



MODERN METHODOLOGICAL
APPROACHES. CBES AND ECB
EXPERIENCE

CLIMATE RISK STRESS TESTS

ESG IS A PRIORITY FOR INVESTORS, BUSINESSES, GOVERNMENTS AND SOCIETY, WITH IMMEDIATE FOCUS ON CLIMATE RISK

The New York Times

DealBook / Business & Policy

DEALBOOK

BlackRock C.E.O. Larry Fink: Climate Crisis Will Reshape Finance

In his influential annual letter to chief executives, Mr. Fink said his firm would avoid investments in companies that “present a high sustainability-related risk.”

Aviva Investors demands greater climate change disclosure

UK fund house to vote against companies that do not reveal their global warming risks

Monday 10 June 2018

FRANKFURT, GERMANY

COMPANIES

Energy groups to be sued over climate change

Activists hope oil and gas producers will be forced to make settlements similar to those of tobacco industry

Weather warning

ill cases,” said the firm. “What is new is our ability to quantify the relationship between emissions and climate change-related impacts, the way food does – and to attribute the emissions to particular companies.”

Progress so far has been mixed: the question of whether the climate should be based on state or federal courts has swung back and forth. The lawsuits brought by San Francisco, Oakland and New York City are under way.

The Economist Today Weekly edition Menu

Heathrow third runway ruled illegal over climate change

Appeal court says decision to give go-ahead not consistent with Paris agreement



Eyevine

Asia Jan 2nd 2020 edition >

Australia’s bushfires intensify its debate about climate change

Summer inferno

The government that scrapped a carbon tax has no plans to bring it back

Netherlands climate lawsuit goes to court of appeals

Published on 28/05/2018, 5:02am

Urgenda and 900 citizens successfully sued in 2015 for stronger climate action but the government is challenging the court’s right to rule on policy

The New York Times

States Sue to Block Trump From Weakening Fuel Economy Rules

At stake in the lawsuit is the single biggest effort by the United States to fight the climate crisis.



The Economist Today Weekly edition Menu



Morning Contributor

Leaders May 21st 2020 edition >

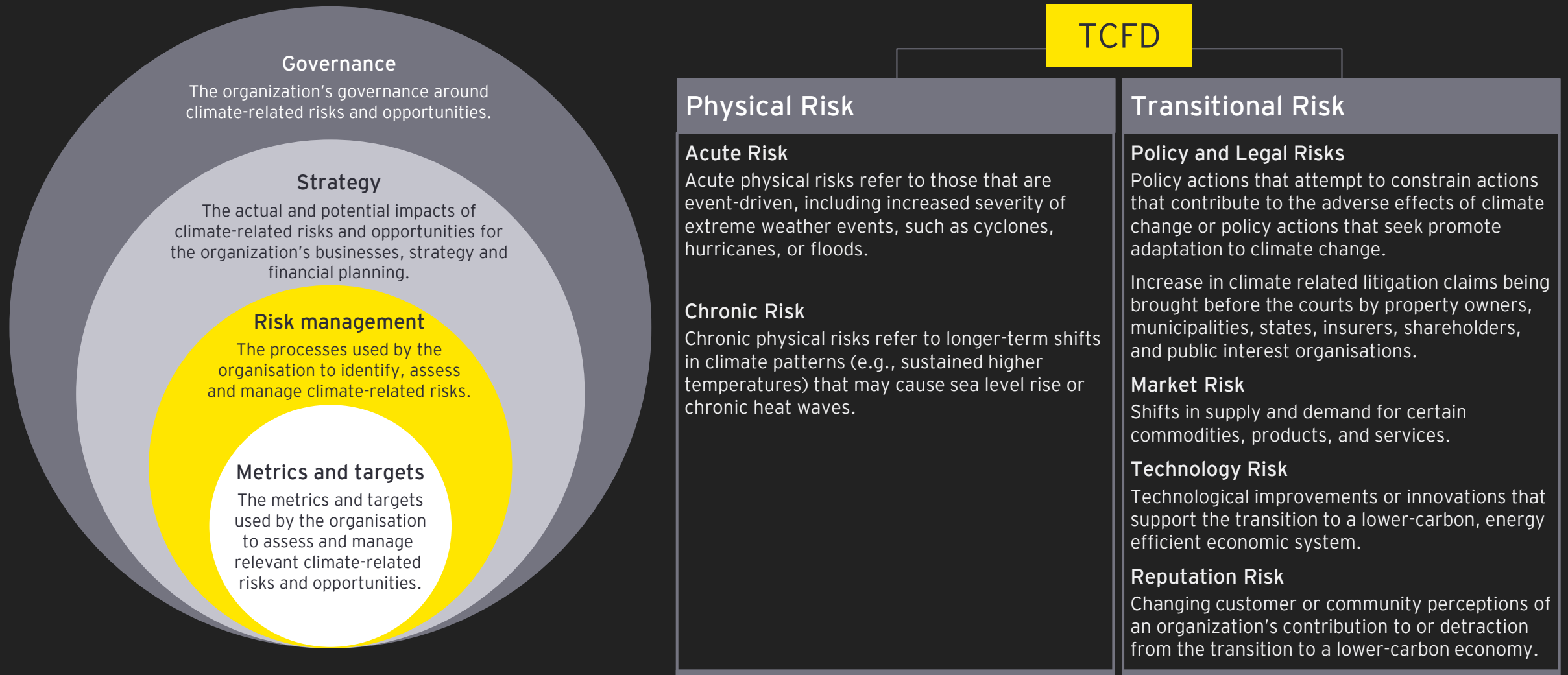
Countries should seize the moment to flatten the climate curve

