Climate scenario analysis for private equity firms

EY

The better the question. The better the answer.
The better the world works.

Building a better working world

Poll

How advanced are you in conducting climate risk scenario analysis?

Go to **www.menti.com** and use the code **98 99 34**

Considerations

Objectives

Why would you want to undertake scenario analysis?

complexity

What is the desired level of complexity?

Scoping

Which portfolio companies are most sensitive to climate risk?

Scenario selection

Which scenarios do you want to use?

Building assumptions and models

Which assumptions do you want to build?

Execute analysis

What do the outcomes tell me?

Introduction to climate scenario analysis

Considerations

Physical risk

- **Primary risks:** damage to land, buildings, stock or infrastructure owing to physical effects of climate-related factors, such as heat waves, drought, sea levels, ocean acidification, storms or flooding
- **Secondary**: knock-on effects of physical risks, such as falling crop yields, resource shortages, supply chain disruption, as well as migration, political instability or conflict

Transition risk

Including:

- **Policy Risks:** including carbon pricing, emission caps and subsidies
- **Market risks**: Transition: disorderly adjustments to markets, including the emergence of disruptive green technologies
- **Reputation risks**: stakeholder expectations to address climate change

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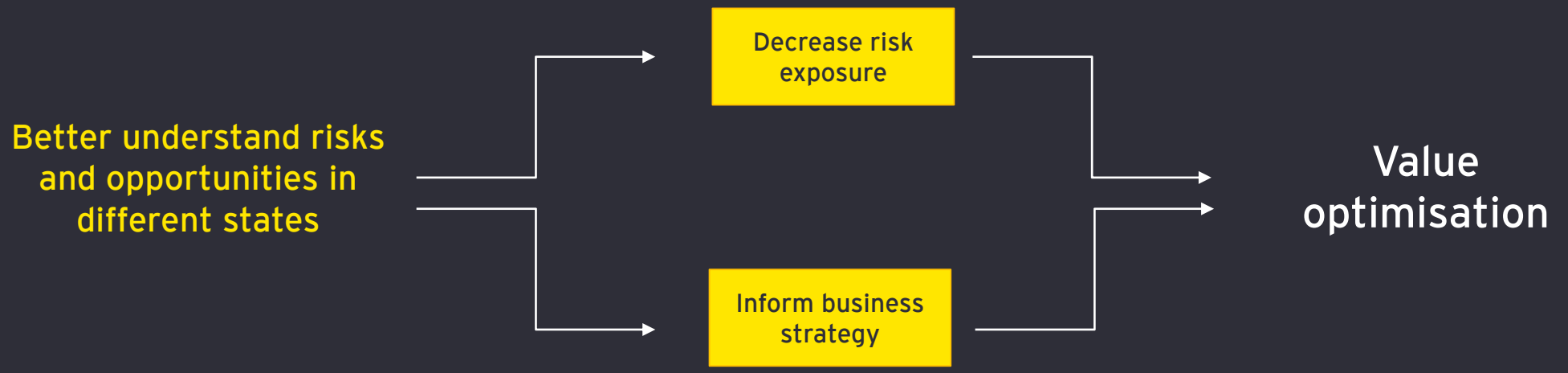
Objectives of scenario analysis

"Scenario analysis is a well-established method for developing input to strategic plans in order to enhance plan flexibility or resiliency to a range of future states."



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DECIDE UPON THE DESIRED COMPLEXITY

Qualitative analysis only

Best for organisations that:

- Want to get the process started
- Have limited access to resources
- Have limited access to portfolio company data
- Want to qualitatively disclose some information externally

A combination of qualitative analysis and high level quantitative analysis

Best for organisations that:

- Want to get a quantitative understanding of risk hotspots
- Want to identify value creation opportunities
- Want to follow market trends

Quantitatively stress test balance sheets

Best for organisations that:

- Want to understand sensitivity of balance sheets against different scenarios.
- Have good access to data and are experienced in business modelling under different scenarios
- Want to be ahead of the curve

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Factors to take into consideration:

