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ASEAN Low Carbon Energy Programme

Series 2: Climate scenario analysis and risk management application for listed companies in the nonfinancial sector

11 November 2022

EY Building a better working world

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Program overview

10 November 2022

Series 1: Implementation of Task Force on Climate-related Financial Disclosures (TCFD) checklist for listed companies in the nonfinancial sector

Subtopics:

1. Introduction to TCFD
2. Step-by-step run through of the TCFD checklist
3. Sharing session by Charoen Pokphand Foods (CPF)

11 November 2022

Series 2: Climate scenario analysis and risk management application for listed companies in the nonfinancial sector

Subtopics:

1. Setting the direction and framework
2. Risk management application for listed companies in the nonfinancial sector
3. Scenario analysis

Main speakers

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Partner, EY Corporate Services Limited (EY Thailand)

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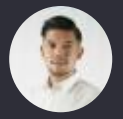
Partner, EY Corporate Services Limited (EY Thailand)



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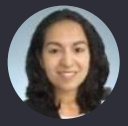


Sheena Narula
Manager, EY Corporate Advisors Pte. Ltd (EY Singapore)

What's on for today?

Date and time: 11 November 2022 (2:00 p.m. – 4:00 p.m.), 2.0 hours			
Introduction and opening	▸ Short introduction and recap	5 mins	2:00 p.m. to 2:05 p.m.
Setting the direction and framework	▸ Risk governance: design and implementation ▸ Risk management framework ▸ Risk appetite	30 mins	2:05 p.m. to 2:35 p.m.
Risk management application for listed companies in the nonfinancial sector	▸ Case studies of risk management application for listed companies in nonfinancial sector	20 mins	2:35 p.m. to 2:55 p.m.
Scenario analysis	▸ Overview of the process of climate scenario analysis ▸ Types of climate-related risks, risk exposure and materiality assessment ▸ Scenario identification, components and development ▸ Scenario assessment - assessing the financial impact	45 mins	2:55 p.m. to 3:40 p.m.
Q&A Session		20 mins	3:40 p.m. to 4:00 p.m.

Content

Technical and concept delivery on

1

Setting the direction and framework

2

Risk management application for listed companies in the nonfinancial sector

3

Scenario analysis

Content

About this topic

1

Setting the direction and framework

1.1 Risk governance: design and implementation

- How risk governance can be designed to incorporate and manage climate risks, with clear roles and responsibilities across the three lines of defense

1.2 Risk management framework

- Integration of climate-related risks into existing risk management framework

1.3 Risk appetite

- Defining risk appetite and determining metrics to measure and monitor climate-related risks

1.1 Risk governance: design and implementation

Organisational changes and transformation would be required as companies seek to become effective managers of climate risks

Focus on enablers

- Acquire technical skills required to manage climate risk.
- Develop strategic understanding of how physical and transition risks may affect their activities.
- Budget for climate adaptation and mitigation strategies including technology, data and talent.

Get up to speed on stress testing

- Assess resilience scenario.
- Identify important climate hazards and primary risk drivers by industry to generate physical and transition climate risk scenarios.
- Quantify the impact by counterparty and in aggregate on portfolio basis.

Formulate climate risk governance

- Top management to set the tone on climate risk governance and nominate a leader responsible for climate risk.
- Set up effective governance structure covering assessment, monitoring to reporting.

Tailor business and credit strategy

- Embed climate considerations in risk frameworks and capital-allocation processes.
- Introduce policies and procedures such as negative screening, sector-specific policies or impose emissions thresholds.

Align risk processes

- Align climate risk exposure with risk appetite and the business strategy.
- Inject climate risk considerations into all risk management processes, including capital allocation, portfolio monitoring and reporting.
- Review and update risk processes periodically to capture latest risks and disruptions.

Source: COSO, WBCSD and EY, Applying Enterprise Risk Management to Environmental, Social and Governance-related Risks ; McKinsey, Banking Imperatives for Managing Climate Risk

Setting up climate governance on corporate boards

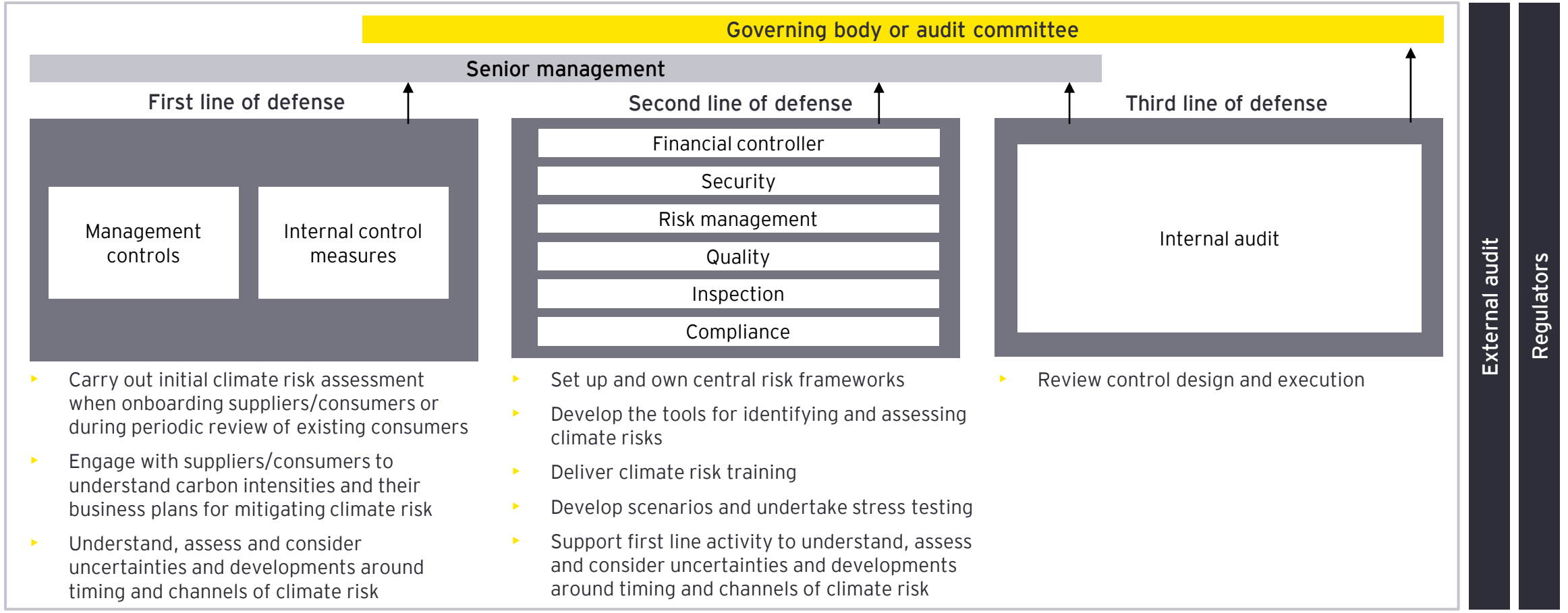
Guiding principles for effective climate governance on corporate boards[1]

Implementation steps[2]

- Deliver a **tailored training program to the board on climate risk** and consider using external experts where necessary.
- Update **board committee terms** of reference to include climate risk.
- Provide **periodic regular updates** to relevant board committee(s) on:
  - The organisation's progress in preparing for and implementing climate risk management
  - Risk reporting metrics
- The board to **review and challenge**:
  - Undue or unexpected climate risk concentrations
  - The organisation's strategy or corporate plan, considering the climate risk profile, through short (e.g., three to five years), medium (e.g., 10 years) and long-term (e.g., 30 years) lenses
  - Materiality assessments and scenario analysis by climate outcomes and time horizons
  - Emerging regulatory, reputational and legal obligation

Source: [1] World Economic Forum (2019) : How to Set Up Effective Climate Governance on Corporate Boards: [2] Climate Financial Risk Forum Guide 2020, Risk Management Chapter

Ensuring understanding, oversight and accountability for risks arising from climate change at all levels



- Carry out initial climate risk assessment when onboarding suppliers/consumers or during periodic review of existing consumers
- Engage with suppliers/consumers to understand carbon intensities and their business plans for mitigating climate risk
- Understand, assess and consider uncertainties and developments around timing and channels of climate risk

