

	Long Name
Model	REMIND-MagPIE 3.0-4.4
Scenario	Current Policies
Region	World
World region (used if missing)	World

Variable name	Unit	2015	2020	2025	2030	2035	2040	2045	2050
Price									
Price Carbon	US\$2010/t CO2	2	10	6	6	6	6	6	6
Price Final Energy Residential and Commercial Residential Electricity Index	Index (2020 = 1)	1.3	1	1	2	2	2	2	2
Price Final Energy Residential and Commercial Residential Gases Natural Gas Index	Index (2020 = 1)	1.0	1	1	1	1	1	1	1
Generation									
Secondary Energy Electricity	EJ/yr	83.7	92.1	105.0	124.2	145.4	162.6	176.6	190.1
Secondary Energy Electricity Biomass	EJ/yr	1.6	2.1	2.5	3.0	3.3	3.3	3.3	3.2
Capacity									
Capacity Electricity	GW	5,845	6,736	8,247	10,861	13,838	16,466	18,744	20,903
Capacity Electricity Biomass	GW	82.6	102.6	122.8	143.9	148.3	138.0	120.9	102.0
Consumption									
Final Energy Electricity	EJ/yr	69.2	77.3	89.5	107.3	127.1	143.8	158.0	172.3
Final Energy Industry Electricity	EJ/yr	29.8	28.6	31.8	36.7	42.0	46.9	52.0	56.2
Capital Costs									
Capital Cost Electricity Biomass w/ CCS	US\$2010/kW	7,891	6,076	5,067	4,059	3,386	3,389	3,389	3,390
Capital Cost Electricity Biomass w/o CCS	US\$2010/kW	4,018	3,917	3,910	3,882	3,828	3,756	3,679	3,605
Capital Cost Electricity Coal w/ CCS	US\$2010/kW	5,992	5,552	5,326	5,217	4,954	4,670	4,442	4,213
Capital Cost Electricity Coal w/o CCS	US\$2010/kW	2,754	2,766	2,772	2,771	2,773	2,776	2,779	2,776
Capital Cost Electricity Gas w/ CCS	US\$2010/kW	2,883	2,788	2,564	2,415	2,275	2,134	2,013	1,894

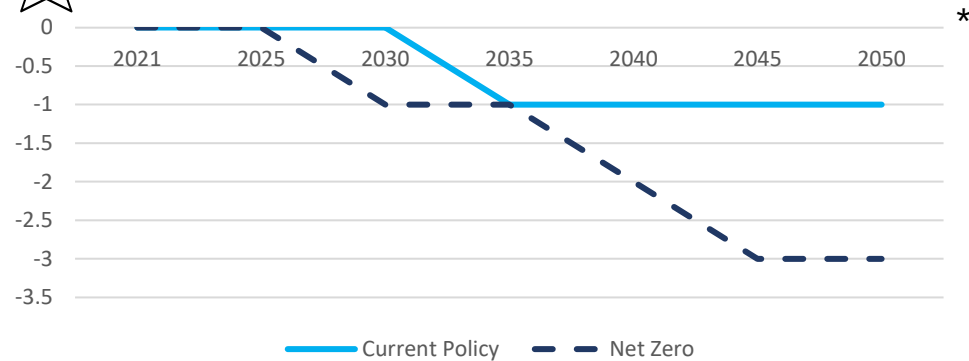
NGFS Scenarios for central banks and supervisors; S&P Global Market Intelligence; Oliver Wyman