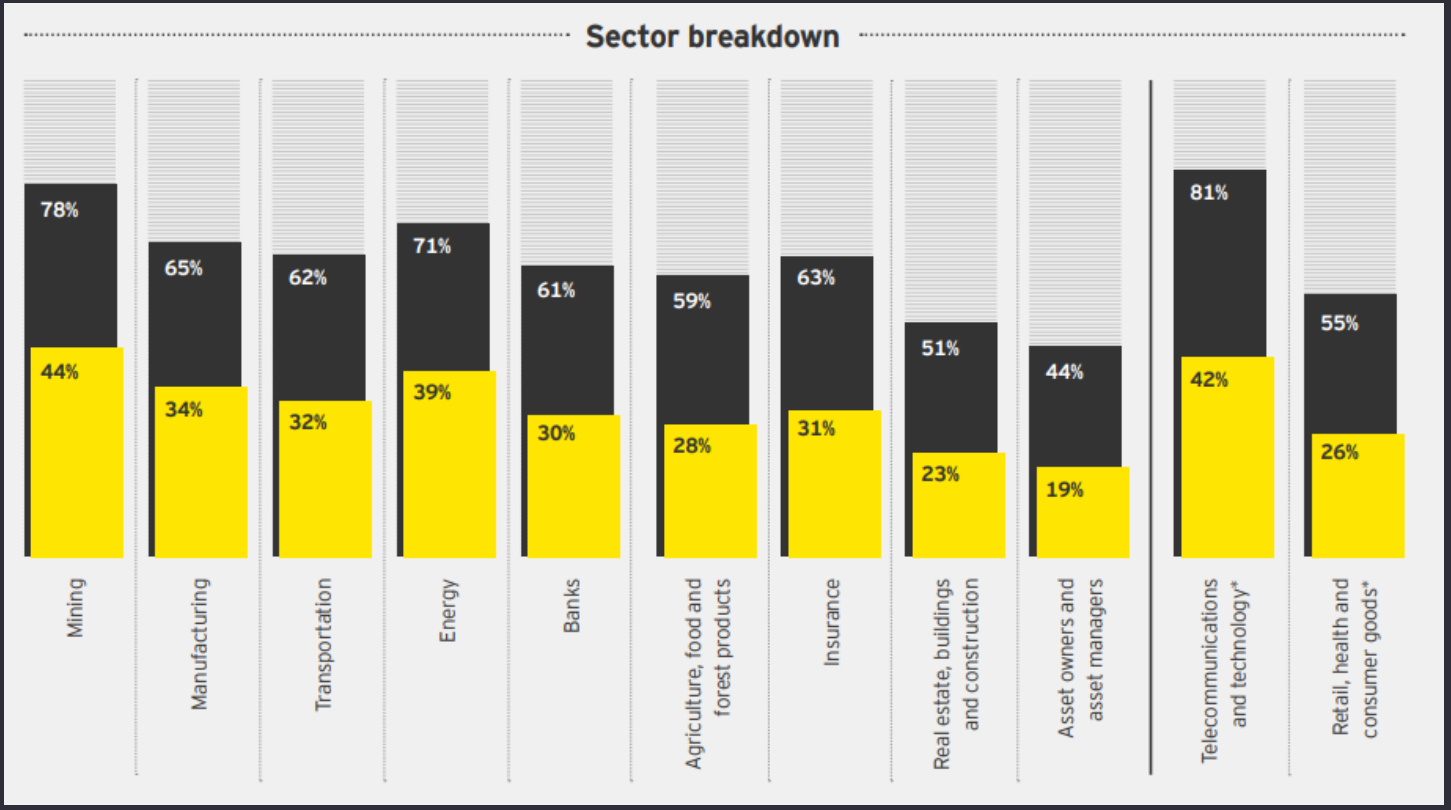
Sector

Geography

Supply chain

Sectors: Climate risk barometer

EY has developed the 'Climate Risk Disclosure Barometer' to provide an annual snapshot on the uptake of the TCFD Recommendations across highly impacted sectors. This provides analysis of current corporate disclosures to compare the high risk sectors listed in the Recommendations against each proposed TCFD disclosure.