A new opportunity to tackle climate change

Besieged by the rising tides of climate change, Kiribati buys land in Fiji

Nation finalises purchase of land on Vanua Levu, 2,000km away, but it may be just the first of many seeking refuge

CLIMATE RISKS – A DRIVER FOR CHANGE WITH TCFD AS THE STANDARD



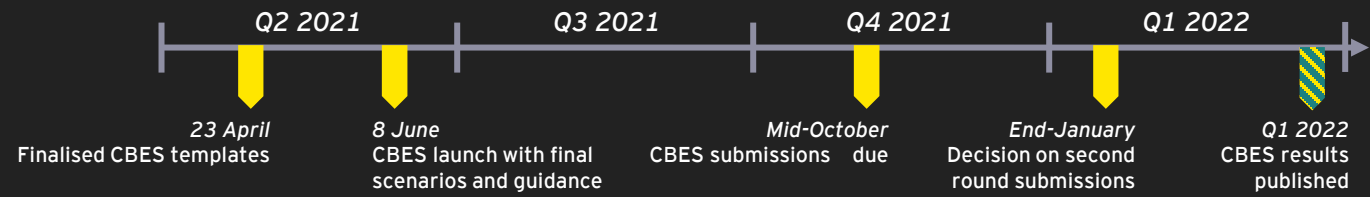
THE BOE'S CLIMATE BIENNIAL EXPLORATORY SCENARIO (CBES) 2021

- ▶ The 2021 biennial exploratory scenario centres on climate change in order to test the resilience of UK banks and insurers against the physical and transition risks brought on by climate change.
- ▶ The exercise is on an invitation basis for major UK banks and insurers, who are required to focus on credit risk and projecting provisions.
- ▶ The objective of this initial CBES exercise is to size the risks presented to the UK financial system and will not be used to test capital adequacy or set capital requirements at this juncture.