Driver	Expected scenario impact	Approach
Price	- Electricity prices initially rise as carbon taxes increase cost of fossil fuel generation - In later years, shift towards low-marginal cost renewables puts pressure on prices	<i>Apply projected change in electricity prices to company's average price</i>
Volume	- Volume evolves following the company's transition plans and scenario variables Market shift towards renewables puts pressure on firms to retire fossil-fuelled plants in favor of renewable capacity	<i>Baseline capacity per fuel source from the company's publicly available reports</i> <i>Projection of energy mix based on the company's commitments and scenario evolution</i>
Unit cost	Fossil plants' production costs (variable O&M) increase due to higher carbon or fuel prices, unit costs for renewable plants remain unchanged (no fuel costs, stable O&M costs (per 1 unit of generation) and no carbon cost)	<i>Increase firm's unit costs based on the carbon intensity of their generation and changes in fuel prices (application in carbon tax scenario depends on whether tax is applied to consumer or producer)</i>
Capex	- New build capex to rise to reach the new capacity defined by stated commitments - In some scenarios, fossil generation persists through CCS installation and associated retrofit capex	<i>Apply overnight capex assumptions to projected installation needs</i> <i>Install CCS at market rate</i>
Asset value	Some fossil generator assets may become underutilized ("stranded") and decommissioned before their planned retirement date or end of useful life	<i>Apply impairment charge based on remaining asset balances (if any) for plants decommissioned early</i>

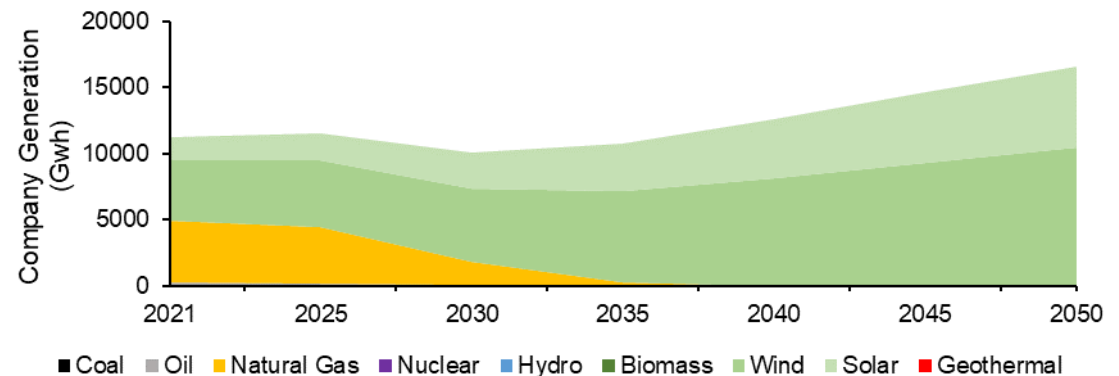
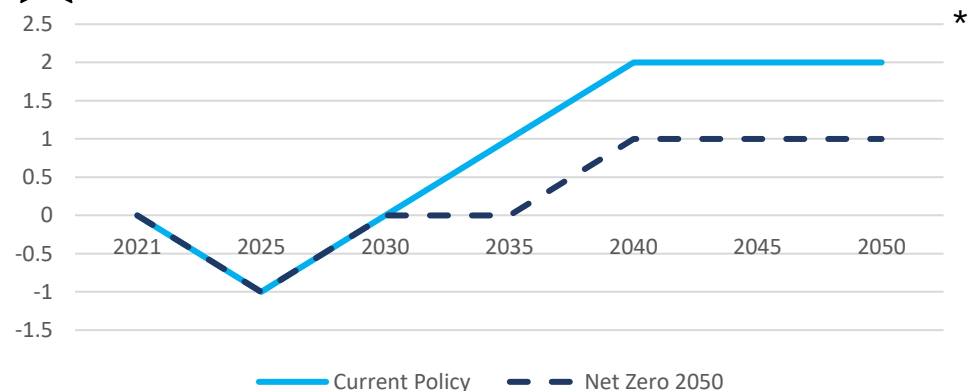
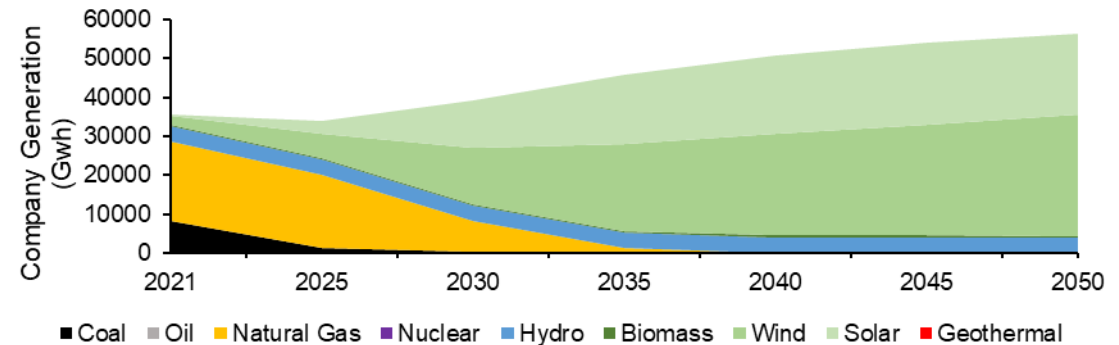
Source: S&P Global Market Intelligence; Oliver Wyman