Sectors: PRA insurance stress test sensitivity

Sector	% of Investment portfolio in following sectors	Assumptions	Scenario A	Scenario B
Energy	Electricity producers/Gas/Coil/Crude/other oil/renewables	Change in equity value for sections of the investment portfolio comprising material exposure to the energy sector as per below:		
		Coal Oil Gas Renewables	-40% -28% +13% +20%	-15% -10% +7% +10%
Transport	Automotive (Electric Vehicles and non-Electric Vehicles), Aviation (freight and passenger), Marine (freight and passenger), manufacture of other transport equipment	Change in equity value for sections of the investment portfolio comprising material exposure to the transport sector as per below	-30%	-10%
		Automotive non EV Automotive EV Non-Automotive (eg marine, aviation)	-30% +5% -20%	-10% - -5%
Materials/ Metals/ Mining	Manufacture and first-order processing of coke and refined petroleum products, chemicals, cement, iron and related alloys processing	Change in equity value for sections of the investment portfolio comprising material exposure to materials/metals/mining sector as per below: Proportion of the portfolio relying on transporting/extracting/processing fossil fuels or heavily reliant on fossil-fuel energy	-25%	-10%
Water, Agriculture & Food Security	Agriculture, forestry, fishing, dairy cattle, water utilities, food logistics and retail	Change in equity value for sections of the investment portfolio comprising material exposure to water (inc. utilities), agriculture & food security sector as per below: Proportion of the portfolio with income heavily reliant on transporting/trading/supplying products based on water/food/agriculture (eg supermarket chains, utilities, etc.)	-15%	-10%
Real Estate Assets (Inc. CRE & Infrastructure)	Real estate activities	Change in property value for assets materially affected by physical climate change risk. Apply the price drop impact on mortgage valuations where relevant.	-30%	-10%
		Change in property value for assets not affected by physical climate change risk. Apply the price drop impact on mortgage valuations where relevant.	+10%	+7%

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Which scenarios to consider

DISORDERLY TRANSITION

A sudden transition scenario materialising over the medium-term business planning horizon that results in achieving a maximum temperature increase of 2° C (relative to pre-industrial levels) by 2100 but only following a disorderly transition. In this scenario, transition risk is maximised.

ORDERLY TRANSITION

A long-term orderly transition scenario that is broadly in line with the Paris Agreement. This involves a maximum temperature increase of 2°C by 2100 (relative to pre-industrial levels) with the economy transitioning to be greenhouse gas-neutral in the next three decades by 2050. The underlying assumptions for this Scenario are based on the range of 2° scenarios cited in the IPCC AR5 report (2014)

HOT HOUSE

A 'hot house' scenario reaching a maximum temperature increase of 5°C (relative to pre-industrial levels) by 2100 assuming no transition where physical climate change is maximised following an emissions pattern similar to an IPCC RCP 8.52.

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Assumptions

ILLUSTRATIVE

Assumptions	Disorderly transition	Orderly transition	Hot house
	Market and technology		
Market demand	-5.3%	-3.2%	-1%
Technology disruption	-12.1%	-6.7%	-0.5%
	Policy and legal		
Carbon caps and policy influence	-8%	-5.3%	0
License to operate	-4.3%	-3.3%	-0.2%
Liability costs	-2.7%	-0.1%	0
	Physical		
Physical damage	0	-0.2%	-16%
Reduced production	0	-2.1%	-5.9%

Building an assumption – example for a home builder

The Committee on Climate Change

proposes the full decarbonisation of buildings by 2050

The Clean Growth Strategy

recommends that all fuel poor homes are upgraded to **EPC Band C** by 2030, with the aspiration for as many homes as possible to be EPC Band C by 2035

UK Government

has set ambitions to halve the **energy use** from all new buildings by 2030 and stop the **installation of gas heating** in new homes from 2025

Recommendations

Transition risk modelling capabilities

Global Trade Analysis Project (GTAP)

The GTAP model is a **global** Computable General Equilibrium (CGE) **model**, designed to model changes in tariff and non-tariff barriers in international trade, as well as policy changes within or across countries

It is maintained by academics at Purdue University in the US, and contributed to and widely used by government agencies, multinational institutions, and academia

Some examples include the World Bank, the World Trade Organization (WTO), the European Commission, the Asian Development Bank and the Organisation for Economic Co-operation and Development (OECD)

It uses the data from the **GTAP database**, which provides a consistent representation of the world economy across 140 countries or regions and 57 sectors

The GTAP model has a range of energy and environmental **extensions**, including additional detail on electricity supply, CO2 and non-CO2 emissions, and land use

What the model does

Incorporates consistent data on input-output tables and cross-border trade for 140 countries/regions and 57 sectors – thus it represents what is produced and how it is consumed across the world economy

Behavioural is included through consumer and producer responsiveness to prices and supply. These relationships are estimated / calibrated to fit economic theory and empirical literature

Scenarios can be designed using third party inputs/reports – e.g. assessments of lost crop production, or trends in consumer preferences, or estimates of the social costs of carbon