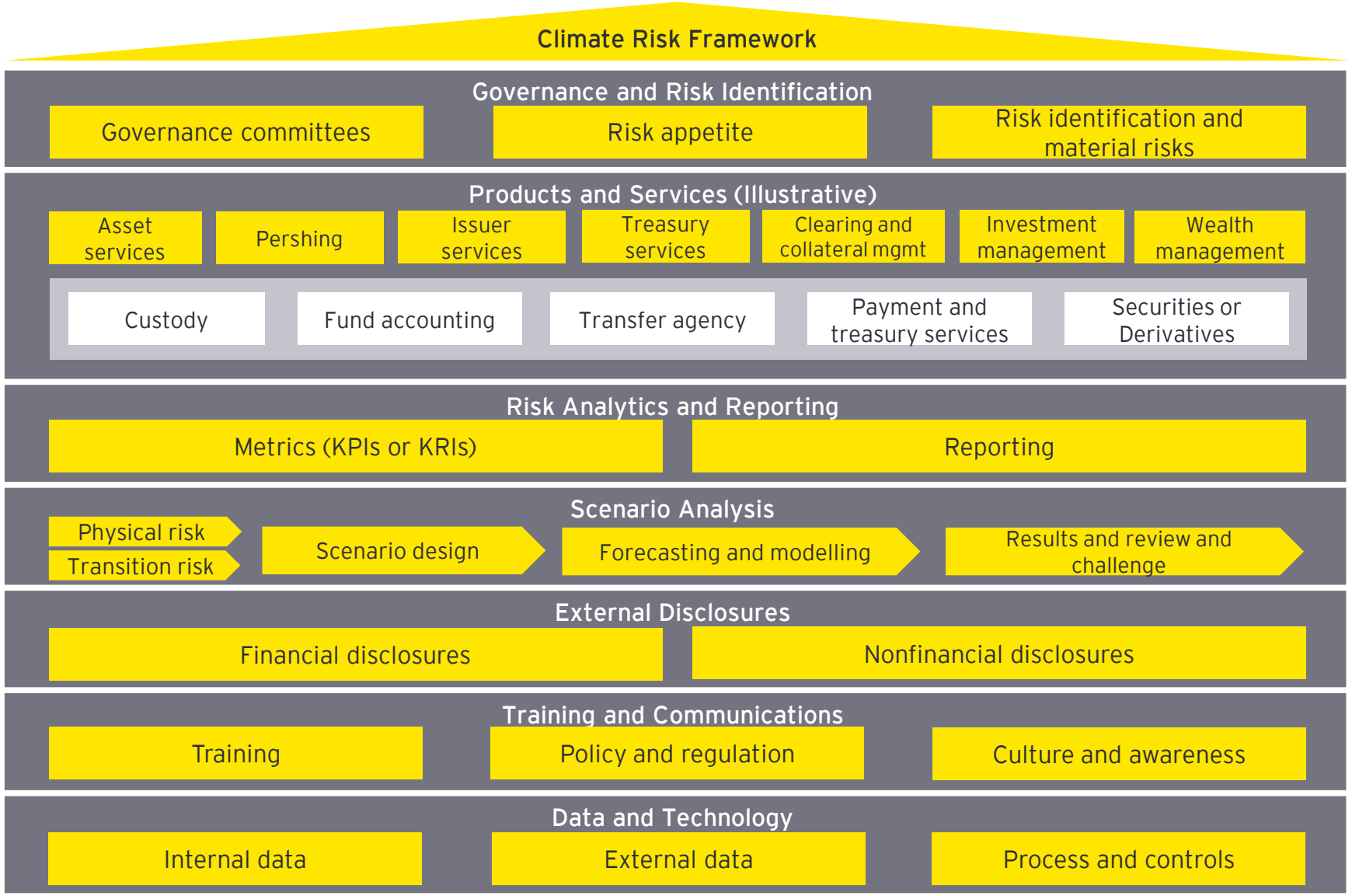
- Set up and own central risk frameworks
- Develop the tools for identifying and assessing climate risks
- Deliver climate risk training
- Develop scenarios and undertake stress testing
- Support first line activity to understand, assess and consider uncertainties and developments around timing and channels of climate risk

- Review control design and execution

A potential indicator of the organisation's quality of climate risk governance could be based on **the extent to which climate risk management is integrated effectively into established risk management.**

Source: [1] EY, Being business-minded about climate change: Ten ways to address climate-related risks and opportunities in 2020 and beyond; [2] Chartered Institute of Internal Auditors, 2018, Governance of Three Lines of Defense: [3] Climate Financial Risk Forum Guide 2020, Risk Management Chapter

Climate risk needs to be implemented across the full risk management framework



Lessons learned:

Team: Integrating climate risk into an organisation is a cross-functional, transformational and business-driven exercise that will require collaboration with unique skillsets and perspectives.

Strategy-driven: Risk appetite and limits should be aligned to company strategy and have sufficient monitoring and controls.

Data: Design with an end-state in mind and develop a data strategy related to the procurement, storage and unification of environmental data for financial and nonfinancial reporting.

Learn: Ask a lot of questions and think of climate risk as an "add-on" existing BAU capabilities (e.g., risk ID, underwriting).

1.2
Risk management framework

Question time

What first steps would you take to embed climate risks into your existing risk management framework?

Please use the whiteboard to give your answer

Embed climate-change risk deep into Enterprise Risk Management (ERM)

Ultimately, climate change must be built into the organisation's risk management framework. This requires embedding it into the risk management life cycle:

1 Risk identification and assessment

- To identify risks, granular analysis of customers and clients by region and sector is useful
- Bifurcating between physical and transition risks makes the analysis more precise and actionable
- Understanding the direct impacts of physical risks on the organisation's operations and third parties is essential

2 Risk taxonomies

- In order to capture climate risk within existing processes and standards, organisations will need to re-evaluate their risk taxonomies to determine whether climate risk is material
- These granular components will need to be examined across portfolios to inform credit limits and internal ratings to maintain prudent risk management

3 Risk reporting

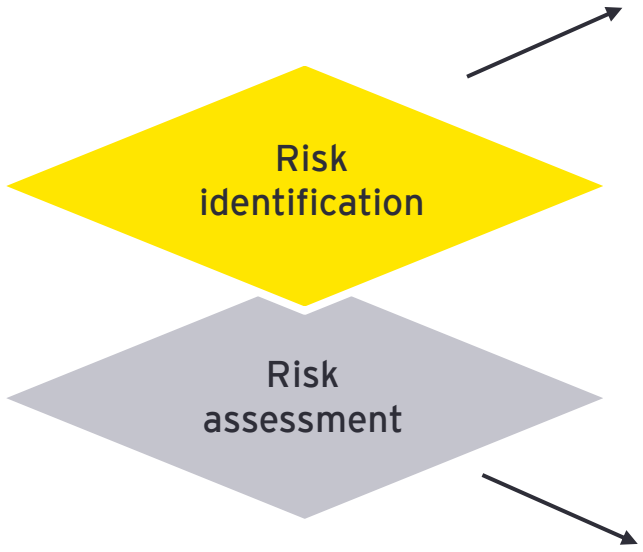
- Develop and maintain a set of risk metrics that capture their own and the counterparty's climate change risks
- Be able to aggregate those metrics to enable board and senior management reporting and oversight
- Risk reporting can be linked to existing portfolios, concentration and exposure threshold and limits

4 Risk mitigation

- Climate risk analysis needs to support decision-making on how to manage climate risks
- This may range from:
  - Altering exposure to certain sectors or region
  - Making decisions on how to deploy capital

Source: EY, Being business-minded about climate change: Ten ways to address climate-related risks and opportunities in 2020 and beyond

Risk identification and assessment



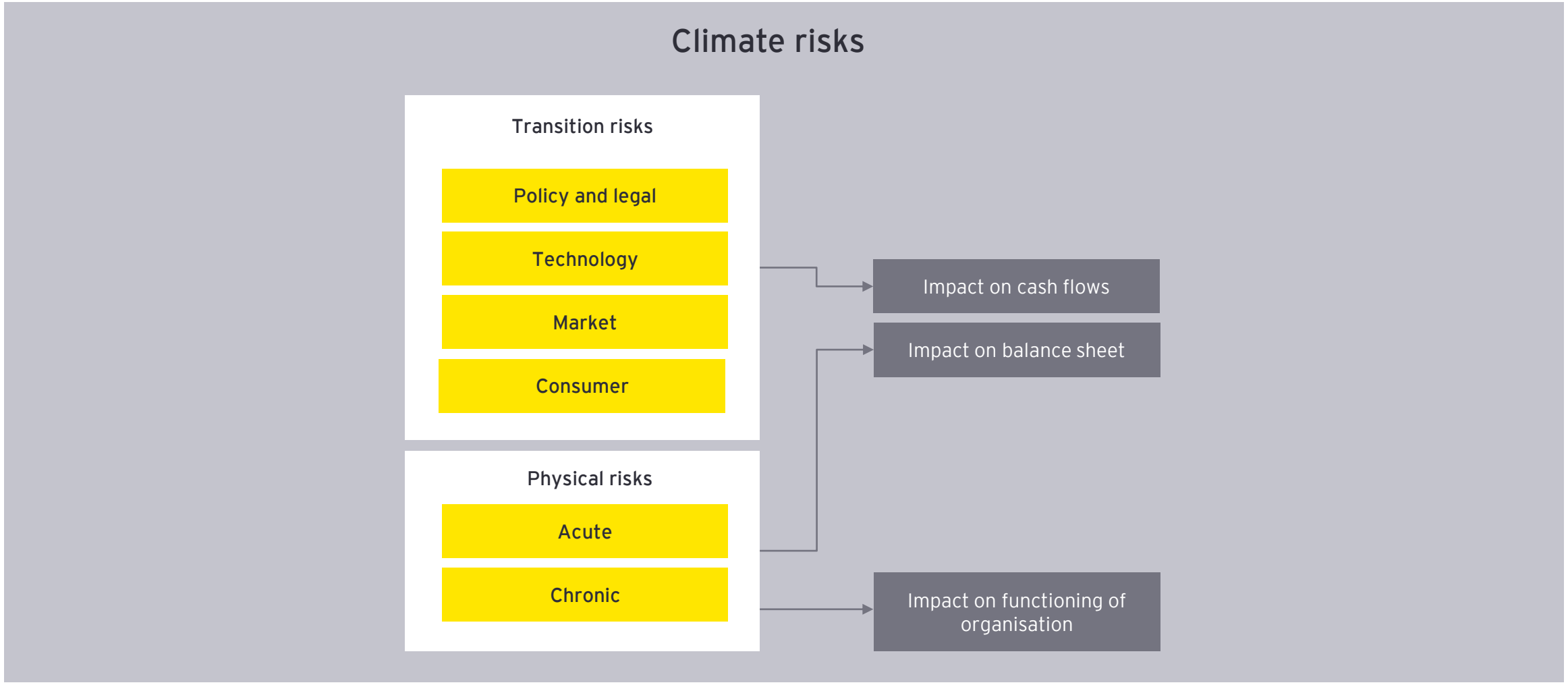
- Management and stakeholders broadly identify exposure using risk statements.
- Example of a risk statement: "we face a risk from increasing levels of drought impacting our agricultural clients and their ability to repay loans".