Transition Risk: Power Generation Example

Credit score notch change vs 2021
in Current Policies and Net Zero 2050



Expected change in generation profile under
Net Zero 2050

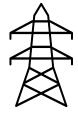


Source: S&P Global Market Intelligence; Oliver Wyman

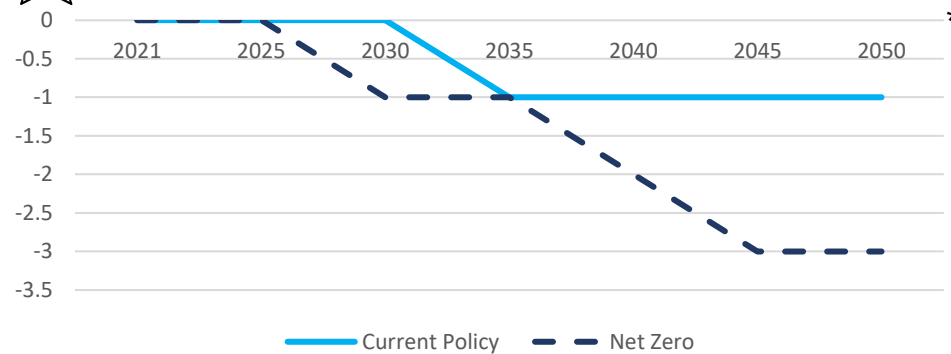
Transition Risk: Power Generation Example

Credit score notch change vs 2021
in Current Policies and Net Zero 2050

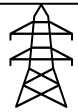
Comments



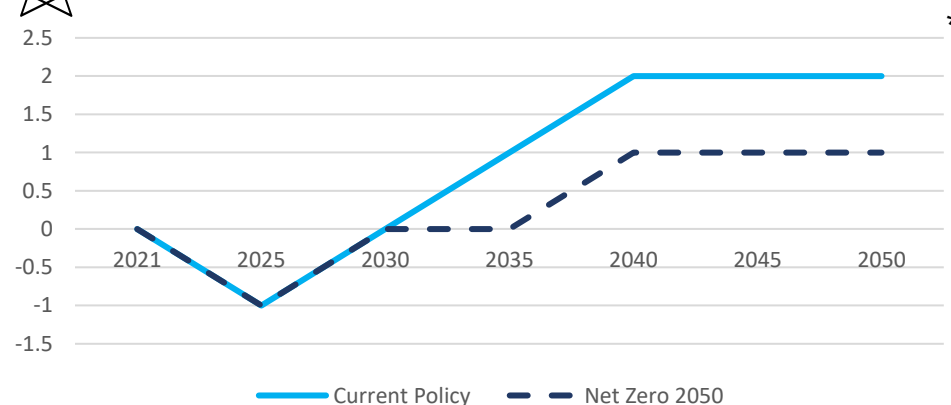
Company A: US unregulated utility company with natural gas and coal generation