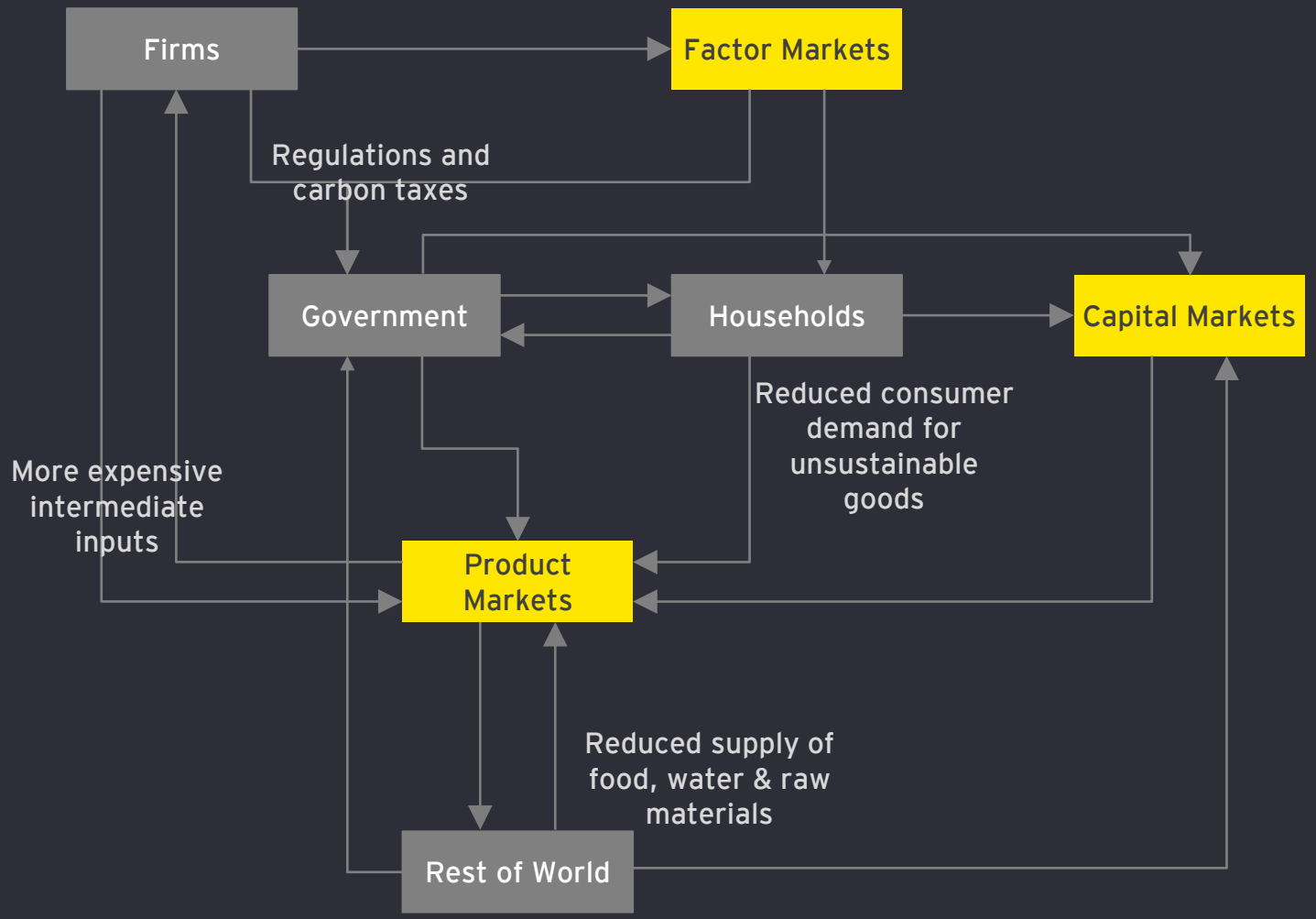
Changes in demand and supply in different sectors and geographies will interconnect across the global economy, reflecting modern interconnected global supply chains

The model outputs will show which sectors bear most risk (in terms of lost output / value), changes to energy use and emissions, and total changes in economic aggregates (e.g. GDP)