- Based on the risk statement, assign a risk score equivalent to the likelihood of the risk multiplied by the impact of the risk.
- Exposures on physical and non-physical assets related to the companies need to be taken-into account for analysis. Assets which are owned by customers and funded by the companies should also be considered.
- Non-physical assets include:
  - Customer and staff safety
  - Financial exposures such as market risk
  - Responsible investment and corporate social responsibility
  - Reputational risk and loss of shareholder value
- Key stakeholders then form a collective view of the priority of the risk – a plan will be developed in response to priority risk.
- Non-priority risk can still be identified and monitored going forward.

Exposures on physical and non-physical assets related to the companies need to be taken-into account

Source: Climate Risk Management for Financial Institutions, Actuaries Institute's Climate Change Working Group, November 2016

Risk categorisation varies based on industry, business model and regulations



Source: Climate Financial Risk Forum Guide 2020, Risk Management Chapter

Climate-related examples aligned to ERM risk categories

	Strategic risk	Operational risk	Business risk	Financial risk	Compliance risk
Physical risk	▸ Increase in probability of downturn for certain businesses (e.g., severe droughts causing defaults in agriculture) ▸ Lower asset values (e.g., lower value of real estate due to higher flood risk) ▸ Increase in country or sovereign risk through lower productivity and economic disruption	▸ Destruction of the organisation's operations (e.g., operational buildings, information communication technology (ICT) network) ▸ Business continuity issue for high carbon intensity businesses or agriculture or foods	▸ Impact on organization's capacity to generate sustainable profits (exposures to certain countries or activities become less profitable)	▸ Investment increase for assets that are impacted by climate-related physical risk	▸ Not ready to disclose mandatory information ▸ Fines owing to inaccurate of fraudulent disclosure

Transition risk	▸ Increase in probability of downturn in certain businesses:
	  ▸ Carbon-intensive industries (stranded assets)
	  ▸ Assets that turn out to be less green as initially expected (greenwashing)
	▸ Lower asset values (lower value of real estate due to policy changes)
		▸ Business models reliant on carbon-intensive activities may no longer be profitable
		▸ Risk of lagging behind new green activities and technologies vs. risk of new technologies being less promising than expected
			▸ Reputational risk if an organisation does not manage to adapt its own business models
			▸ Reputational risk if an offered product does not turn out to be as green as initially expected
			▸ Liability risk resulting from (e.g., greenwashing)
				▸ Investment increase for businesses that are responded to climate risk
				▸ Return on investment is not as expected
				▸ Increasing cost due to carbon tax, carbon mechanism adjustment or other mandatory emission cap schemes
					▸ Not ready to disclose mandatory information
					▸ Fines owing to inaccurate of fraudulent disclosure

Source: NGFS Call for Action Report 2019

1.3

Risk appetite

Risk appetite should reflect and communicate the level of climate financial risk that an organisation is willing to take

Approach toward defining climate risk appetite differs depending on the categorisation of climate risk

Principal/standalone risk

If climate risk is a standalone risk category, the risk appetite should consist of **two components**:

- **"Statement"**: a clear, plain English articulation of the acceptable risk level
- "**Metrics":** quantitative or qualitative measurement which allows the institution to assess adherence to the statement

Each statement may have a number of metrics associated with it which allows the business and risk committees to monitor the risk profile.

Cross-cutting risk type

If climate risk is considered within other existing risk categories, the risk appetite may not have a statement specific to climate risk, but **there should still be metrics that can be clearly linked to climate risk**.

Initial implementation steps

1. Consider business strategies, the existing portfolio and the type of climate risk faced.
2. Engage the board to probe specific aspects of risk appetite.
3. Develop and approve a qualitative risk appetite statement.
4. Identify metrics which can be used to track climate risks to the organisation and work with business and risk to determine appropriate appetite or tolerance thresholds.
5. In the longer-term, assess how metrics can best include the results from scenario analysis and impact assessments or trend analysis.

Source: Climate Financial Risk Forum Guide 2020, Risk Management Chapter

Mature risk appetite considers impacts over a longer period and includes scenario analysis and impact assessment

Example: Options for considering a 30-year timeframe in the risk appetite statement

1 Long-term scenario analysis to project existing metrics

Use scenario analysis to understand the projection of metrics that are used to measure and monitor risk appetite under set scenarios. The projected metrics can guide pre-emptive actions.

The amount and type of risk an organisation is willing to accept in pursuit of its business objectives[2]

The specific maximum risk that an organisation is willing to take regarding each relevant risk[2]

Projection of metrics under different set of scenarios in the long-term

Metric	Appetite	Tolerance	Current RAG*	Scenario 1 – 2050	Scenario 2 – 2050	Scenario 3 - 2050
	X%	Y%	Z%	A%	B%	C%

Current performance (RAG means Red, Amber or Green)

2 Defining new metrics and thresholds under specific scenario

The scenario analysis could identify new, additional metrics with defined appetite and tolerance that may need to be added under a specific scenario.

Metric	Appetite	Tolerance	Current RAG
	X%	Y%	Z%
XXXX under disorderly 2 degrees scenario	D%	E%	F%

3 Using metrics which incorporate longer-term view

For climate risk, metrics may need to be altered to incorporate the longer term risks.

Metric	Appetite	Tolerance	Current RAG
Percentages of high transition risk ratings in portfolio	X%	Y%	Z%
QoQ leverage of high transition risk industries or customers	X%	Y%	Z%

Source: [1]EY, Risk Appetite: The Strategic Balancing Act; [2]Climate Financial Risk Forum Guide 2020, Risk Management Chapter

Content

About this topic

2

Risk management application for listed companies in the nonfinancial sector

2.1 Risk management application

- Case studies of risk management application for listed companies in the nonfinancial sector

2.1 Case studies of risk management application for listed companies in the nonfinancial sector

Example from TCFD adopter

Industrials | Example: Eaton, United States

Eaton's process for risk management and mitigation

Eaton disclose on their corporate planning and strategies to undertake climate-related risks by engaging in a deeper, focused analysis to understand various ways that climate change could impact their businesses and products

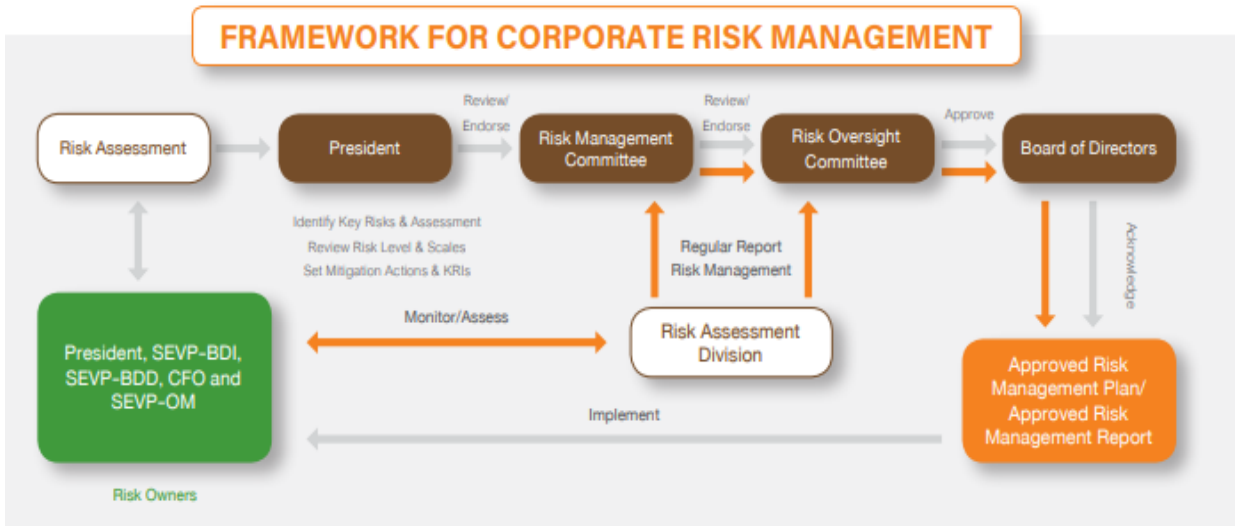
Source: Eaton's 2022 TCFD Report, https://www.eaton.com/content/dam/eaton/company/sustainability/files/eaton-tcfd-disclosure.pdf, accessed on October 10, 2022

Example from TCFD adopter

Energy

Example: EGCO, Thailand

EGCO's corporate risk management framework



EGCO's risk oversight committee is responsible to consider, give comments and provide recommendations on enterprise risk management policy framework – about how the company can manage risk tolerance and risk appetite.

To increase the effectiveness of the risk indicators, EGCO Group conducted Sensitivity Analysis and Stress Testing on business significant topics, such as financial risks, climate change risks and changes in water availability.

In 2021, there were 11 meetings with the RMC and 13 meetings with the ROC to make sure that the risk management processes are implemented throughout the organisation.

Source: EGCO Sustainability Report 2021, https://sustainability.egco.com/storage/document/sustainability-reports/2021/20220317-egco-ar2021-en.pdf, accessed on October 11, 2022

Example from TCFD adopter

Communication Services | Example: Sanoma, Finland

Sanoma's risk management response based on TCFD recommendation

Topic	TCFD Recommended Disclosure	Sanoma's response
Risk Management	▪ Describe the organisation's processes for identifying, assessing and managing climate-related risks.	▪ Sanoma's Risk Management Policy defines the Group-wide risk management principles, objectives, roles, responsibilities and procedures also covering sustainability and the climate-related risks. Sanoma's formal risk management process includes several phases further described in our Non-Financial Information (NFI) Statement and applies to our climate-related risk assessment. Sanoma has set strategic and operational targets for climate-action in it's Sustainability Strategy. In addition, we report on climate-related issues in our Sustainability Report 2021 to report GHG emissions and emission intensities according to Greenhouse Gas (GHG) protocol for scopes (1, 2 and 3).
	▪ Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organisation's overall risk management.	▪ The most significant sustainability-related risks are identified and assessed as a part of the annual risk management cycle facilitated by Sanoma's risk management team and supported by Sanoma's sustainability team for climate-related issues. The risk management team monitors the level of risks and ensures that risks are mitigated appropriately by Sanoma's business units, functions, and country units. Our risk-based approach and our sustainability risks are further described in our NFI Statement. In addition, we publish our submissions for the CDP investor questionnaire each year.