- [Regulated Status]: Unregulated utility companies are expected to have lower pass-through rates than regulated counterparts
- [Volume, Leverage, Capex]: Under current policy, company A reduces generation through coal and natural gas sources gradually. This gradual process alongside building out renewable capacity allows renewable assets to come online and offset the reduction in generation coming from coal
- [Volume, Leverage, Capex]: Under higher levels of carbon taxes in Net Zero 2050, Company A invests more heavily in renewable capacity and generation. This more aggressive investment requires accelerated ramp-ups in capex and leverage (to fund capex)
- [Asset Value]: Larger impairments through 2040 due to stranded assets



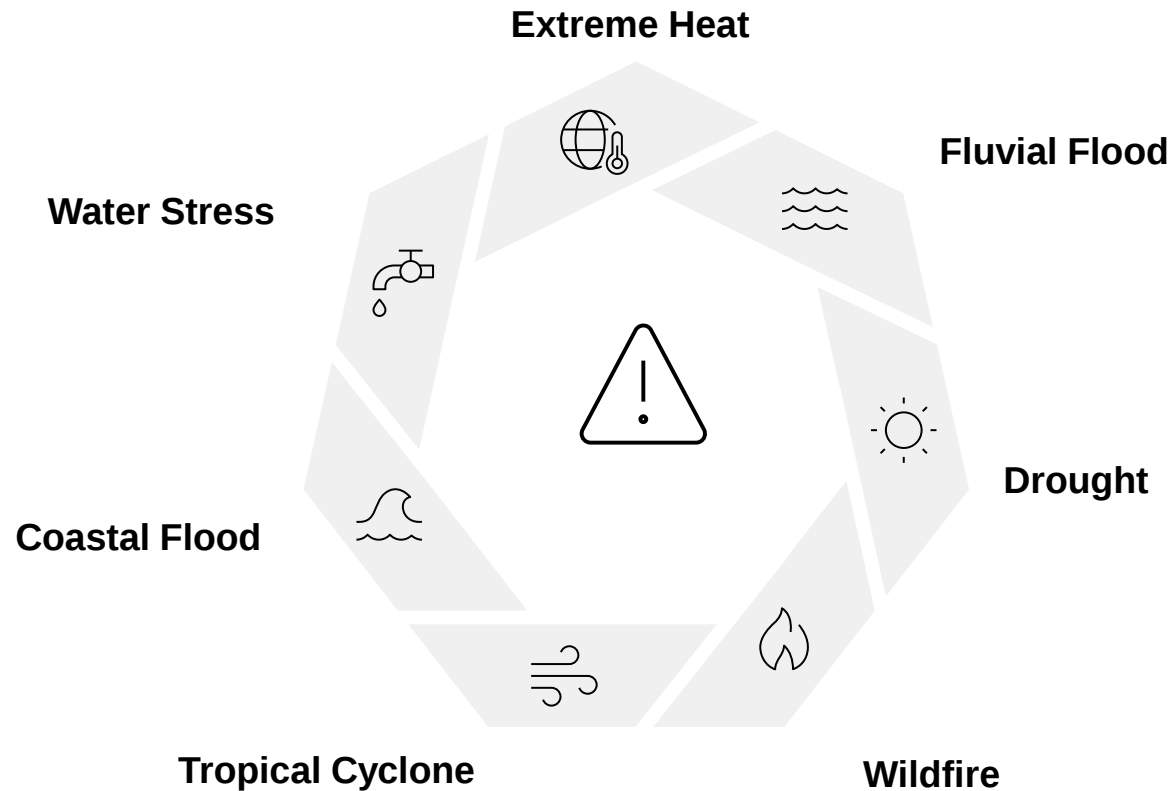
Company B: US unregulated utility company with natural gas, wind, and solar generation



- [Regulated Status]: Unregulated utility companies are expected to have lower pass-through rates than regulated counterparts
- [Volume, Leverage, Capex]: Under current policy, company B instead continues to invest heavily in renewable power generation. Initially, this investment causes slight credit deterioration in the 2025 period. However, low emissions combined with increasing generation lead to credit improvement through the end of the scenario as the firm is able to build substantial renewable capacity/generation profile.
- [Asset Value]: Due to a heavy focus on renewable power generation, no impairments are expected