CBES introduces:

- 100** Top non-financial corp. exposures analysed at counterparty-level
- 40** Potential new data points per customer for stress testing
- 35** New physical & transition risk variables
- 30** Year time horizon

CBES timeline



3 scenarios



Early Action -
Transition to a carbon-neutral economy starts early, global temperature rise stays below 2°C



Late Action -
Global climate goal met but the transition is delayed and must be more severe to compensate for the late start



No Additional Action -
No policy action beyond that which has already been announced. Global climate goal not met

Physical & Transition Risk



Physical Risk

- ▶ Financial impact of a changing climate, including extreme weather events and gradual changes such as deforestation
- ▶ Examples include damage to property, or reduced productivity due to direct or indirect disruption to supply chains







Transition Risk

- ▶ Financial loss resulting from the process of adjustments towards a more environmentally sustainable economy
- ▶ Examples of how this could be triggered include government policies or changing market sentiment

CLIMATE RISK STRESS TESTS: ECB VS. BOE

- ▶ UK Banks executed the Climate Biennial Exploratory Scenario (CBES) exercise for the Bank of England (BoE) with an initial submission deadline of October 2021
- ▶ Meanwhile, the European Central Bank (ECB) launched its own climate risk stress test for banks to perform in 2022
- ▶ While these exercises both aim to explore impact of climate change on the financial systems of their respective jurisdictions, there are some key differences in their approaches

Component	ECB climate stress test	BoE CBES
 <p>Scenarios</p>	<p>6 scenarios, including 3 long-term scenarios, 1 short term transition risk scenario and 2 short term physical risk scenarios</p>	<p>3 scenarios, all long-term scenarios that cover both transition risk and physical risk</p>
 <p>Risk types</p>	<p>Credit risk projections for all scenarios but also market risk for the short-term transition risk scenario along with separate operational and reputational qualitative questions</p>	<p>Credit risk is the key focus for all 3 scenarios, including projections of provisions</p>
 <p>Balance sheet</p>	<p>Dynamic balance sheet under the 3 long term scenarios, where asset growth and asset reallocation are permitted in line with projected business strategy (other scenarios are static)</p>	<p>Fixed balance sheet assumptions are used, with no nominal growth and portfolio residual maturity remaining constant</p>
	<p>Not all participants will be asked to make projections, but all need to provide emissions for top counterparties and income from high GHG sectors as well as detailed starting point data across all scenarios</p>	<p>All participants are required to provide actuals and projections data - this does not cover counterparty emissions data</p>

CLIMATE STRESS TESTING – PRACTICAL CHALLENGES



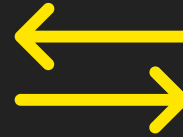
Lack of transparency in vendor models

- ▶ Vendor models offer a quick fix to the climate stress testing – however, a number of banks have experienced issues with vendor models during execution
- ▶ This is due to lack of transparency in the model methodologies, dependence on a third party to produce timely results and limited ability to change assumptions and perform sensitivity testing throughout the scenarios without incurring significant additional expense for “re-running” models



Static balance sheet and management action challenges

- ▶ Due to static balance sheet assumptions and limited recognition of customer adaptation plans by corporate customers, banks see accumulating provisions in vulnerable sectors without a means of response
- ▶ These assumptions make interpretation of results over the long time horizon more challenging, and management actions become the way for banks to address to deteriorating performance, which cannot be reflected in projections templates



Consistency of results across sectors

- ▶ The BoE provided UK GVAs in the final set of variables, which most firms have used to benchmark results across sectors
- ▶ Other scenario components require detailed consistency checks across sectors – for example, carbon price provided by the BoE was not accompanied by passthrough rate or price elasticity assumptions, which therefore require banks to make industry-specific assumptions that need to be consistent across scenarios



Model validation

- ▶ Vendor models and a new class of internally developed climate stress testing models have been challenging for validation teams to tackle
- ▶ The BoE does not expect the same level of validation rigour as with, for example, a regulatory capital model – but this exercise has highlighted a gap in most validation frameworks and team skillsets