- **Sanoma's** response on the risk management based on TCFD recommendation. Sanoma divide their risks into two main categories including financial and nonfinancial risks.
- **Sanoma's risk management team** is responsible for identified and assessed annual risk management cycle

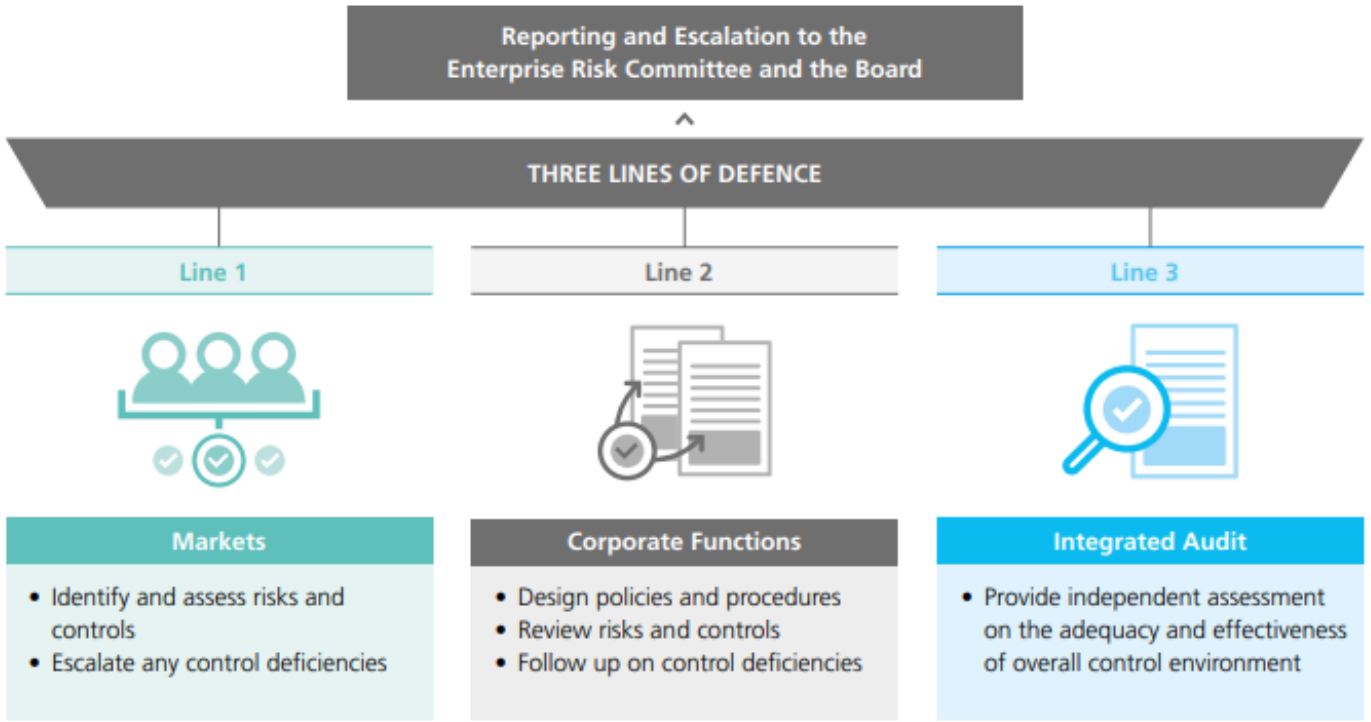
- **Sanoma's enterprise risk management policy** defines the group-wide risk management principles, objectives, roles, responsibilities and procedures which cover sustainability and climate-related risk on their annual report.

Source: Sanoma's Annual Report, https://www.sanoma.com/globalassets/wp-content/uploads/2022/03/sanoma_annual-report-2021.pdf#page=16, accessed on October 10, 2022

Example from TCFD adopter

Industrial | Example: Sembcorp, Singapore

Sembcorp's Integrated Assurance Framework (IAF)



- **Sembcorp** manages their risk through the IAF which adopts three lines of defense (LOD). Through the IAF, the respective LODs work together to ensure that key business risks are reviewed and tested using a robust assurance process.
- **Sembcorp's market teams** conducted a quarterly review of their key risks including climate-related risk using a likelihood of impact matrix and provide performance updates to Group Sustainability and Group Risk divisions.
- **The ERC** monitors and reviews the risk management performance and appropriateness of risk mitigation measures. The ERC then reports to the RC on a quarterly basis to monitor group-wide risks, including significant risk exposures as well as corresponding risk mitigation plans.

Source: Sembcorp Climate-related disclosures 2021

Example from TCFD adopter

Retails

Example: AEON, Malaysia

AEON delight Group Basic Rules for Risk Management

- AEON established the system of "AEON delight Group Basic Rules for Risk Management" to make necessary decisions and take actions against various risks which may arise in the course of business activities which include following:

1. For risk management under normal circumstances, the department in charge of risk, which is designated by risk category*, will manage risks to prevent the occurrence of risk events and reduce losses.
2. The Risk Management Committee oversee the evaluation and analysis of risks and proposed countermeasures implemented by each department in charge of risk, examine risk scenarios for each Group company, and periodically report the results of these examinations to the Board of Directors.
3. In the event of a major crisis, a disaster response headquarters headed by the President & CEO will be established to enable more rapid decision-making and execution than under normal circumstances. AEON will also develop rules and manual for business continuity in times of crisis.
4. The department in charge of risk management should prepare risk scenarios for each of the business risks set by the Risk Management Managers' Meeting, and the Group Corporate Audit Department shall evaluate the effectiveness of risk management through audits and other measures.

Source: AEON Disclosure based on TCFD recommendations, https://www.aeondelight.co.jp/english/csr/tcfd.html, accessed on October 11, 2022.

Content

About this topic

3

Scenario analysis

3.1 Overview of the process of climate scenario analysis

- Definition, process, analytical choices and TCFD considerations

3.2 Type of climate-related risks, risk exposure and materiality assessment

- How climate risks impact businesses and the wider economy

3.3 Scenario identification, components and development

- How physical and transition risks can affect PLN

3.4 Scenario assessment – assessing the financial impact

- Materiality assessment to establish exposure to climate risk

Question time

What is your level of understanding of climate scenario analysis?

Please use the poll to give your answer

Question time

What do you consider to be the key challenges in conducting climate scenario analysis?

Please use the whiteboard to give your answer

3.1

Overview of the process of climate scenario analysis

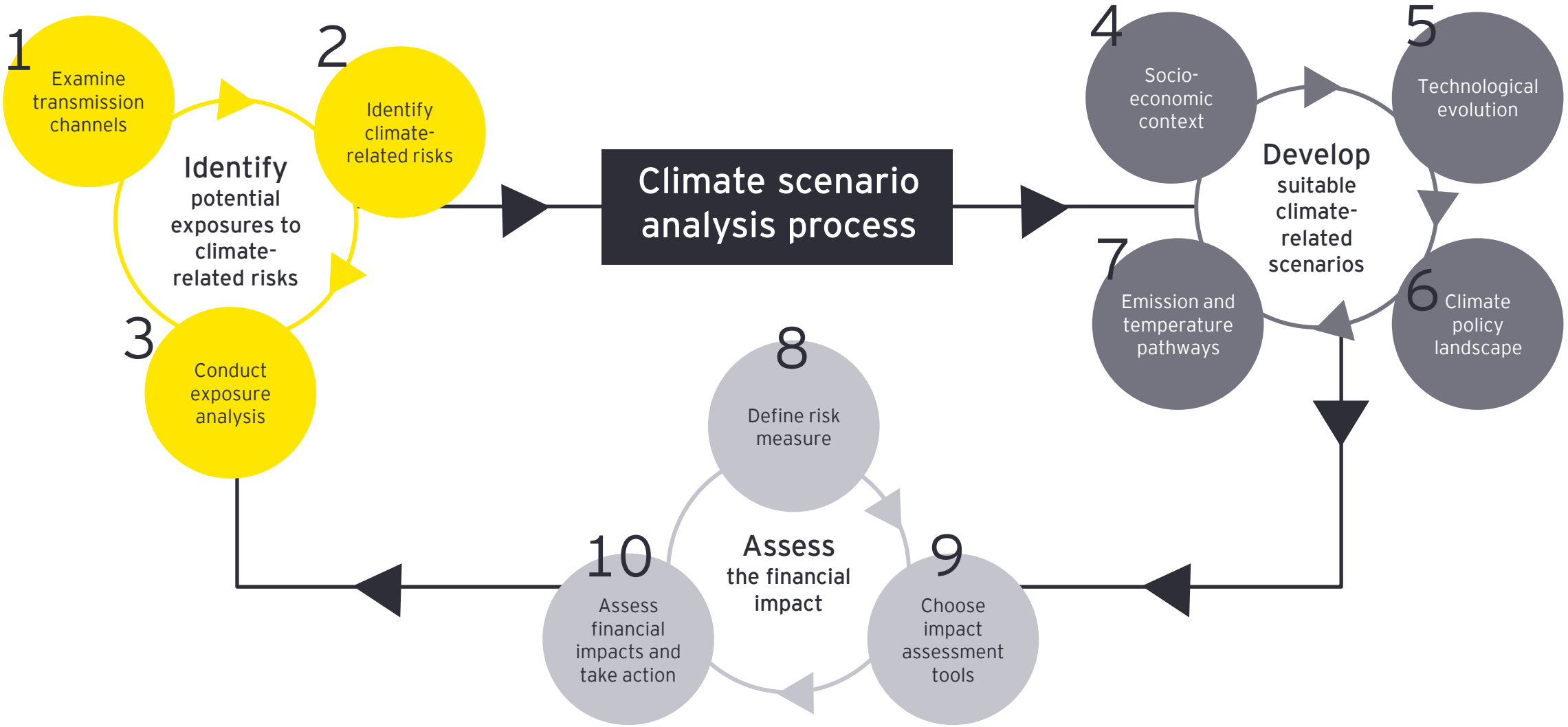
What is scenario analysis?