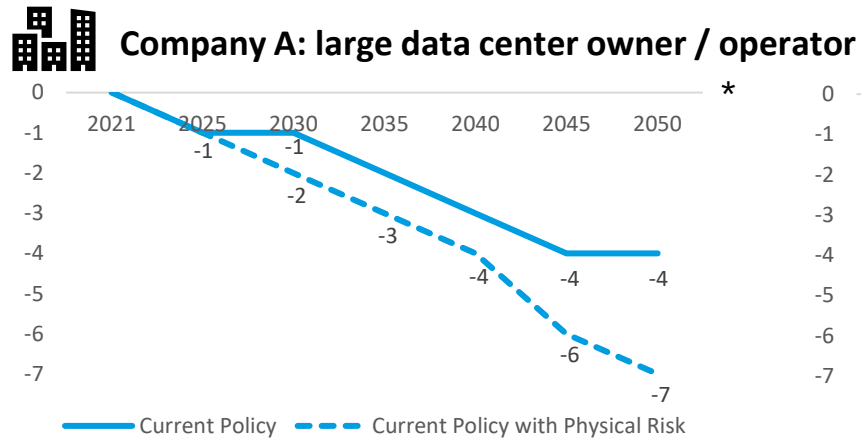
Source: S&P Global Market Intelligence; Oliver Wyman

Physical Risk: Oil & Gas vs. Data Center Operator

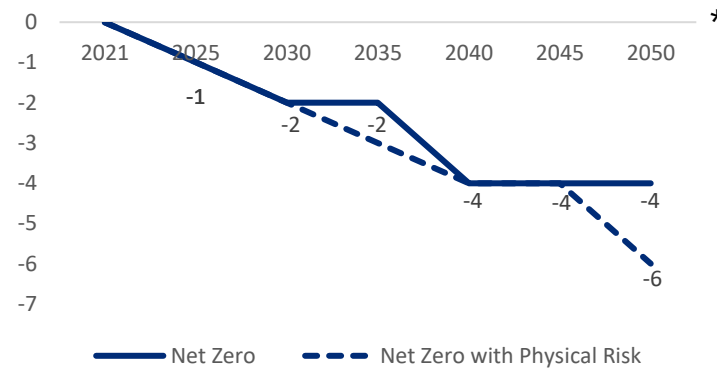


Physical Risk: Oil & Gas vs. Data Center Operator

Credit score notch change vs 2021
in Current Policies*



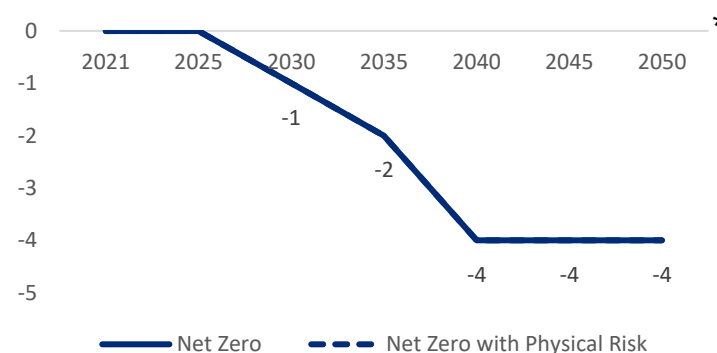
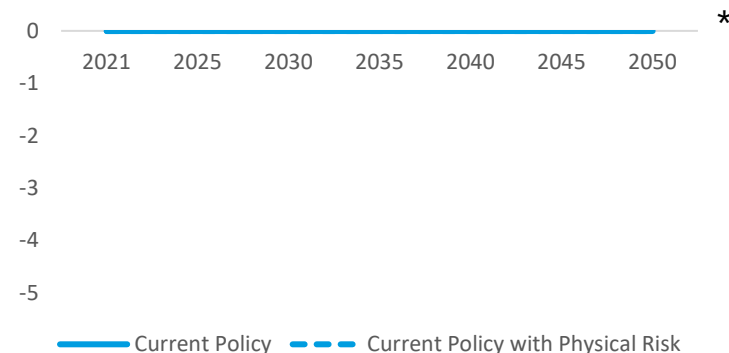
Credit score notch change vs 2021
in Net Zero 2050*