Transition risk modelling capabilities

GTAP is a Computable General Equilibrium (CGE) model

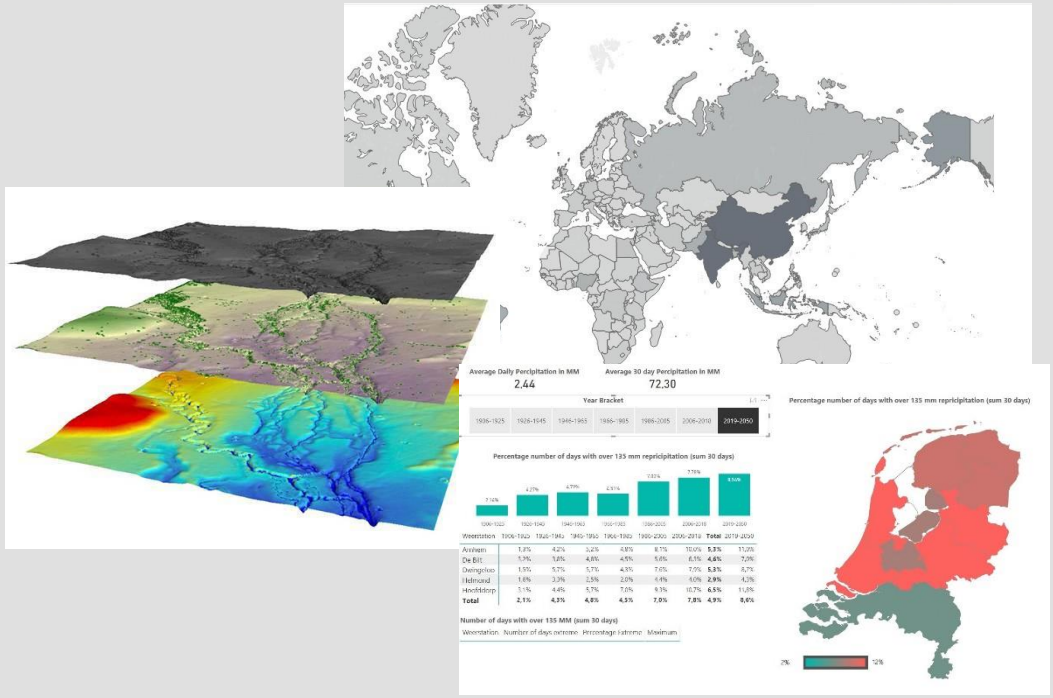
- **Computable:** CGE models are a class of large-scale models describing an economy as a whole and interactions among its parts. This class of models allows to quantify the outcomes of various "what if" scenarios
- **General:** CGE models are comprehensive, because they describe all parts of the economy simultaneously and how these parts interact with each other. They combine the supply-chain of production with consumer demand, government taxes and spending, and external trade
- **Equilibrium:** They model an economy that starts and finishes in equilibrium – thus in model simulations any displaced productive resources (labour and capital) are put back to work in other sectors of the economy, and growth in the overall economy is constrained by the available productive resources



Physical risk modelling capabilities

Physical risk – Spatial risk modelling

Physical risk analysis, combining the spatial location of portfolio companies (and key value chain) assets, forecast change in key climate variables such as temperature, and performance thresholds and impacts (e.g. temperature impacts on operations or staff activities).



QA

Climate risk across the value chain

	Your suppliers	Yourself	Your customers

What?	▸ Supply chain climate risk drivers, including:
	  ▸ Lack of supply
	  ▸ Higher cost
	  ▸ Region and product specific volatility
	  ▸ Change in just in time transport reliability
	▸ Domestic and (limited) international climate and energy policy interaction
		▸ Physical risk to shops (e.g. flooding)
		▸ Physical risk to within house logistics (e.g. customer and staff movement)
		▸ Energy & emissions impact on:
		  ▸ Fuel and electricity price volatility
		  ▸ Cost & cost volatility
		  ▸ Potential future liability (e.g. carbon pricing)
		▸ Domestic climate and energy policy interaction
			▸ Short-term changes: weather driven demand change (e.g. for ice cream)
			▸ Long-term changes: supply & demand mismatch, and or higher costs due to supply chain uncertainty
			▸ Change in risk profile of customers

How?	▸ MRIO-based analysis of key supplier regions by product ▸ Physical risk assessment of key supplier regions ▸ Climate policy assessment	▸ Physical risk assessment ▸ Climate policy assessment ▸ Review of energy and emissions audits ▸ Energy efficiency MACC	▸ Consumer demand forecasts ▸ IEA global and regional climate scenario outcomes ▸ Weather volatility analysis

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