- Scenario analysis is a **strategic planning tool** to help an organisation understand how it might perform in different future states.
- It is designed to embrace **complexity and uncertainty**, allowing decision makers to evaluate the organisation's flexibility, resilience, or robustness across a range of potential outcomes.
- Scenario analysis is not designed to produce rigid predictions nor irrational futured, but it is **designed to consider possible and plausible alternative futures.**
- In the context of climate change, the **TCFD recommends the use of climate scenario analy**sis to help firms to explore the potential range of climate-related outcomes and analyse the impact of these alternative states of the world on the business in a structured manner, as well as how the business may respond in these circumstances.

> "In a world of uncertainty, scenarios are intended to explore alternatives that may significantly alter the basis for "business-as-usual" assumption.
>
> Task Force on Climate-related Financial Disclosures

Source: Climate Financial Risk Forum Guide 2020, Scenario Analysis Chapter

Climate scenario analysis process



Source: Climate Financial Risk Forum Guide 2020, Scenario Analysis Chapter

Analytical choices involved in scenario analysis

Parameters or Assumptions

Example parameters or assumptions involved in scenario analysis include:

- **Discount rate** to apply to discount future value
- **Carbon price**: the rationale behind the assumptions regarding how carbon price(s) would develop over time (e.g., geographic scope of implementation)
- **Energy demand and mix** across different sources of primary energy and how they develop over time
- **Macro-economic variables**: what GDP rate, employment rate and other economic variables are used

Analytical Choices

Examples of analytical choices involved in scenario analysis include:

- **Scenarios**: selecting scenarios for transition and physical impact analyses
- **Quantitative vs. qualitative**
- **Timing** of implications under scenarios (e.g., on a decadal level)
- **Scope of application**, whether applied throughout the whole value chain or on specific business units

Business Impacts or Effects

Examples of business impact or effects involved in scenario analysis include:

- **Earnings:** impact on earnings and how it is expressed (e.g., EBITDA, dividends)
- **Costs**: implications on operating or production cost and development
- **Revenues:** implications for revenue from key products and services
- **Capital allocation or investments**: implications for CAPEX and other investments by the organisation

Source: TCFD website

How TCFD addresses different organisations' capacity to perform scenario analysis

Development of guidance

TCFD was developed with the understanding that companies have different approaches to climate-related scenario analysis and different disclosure capabilities.

Qualitative disclosure

Most organisations are expected to perform qualitative scenario analyses and will provide more qualitative disclosures.

Robust scenario analysis

To address concerns about burden on smaller organisations, TCFD established a threshold for organisations to consider conducting more robust scenario analysis to assess the resilience of their strategies (organisations with annual revenue greater than US$1b in the four nonfinancial groups).

In-depth consideration on qualitative disclosure

Recommends organisations that may be more significantly affected by transition risk and/or physical risk consider more in-depth, quantitative disclosure around scenario analysis. Organisations may use existing external scenarios or their own, in-house modelling capabilities depending on their planning needs and resources.

Just starting	Gaining experience	Advanced experience
May start with **qualitative scenario narratives or storylines** to help management explore the potential range of climate change implications	Can use **quantitative information** to illustrate potential pathways and outcomes	**Greater rigor and sophistication** in the use of data sets and quantitative models and analysis

Source: TCFD website and 2021 Implementing Guidance

Overview of the process of climate scenario analysis

Supplemental Guidance for non-financial Groups

- Organisation should consider discussing the implications of different policy assumptions, macro-economic trends, energy pathways and technology assumptions used in publicly available climate-related scenarios to assess the resilience of their strategies.
- For the climate-related scenarios used, consider providing information on the following factors to allow investors and others to understand how conclusions were drawn from scenarios analysis:

Critical input parameters, assumptions and analytical choices for the climate-related scenarios used, particularly as they relate to key areas such as policy assumptions, energy deployment pathways, technology pathways and related timing assumptions

Potential qualitative or quantitative financial implications of the climate-related scenarios, if any

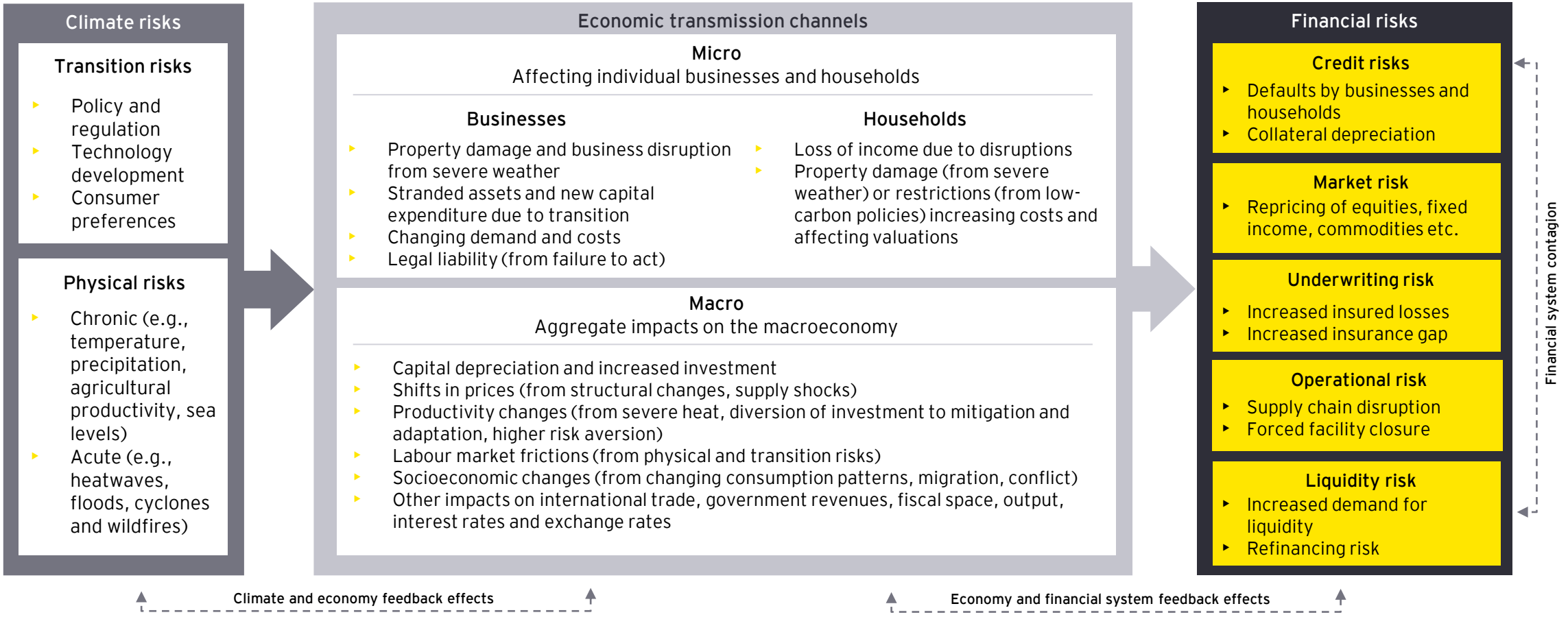
Source: TCFD, 2021 Implementing Guidance

3.2
Types of climate-related risks, risk exposure and materiality assessment

Climate risks could affect the economy and financial system through a range of different transmission channels

Identify potential exposures to climate-related risks

Examine both physical and transition transmission channels.



Source: NGFS Climate Scenario for Central Banks and Supervisors

How transition and physical risk channels could impact businesses now and beyond

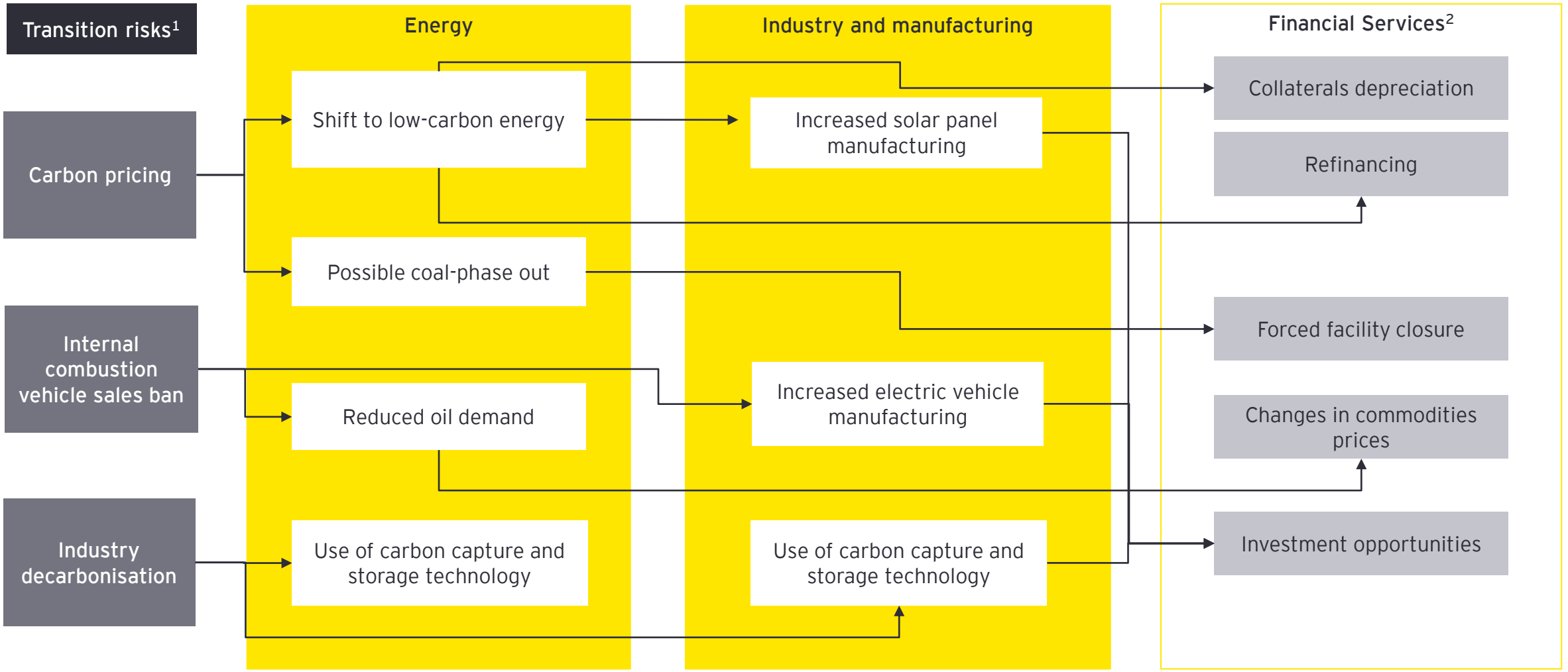
Identify potential exposures to climate-related risks

Examine both physical and transition transmission channels.