Comments

- [Asset Value] Most of the company's assets are data center buildings, the large amount of net PP&E comparing to revenue and total asset leads to higher overall exposure to physical risk
- [Asset Type] Data centers have high exposure to physical risk from extreme heat since they tend to have higher HVAC (Heating, Ventilation, and Air Conditioning) ratio comparing to other asset types, given the cooling requirement for safe operating temperature
- [Industry] Since extreme heat has continues impact to data center operation (i.e., high costs such as electricity for cooling are spent on a regular basis), the incremental impact increases over time and has larger effect in the Current Policies scenario

Company B: large oil and gas producer



- [Asset Type, Asset Location] Most of the company's PP&E are onshore and offshore oil and gas platforms, which have limited exposure to various hazards include wildfire, floods, drought, and extreme heat
- [Industry] Although oil and gas platforms tend to have large exposure to tropical cyclones, tropical cyclone events are projected to be relatively stable over time with no significant incremental impact. Unlike extreme heat which has continues impact, tropical cyclones causes temporary business interruption/repair costs that even out to smaller impact on average in each year. Thus, the company has no incremental downgrade compared to the "transition risk only" case

Source :S&P Global Market Intelligence; Oliver Wyman

Regulatory Landscape in North America

REGION	REGULATOR	CLIMATE RISK ASSESSMENT MEASURES
United States	Federal Reserve Board	The US Federal Reserve has conducted its first climate scenario with the six largest banks. Banks submitted the results July 31. The Fed will publish the aggregated data by end of year. S&P has worked with 2 of the Banks that are part of this exercise.
Canada	Bank of Canada/Office of the Superintendent of Financial Institutions (OSFI)	OFSI published a climate guideline for banks and insurers, B-15: Climate Risk Management, with OFSI's expectations on risk management and climate-related risks. Mandatory exercises for major institutions begin in 2024, followed by smaller entities the next year. S&P is working with 2 of these institutions.
California Bills	California State	- The California State passed the Climate Corporate Data Accountability Act, which would require all companies that have at least USD 1 billion in revenue to report both their direct and indirect GHG emissions. - California introduced a climate risk disclosure bill that will require companies (any entity formed in the state and any entity formed in another state that does business in California with annual revenues > \$500M) to disclose climate-related financial risk reports annually. The bill is now with a policy committee and the first round of disclosures will be on Dec 2024.

Lessons Learned from the Federal Reserve Pilot Climate Scenario Analysis (CSA) Exercise



Scope: Largest 6 nation banks.

Timeline for Submissions:

- Banks submitted the results July 31.
- The Fed will publish the aggregated data by end of year.

Timeframe: 10 Years (2023 – 2032)

Climate Risks: Transition Risk only.

Company Pledges/Transition Plans: Incorporate obligors' transition capacity into their measurement approaches should document the source and assumptions related to an obligor's transition capacity, demonstrate a robust process to review and evaluate the credibility of those assumptions, and identify and quantify the effect of those assumptions