Data demands

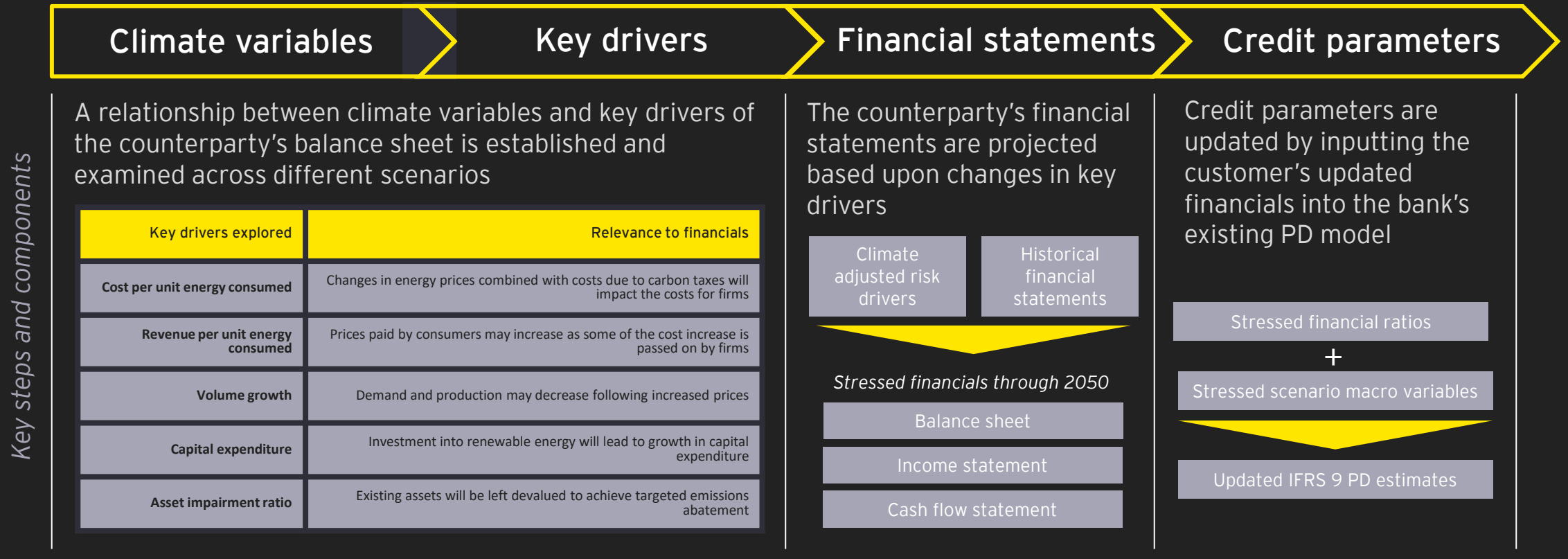
- ▶ All banks undertaking the CBES exercise faced challenges with identifying / sourcing the data needed to run models for transition risk and physical risk

ECB SCENARIO KEY FEATURES

Scenario	Short-term tail risk	Orderly transition	Disorderly scenario	Hot house	Heatwave / drought	Flood
Narrative	<ul style="list-style-type: none"> ▶ Three-year disorderly transition scenario triggered by a sharp increase in the price of carbon emissions 	<ul style="list-style-type: none"> ▶ Orderly transition with a smooth reduction in CO2 emissions to achieve the carbon emission goals by 2050 	<ul style="list-style-type: none"> ▶ CO2 emissions do not decrease quickly enough until 2030, triggering a disorderly transition in the years thereafter to still achieve emission targets by 2050 	<ul style="list-style-type: none"> ▶ CO2 emissions are not reduced and the economy is confronted with the materialisation of increasing physical risks 	<ul style="list-style-type: none"> ▶ EU is hit by a heatwave in 2022 which hampers economic activity and results in output losses for vulnerable industries 	<ul style="list-style-type: none"> ▶ EU is hit by a severe flood which causes damage in a certain fraction of the areas at risk ▶ ECB will provide banks with a flood risk map
Time horizon	2022 - 2024	2022 - 2050			2022	
Projection frequency	Annual	Ten-year intervals (2030, 2040 and 2050)			One-year	
Balance sheet treatment	<u>Static</u> : maturing loans replaced with loans and collateral of similar quality	<u>Dynamic</u> : banks can adjust their balance sheets to changing circumstances in alignment with internal projected business strategy at least for the horizon covered by their business strategy			<u>Static</u> : maturing loans replaced with loans and collateral of similar quality	