Transmission channels	Transition	Physical
Direct	As climate policies penalise fossil fuel production as well as the production and use of emission-intensive goods and services, organisations will face **risks** from: ▸ Stranded assets ▸ Negative movements in bonds and equity valuation ▸ Changes in cash flows ▸ Deterioration in the customer credit risk profile (in the affected sector) In contrast, climate policies will promote organisations involved in the production of goods and services that assist in reducing emissions.	**Corporate balance sheets will be impacted by acute physical events** e.g., precipitation, flood, or wildfire; or by chronic physical effects, e.g., flood risk due to sea level rise. The direct economic impact could be: ▸ Loss of output ▸ Costs of repair
Indirect	**Climate policies will also have broader, indirect consequences** by: ▸ Changing the prices of a broad basket of goods and services ▸ Affecting aggregate patterns of demand and supply	▸ Long-term chronic changes in climate patterns (e.g., sea level and mean temperature rises) as well as the broader impact of extreme events will impact aggregate demand and output. ▸ These broader economic costs may arise from spillovers, such as disruption to a supply chain or support and adaptation costs borne by the sovereign, which would then impact inflation, interest rates and long-term productivity.

Source: Climate Financial Risk Forum Guide 2020, Scenario Analysis Chapter

How actions in one sector may have implications in another



Source: [1]Inevitable Policy Response, UN PRI (2020) ; [2]NGFS Climate Scenario for Central Banks and Supervisors

Complementary approaches that organisations can take to start identifying climate-related financial risks

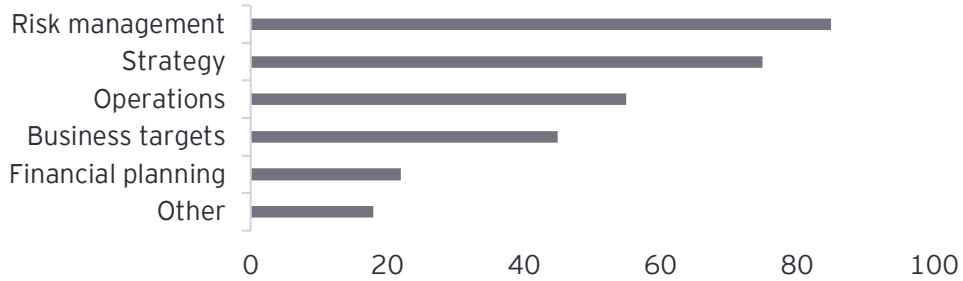
Identify potential exposures to climate-related risks

Identify climate-related financial risks and opportunities

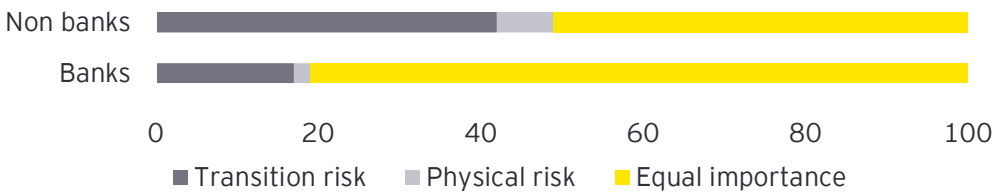
Start from the business profile and risk register of organisations and questions such as **which business areas or risks are vulnerable to the physical effects of climate change or the transition to a low-carbon economy?**[1]

Start with a **future climate scenario and consider how macroeconomic variables** (such as gross domestic product (GDP) and unemployment) used in existing financial risk assessments could be affected.[1]

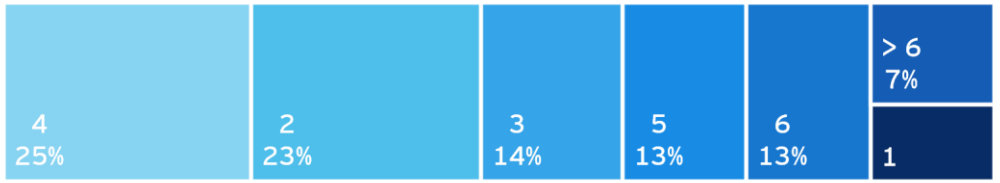
Aspects of business reviewed for climate risks and opportunities[2]



Physical and transition risk – Potential impact[2]



Number of scenarios used, per firm[2]



Commonly used scenarios[2]

IPCC

Public scenarios from the UN Intergovernmental Panel on Climate Change. Scenarios start from projections of global greenhouse gas emissions to derive climate and socioeconomic projections. Data includes atmospheric composition, land use, sea level, among others.

IEA SDS

Sets out an ambitious and pragmatic vision of how the global energy sector can evolve in order to achieve these critical energy-related Sustainable Development Goals (SDGs) .

NGFS

Network for Greening the Financial System (NGFS) scenarios were made available in June 2020 and these will be leveraged for Bank of England 2021 biennial exploratory scenario.

Source: [1]Climate Financial Risk Forum Guide 2020, Scenario Analysis Chapter; [2]GARP GRI, Second Annual Global Survey of Climate Risk Management at Financial Firms

Example from TCFD adopter

Chemical

Example: Orbia, Mexico

Orbia's climate risk identification and assessment

TIME HORIZON	RISK TYPE	CLASSIFICATION	RISK DESCRIPTION	MAGNITUDE OF FINANCIAL IMPACT	REFERENCE/ FURTHER DETAILS
Short term	Physical	Chronic	Increased water stress and drought leading to reduced capacity, resulting in decreased revenues.	Low	CDP response section 2.3 Orbia 2020 Annual Report p. 22, 26, 27, 35, 36, 74, 115
	Transition	Policy and Legal	Carbon pricing mechanisms leading to increased direct costs.	Low	
	Transition	Policy and Legal	Mandates on and regulation of existing products and services (e.g. The AIM Act, which was signed into law in Dec. 2020, and directs EPA to establish limits to production and consumption of HFCs in line with the Kigali amendment), leading to reduced demand for products and services and decreased revenues from HFCs.	Medium - Low	
Medium term	Physical	Acute	Increased severity and frequency of cyclones and floods, leading to reduced capacity and decreased production and revenues.	Medium - Low	

In order to determine physical and transition risks, Orbia conducted a detailed climate risk assessment on its 12 most vulnerable sites, including four from Fluorinated Solutions, seven from Polymer Solutions and one from Building & Infrastructure (as a representative site, and the most vulnerable to climate events of all extrusion sites)

Orbia also include magnitude of the financial impact when assessing risks, thus risk assessment can represent long-term financial outlook of the organisation

Orbia TCFD 2020 Report, https://www.orbia.com/49908e/siteassets/6.-sustainability/tcfd-reports/2020/orbia-2020-tcfd-report.pdf, *accessed October 5, 2022*

3.3
Scenario identification, components and development

Question time

Why do you think it is necessary to consider scenario analysis?

Please use the poll to give your answer

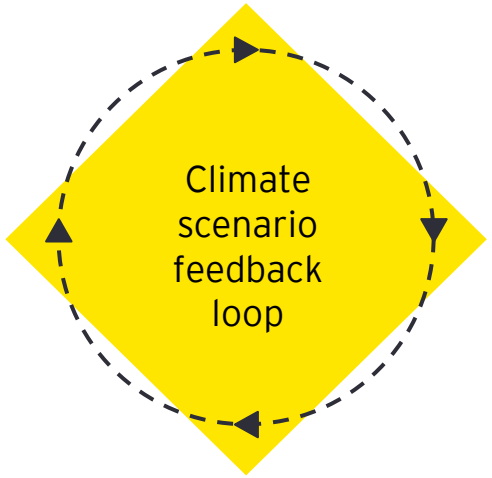
Components of the climate scenarios are interdependent and form feedback loops

Develop suitable climate-related scenarios

Identify feedback loops and interdependencies between the components of climate scenarios

The **socioeconomic context** lays out the scenario backdrop, defining the economy's tolerance for climate change.

The emission pathways represent trajectories of GHG concentrations in the atmosphere. These concentrations result from the interaction of the three previous factors and influence the scale and nature of physical climate impacts. Different pathways reinforce or abate the socioeconomic challenges.



The **climate policy landscape** is represented by policy ambition, which is in large part influenced by socioeconomic challenges.

Technological evolution influences the economy's ability to effect and cope with transition. Policy has an important role in facilitating technological evolution and diffusion.