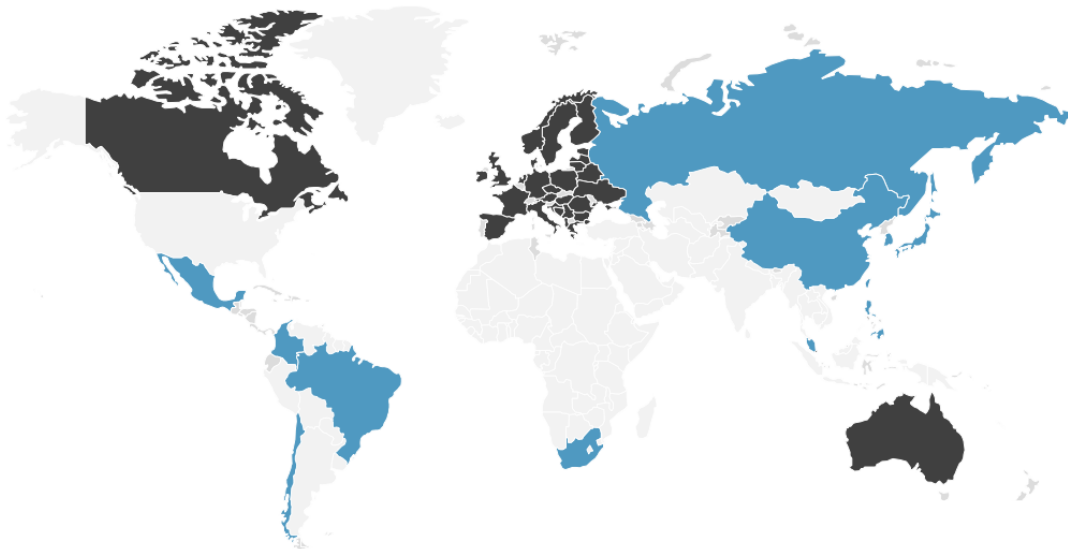
Climate Scenarios:

NGFS 3rd Vintage: Current Policies and Net Zero 2050

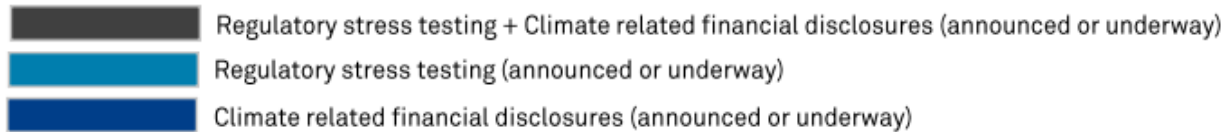
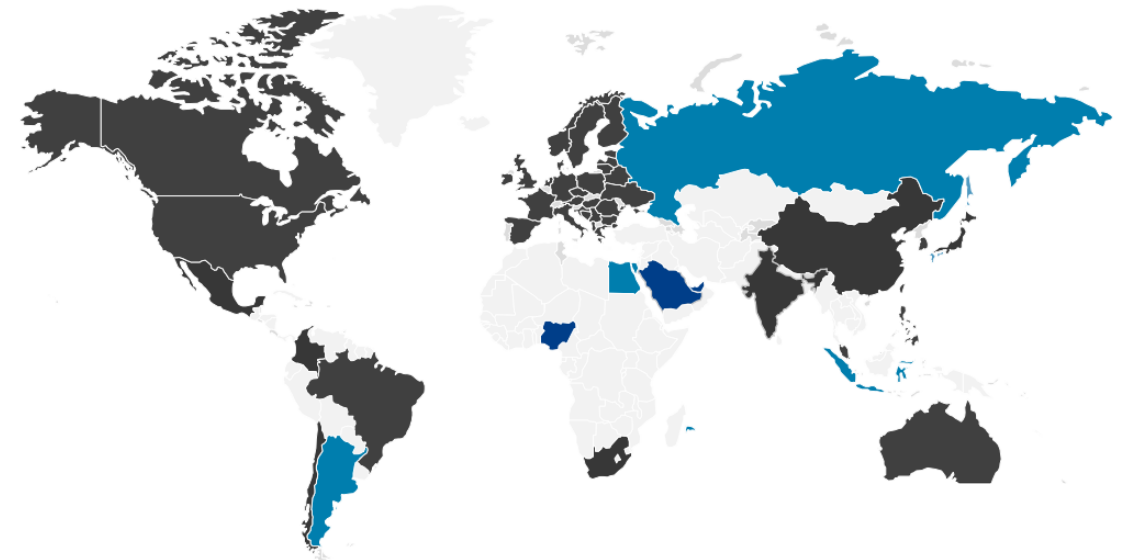
Macroeconomic Variables from the National Institute of Global Econometric Model (NiGEM)