CLIMATE RISKS STRESS-TEST DESIGN

The approach integrates climate risk into your existing credit risk models and stress testing infrastructure – this framework provides transparency of results and enables customised sensitivity testing and analysis



This approach is highly flexible and can be adapted across a range of different industry types, and information about a company's transition plan can be incorporated as an add-on for additional individual firm differentiation

TRANSITION RISK METHODOLOGY OPTIONS



Bottom up

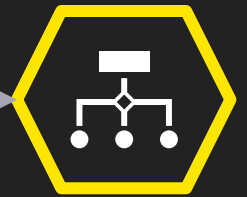
- ▶ The impact of climate risk variables are translated onto counterparty financial statements, typically through key channels of revenue, cost, assets and capital
- ▶ Stressed financials are used with the bank's existing credit models produce stressed credit parameters

+ Pros

- ▶ More granular risk sensitivity driven at the counterparty vs. sector level
- ▶ More detailed data to inform management actions

- Cons

- ▶ Requires more granular data to build methodology
- ▶ Potentially more complex to run stress testing execution



Top down

- ▶ Sector level models can also be use to establish a relationship between key climate affected macroeconomic variables and the migration of credit ratings
- ▶ These variables may include industry specific economic indicators, such as Gross Value Added

+ Pros

- ▶ Less data heavy than bottom up projections
- ▶ Potentially fewer new models to build and maintain

- Cons

- ▶ Results are less specific and do not distinguish winners and losers within sectors

CORPORATE TRANSITION RISK DRIVERS

The transition risk model is underpinned by 5 risk drivers that are recalculated for every sector in scope and used to stress a given counterparty's financial line items. These drivers are as follows:

Cost Growth

Changes in energy prices combined with costs due to carbon taxes will impact the costs for firms.

Calculated approach using aggregated operating costs / costs of goods and sectoral energy consumption.

Price Growth

Price paid by consumers will increase as some of the cost increase is passed on by firms.

Calculation approach using aggregated total revenues and sectoral energy consumption combined.

Volume Growth

Demand and production will decrease following increased prices.

Calculation approach using either weighted future energy demand as an approximation for volume growth or GVA growth.

Capex Growth

Investment into low energy will lead to growth.

Calculation approach using NGFS investment variables and sectoral GVA pathways.

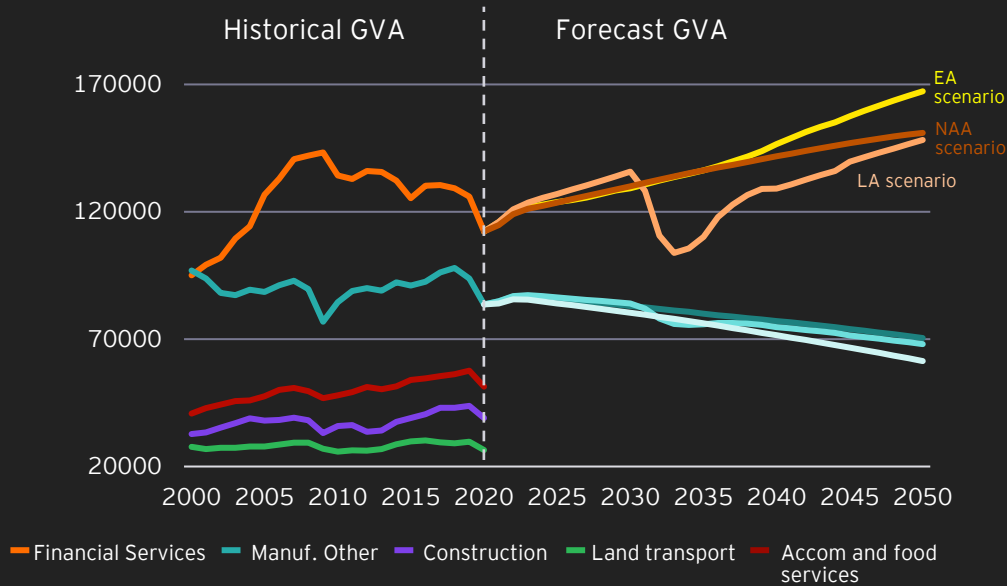
Asset Impairment Ratio

To achieve targeted emissions, existing assets will be left devalued.

Calculation approach using NGFS emissions data and energy demand pathways.

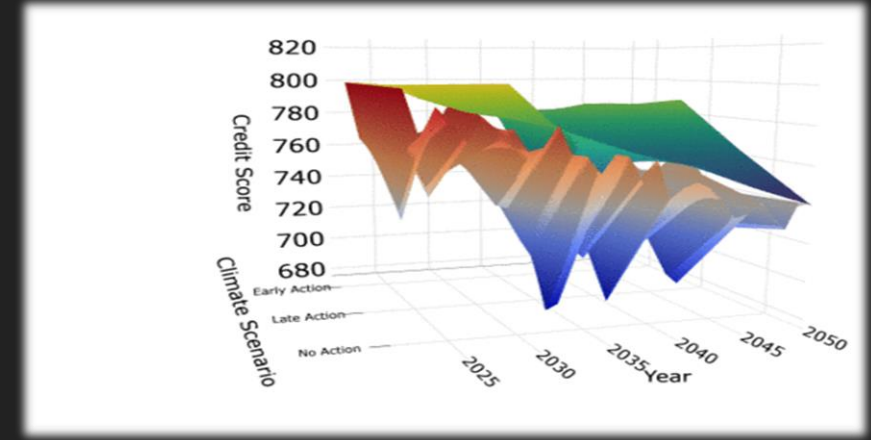
TOP DOWN TRANSITION RISK ASSESSMENT APPROACH

Sector level climate variables



Credit rating migrations

	AAA	AA	A	BBB	C	AAA	AA	A	BBB	C
AAA	100%					100%				
AA		78%	22%				46%	54%		
A		1%	84%	13%	1%			54%	45%	
BBB			7%	89%	4%			2%	68%	30%
C			5%	6%	89%				3%	97%



Top-down sector average (color gradient) Bottom-up result (color gradient)

Expert judgement overlays can be further applied following counterparty specific analysis and physical risk assessment



Outputs

Climate adjusted Credit rating & PD	Sector level impacts
Climate adjusted asset price	Country level impacts