Anticipating the Unknown: Preparing for Future Regulatory Exercises across Jurisdictions

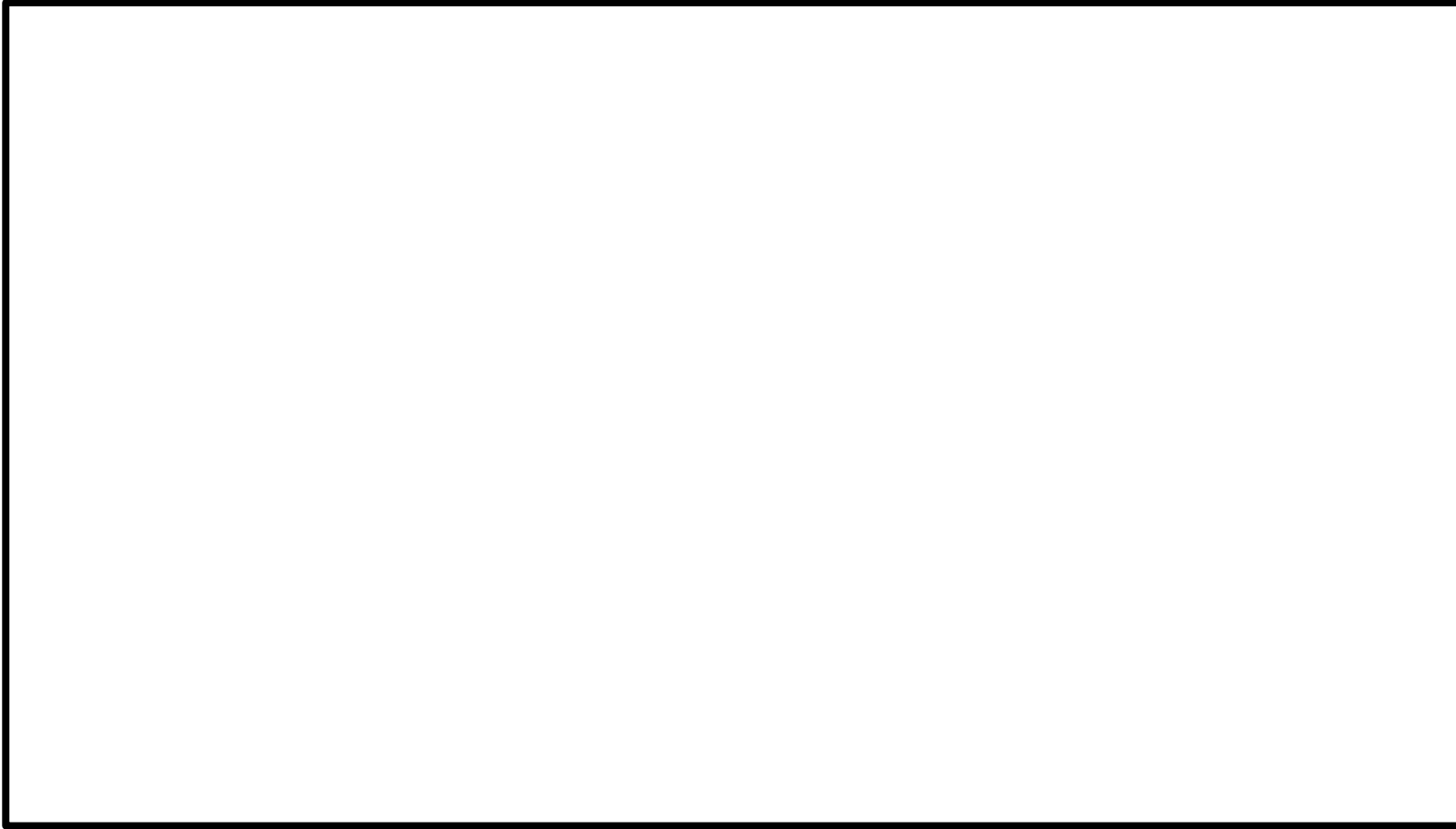
A year ago



Today



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