Impacts relative to the counterfactual

INDUSTRY-SPECIFIC SCENARIO MODELS

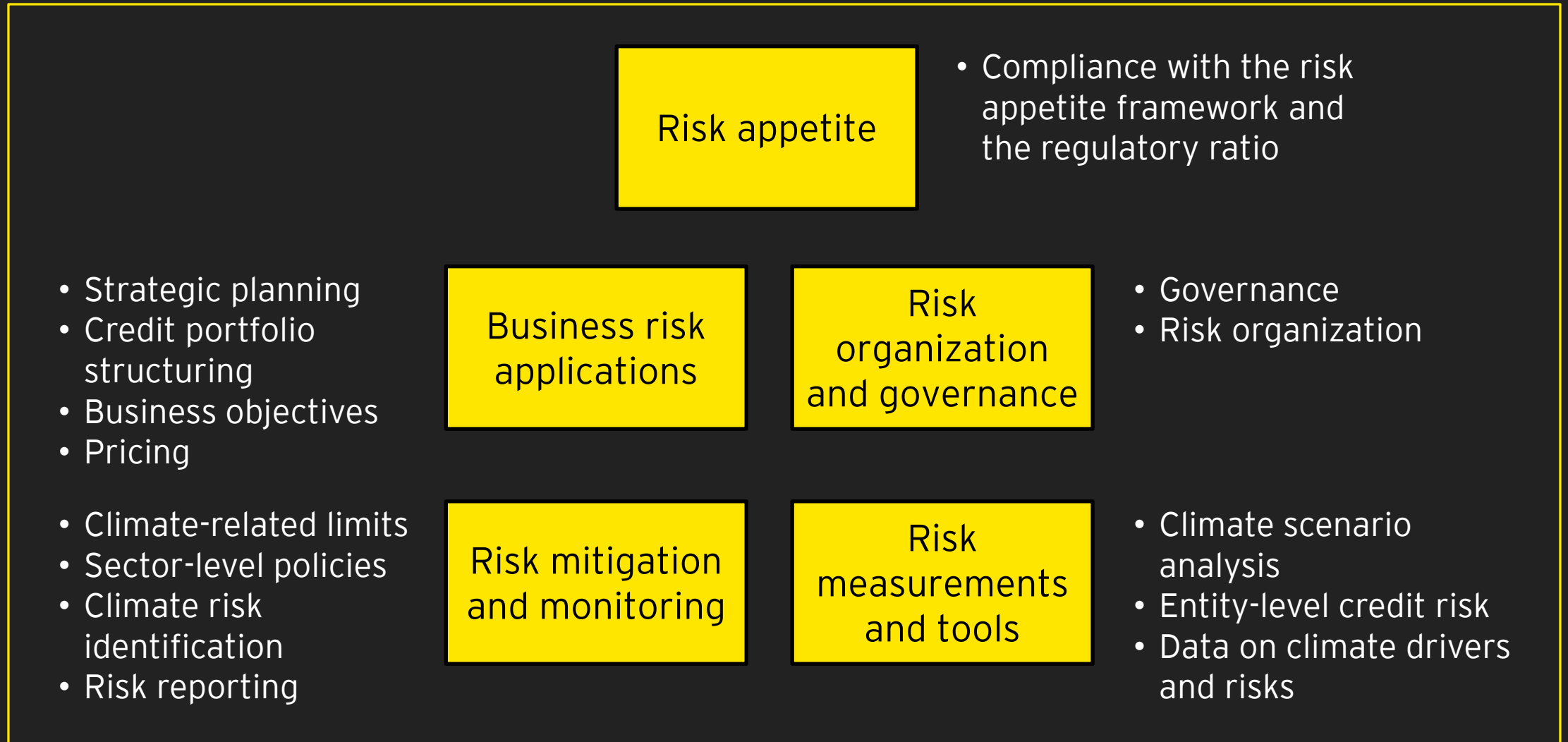
Evaluation of all sectors under common framework has pros and cons. While the common ground ensures comparability among sectors, it has not taken into consideration industry-specific transition pathways. E.g. power generation sector that increases capacity in wind and solar power generation.

However, the general model is still suitable for sectors where transition pathways remain unclear, or the product of the sectors are too diverse for modelling, e.g. manufacturing.

The industry / sector specific models refine the steps to produce the key financial output (%volume, %unit cost, %unit price, %capital expenditure (CapEx)).

Power generation	Coal operations	Oil and gas	Iron and steel	Transportations
Automotive	Metal & Mining	Chemicals	Real estate	Agriculture and Land use

RISK MANAGEMENT AND CLIMATE CONSIDERATIONS



ACHIEVING NET ZERO IN FINANCIAL SERVICES