Organisations may choose to analyse **only one** of these components or may decide that analysis should cover **several of these components.**

This would depend on:

- Context of business decision
- Type of exposures
- Materiality of exposures

Source: Climate Financial Risk Forum Guide 2020, Scenario Analysis Chapter

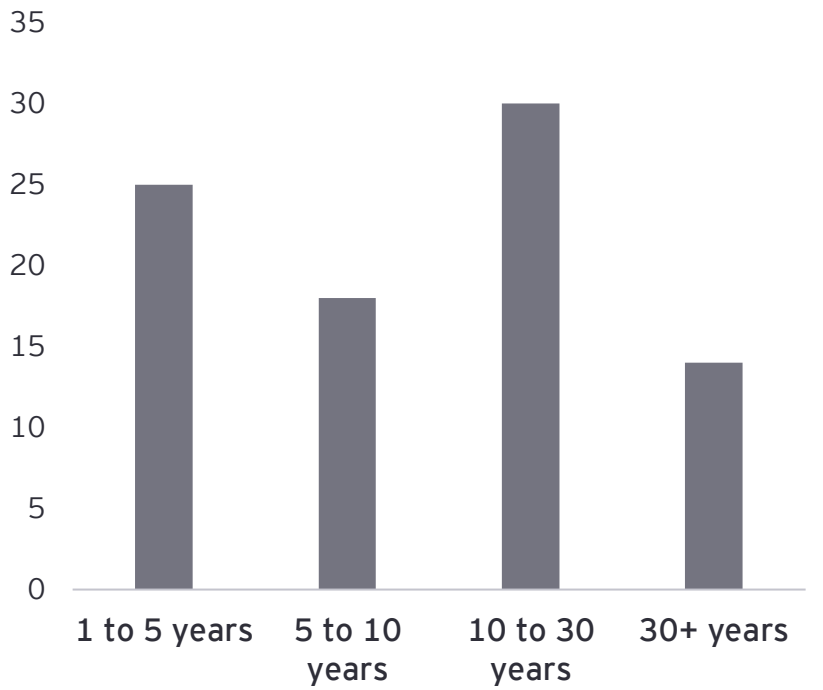
Business decisions where scenario analysis could be appropriate and the likely associated time horizons

Motivation to undertake climate change analysis[1]	Time horizon
Disclosure: TCFD-related	**Long**
Disclosure: public reporting (e.g., Shareholders)	**Medium, long**
Disclosure: public policy advocacy	**Long**
Business decision: underwriting and pricing	**Short**
Business decision: capital	**Short**
Business decision: outwards risk transfer (e.g., reinsurance purchase)	**Short**
Business decision: product development	**Medium, long**
Business decision: business plan	**Medium**
Business decision: risk management, including risk appetite setting	**Medium, long**

- Short term: one to five years, which is the period during which boards typically operate to develop risk appetite, strategy and business plans
- Medium term: five to ten years, which is the period that the viability of new products would need to be tested against
- Long term: ten years or more

Time horizons for scenarios[2]

Most common scenario horizons are one to five years and 10 to 30 years that allow organisation to understand both short- and long-term impacts.



Source: [1]Climate Financial Risk Forum Guide 2020, Scenario Analysis Chapter; [2] GARP GRI, (2020) Second Annual Global Survey of Climate Risk Management at Financial Firms

Scenario analysis: core climate scenario approaches

Scenario data

Determine availability of scenarios in different dimensions:

- **Physical risk and transitional risk:** Assess whether the scenarios cover both types of risk and their level of interaction
- **Assessment of different scenarios:** Use plausible scenarios, including a 2°C scenario and a no-policy scenario
- **Outcome granularity:** Assess applicability of scenario outcomes by sector, geography, etc.

Scenario sources

Option 1: Public Scenarios	Option 2: Internal Scenarios	Option 3: Vendor Scenarios
Developed by scientific community and NGOs to assess climate change from different perspectives, e.g., CD-Links, IEA - Credibility, low cost, transparency - Low granularity of sectors or flexibility	In-house development to obtain risk factors associated to specific sectors and climate metrics - Customisation to organisation - Complex development of assumptions	Robust scenarios to accommodate multiple scenarios and applicability to various sectors - Detailed outputs and visualisation tools - Low standardisation, vendor costs

Scenario examples

Most climate scenarios have been developed by government agencies and academics. Some vendors have developed their own scenarios, whereas others consolidate available scenarios and data to develop modelling and reporting capabilities. Below are some examples:

- **NGFS:** Scenarios were made available in June 2020 and these will be leveraged for the Bank of England 2021 biennial exploratory scenario.
- **IPCC:** Public scenarios from the UN Intergovernmental Panel on Climate Change. Scenarios start from projections of global greenhouse gas emissions to derive climate and socioeconomic projections. Data includes atmospheric composition, land use, sea level, among others.
- **IEA:** The International Energy Agency provides scenario data for different energy sources on a geographical granular level.

Scenario analysis: to build or to buy?

Each organisation faces a basic 'build or buy' choice for climate risk modelling

	Advantages	Disadvantages
Build 1	▸ White-box – The organisation owns the methodology and models and perpetual licence ▸ Better for knowledge transfer to the organisation's team ▸ Potentially better to deal with specific sector needs and low data environments	▸ Limited ongoing external support as fully owned ▸ Initial coverage likely smaller or more focused ▸ Less out-of-the-box features for outputs ▸ Not automated data feeds
Buy 2	▸ Industrial-strength model with full range of features from day 1 ▸ Help line support, version update (incl. scenario updates) ▸ Requires less internal resources for modelling and maintenance	▸ Recurring cost for data-as-a-service subscription ▸ Less room for real-time adjustment of assumptions and parameters, black box models

Example from TCFD adopter

Telecommunication | Example: Vodafone, United Kingdom

Vodafone's climate scenario to access the resilience of the company climate change

1. Early policy action: Smooth transition <2 °C

What it means?

- Early decisive action by society to reduce global emissions
- Coordinated policy action towards low-carbon economy
- Actions sufficient to limit global warming well-below 2°C in line with the Paris Agreement

What is the impact?

- High level of transition risks compared to business as usual scenario
- Physical risks are limited compared to business as usual scenario

2. Late policy action: Disruptive transition <2 °C

What it means?

- Delay in the policy response needed to reduce global emissions
- Severe policy changes required to compensate late start
- Ultimately, global warming is limited to 2°C
- Late, sudden action means that risk velocity is greater

What is the impact?

- Highest level of transition risks compared to other scenarios
- Physical risks are limited compared to business as usual scenario

3. No policy action: Business as usual >3 °C

What it means?

- Governments fail to introduce further policies to address climate change beyond those already known and in place
- Global temperatures increase above 3°C

What is the impact?

- Limited transition risks compared to other scenarios
- Physical risks are highest under this scenario

Vodafone analysed material risks across the three horizons

- Short-term (2020-25)
- Medium-term (2026-35)
- Long-term (2036-50)

Vodafone also used external datasets on climate drivers and internal datasets on their business activity to model the time series of the potential financial impact of material risks under each scenario between 2020 and 2050

Source: Vodafone Group Plc TCFD Report 2021, https://investors.vodafone.com/sites/vodafone-ir/files/2021-05/vodafone-tcfd-report-2021.pdf, accessed on October 9, 2022

Example from TCFD adopter

Energy | Example: Xcel, United States

Testing of climate scenario analysis

	Climate Scenarios	
	Global Commitments: 3 degrees C	**Global Ambitions: Below 2 degrees C**
Transition Scenario Component	International Energy Agency's 2019 World Energy Outlook Stated Policies Scenario	International Energy Agency's 2019 World Energy Outlook Sustainable Development Scenario
Physical Scenario Component	Intergovernmental Panel on Climate Change Representative Concentration Pathway 4.5, as described in the Fourth National Climate Assessment	Intergovernmental Panel on Climate Change Representative Concentration Pathway 2.6, as described in the Fourth National Climate Assessment

Xcel combined scenarios from two different sources titled "Global Commitments and Global Ambitions"

Xcel conducted a holistic climate scenario analysis which required two different types of scenarios: Transition scenario that provides insights into the transition underway of energy sector and physical scenario that translates level of emission to a level of temperature increase and the resulting physical risks, both chronic and acute

The analysis was conducted based on the detailed data and narrative description which underline each scenarios

Xcel also disclosed on how they evaluated each climate scenario using the International Energy Agency's (IEA) 2019 for their evaluation pathway

Source: Managing risks and opportunities in a clean energy future, https://s25.q4cdn.com/680186029/files/doc_downloads/irw/TCFD/Managing-Risks-Opportunities-in-a-Clean-Energy-Future-(TCFD-response).pdf, accessed October 5, 2022

Example from TCFD adopter

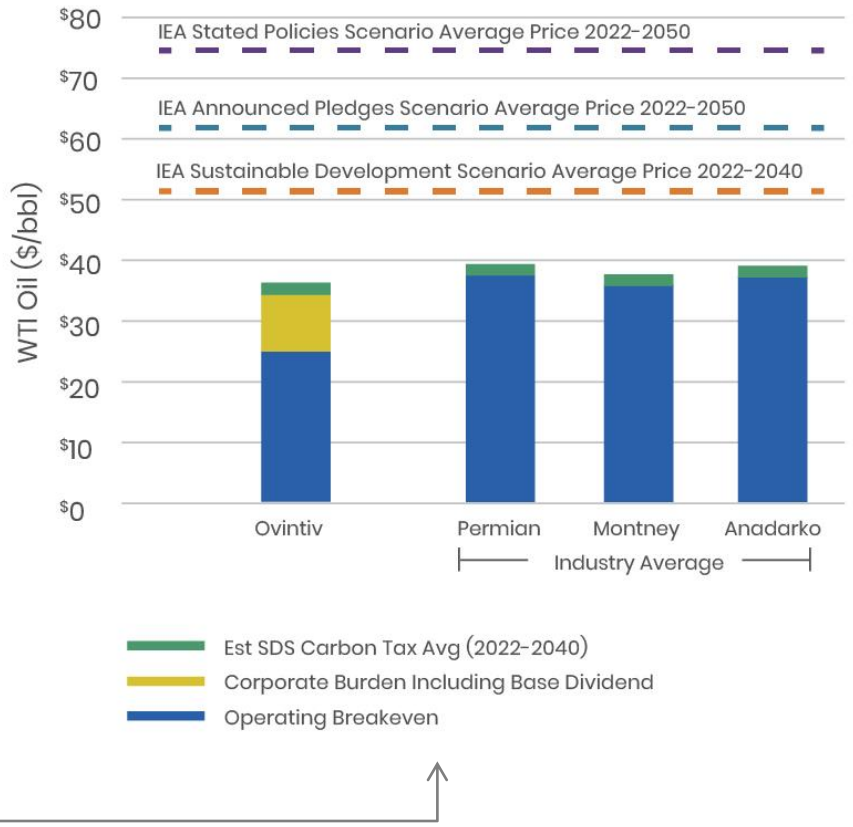
Energy | Example: Ovintiv, Canada

Ovintiv's climate-focused scenario analysis

Ovintiv utilised internal modelling supported in part by International Energy Agency's (IEA) and World Energy Outlook (WEO) to enhance understanding on the future pattern of a changing global energy system. Ovintiv used three scenarios included in the IEA's 2021 outlook including:

1. **Stated Policies Scenario (STEPS)**
2. **Announced Pledges Scenario (APS)**
3. **Sustainable Development Scenario (SDS)**

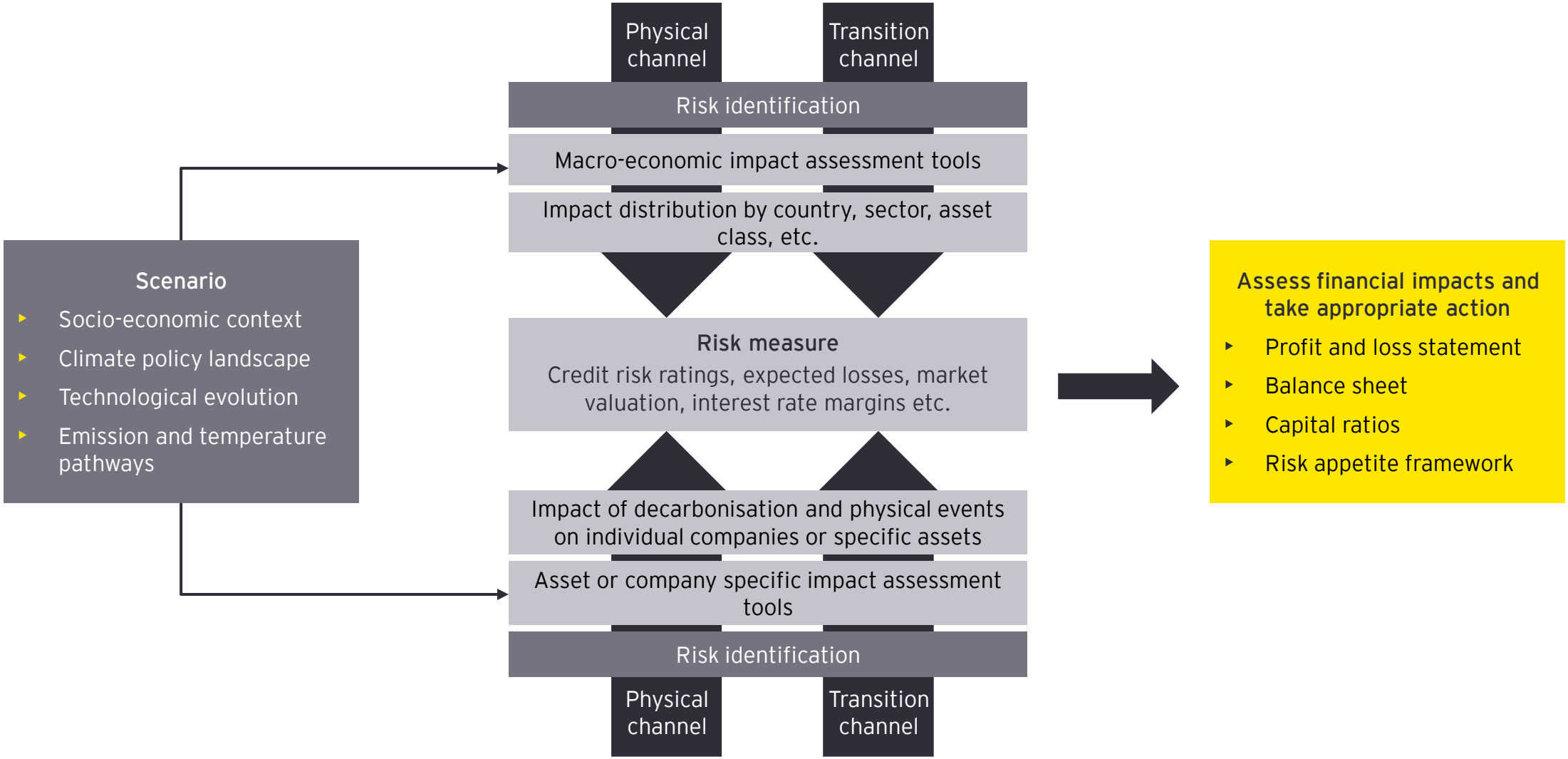
The analysis confirmed the resiliency of their portfolio under a range of possible future climate policy scenarios. Under all scenarios, they expected new well development to continue to yield an economic return as breakeven prices remained lower than forecast prices. Even with the implementation of an escalating carbon tax, the organisation's low-cost, short-cycle portfolio remained competitive.



Source: "Climate-focused scenario analysis", https://sustainability.ovintiv.com/climate-and-tcfd/climate-focused-scenario-analysis/; accessed on October 5, 2022

3.4 Scenario assessment – assessing the financial impact

Approaches for climate scenario assessment



Source: Climate Financial Risk Forum Guide 2020, Scenario Analysis Chapter

Organisations need to measure the impact of climate-related financial risk drivers on their key financial metrics

Assess the financial impact

Define risk measure

Banks, P&U and other companies

Will need to assess how climate-related financial risks can drive variations in their financial earnings and portfolio valuations

Determine the approach for impact assessment

Time horizons

- This depends on the business decision being analysed and the duration of the organisation's exposures
- Shorter-time horizons, therefore, may allow organisations to construct alternative transition scenarios which carry the same physical scenario
- Longer-term horizons may allow organisations to explore a richer combination of both multiple transition and physical outcomes

Baseline

Organisations may choose to assess the impact of climate-related financial risks in one of two ways:

- As a one-off shock to their current portfolio
- As the difference between a central projection and alternative pathways evolving over time

Source: Climate Financial Risk Forum Guide 2020, Scenario Analysis Chapter

Organisations need to select appropriate impact assessment tools to analyse the change in the chosen risk metrics for a given scenario

Assess the financial impact

Choose impact assessment tools

Macro-economic impact assessment tools

- Organisations regularly use these tools to assess the **resiliency of their business model to macroeconomic stresses** in the financial system over the capital planning horizon (~3-5 years).
- These models can be used to **quantify the impact on market and credit risk exposures of both instantaneous and prolonged macroeconomic stresses in the financial system.**
- **Input variables** can typically include GDP, unemployment, interest rates, currency rates and commodity prices, as well as assumptions on asset devaluations (equity prices and credit spreads).
- **Outputs of these approaches** can typically include the P&L impact from an instantaneous market shock, as well as changes in reserve levels to account for increased losses on lending activities.

Asset or company specific impact assessment tools

- Require more **involved analysis and are resource-intensive**, meaning they are typically applicable for **smaller portfolios.**
- **Characterised by high granularity** which considers company- and/or geography-specific idiosyncrasies.
- These tools are likely **to vary more significantly from firm-to-firm**, e.g., banks may use credit rating models, asset managers may use asset allocation models and insurance companies will have models to project natural disasters.

Source: Climate Financial Risk Forum Guide 2020, Scenario Analysis Chapter

Example from TCFD adopter

Manufacturing | Example: SK hynix, South Korea

SK hynix's financial implication and mitigation activities of key climate-related risks

Transition Risks

		Short-term	Medium-term	Long-term	Financial Implications	Mitigation Activities
Policy/ legal	Enhanced GHG emissions regulations and policies	✓	✓	✓	• Increased compliance costs related to climate change policies such as global regulations on GHG emissions and technology, and carbon taxes • Increased cost of purchasing emission permits in K-ETS due to the reduction of national emission allowances allocation coupled with an increased share of auction allowances	• Identify domestic and international climate change policy/ regulatory trends and analyze the potential cost of purchasing emission permits • Establish mid- to long-term GHG reduction goals and action plans
	Unstable electricity supply and increasing electricity prices due to fossil fuel regulations		✓	✓	• Loss caused by production delay/interruption due to unstable power supply • Cost increase due to increased electricity prices	• Build self-generation power facilities at plants in Korea • Install an uninterruptible power supply capable of generating power in the event of a power outage, and introduce a central monitoring system
Techno-logy	Transitioning manufacturing processes and facilities to low carbon technologies	✓	✓	✓	• Increased investment in GHG reduction facilities and energy-efficient equipment and technology • Increased R&D and process improvement costs due to the introduction of low carbon technology	• Reduce GHG emissions and promote energy efficiency by developing high-efficiency scrubbers • Establish mid- to long-term energy reduction goals, and develop and implement annual energy-saving plans • Develop low GWP process gases and process technology through supply chain collaboration
Market	Increasing customer demand for carbon reduction associated with climate change	✓	✓	✓	• Increased costs to meet customer's demands to fulfill RE100 and net zero commitments • Decreased revenue resulting from failing to meet customer demands	• Establish response plans and mid- to long-term strategies for carbon reduction-related demand from customers through the Stakeholder Account Council[1], and strengthen partnerships • Expand renewable energy sourcing through the Green Premium program and REC purchases

Physical Risks

		Short-term	Medium-term	Long-term	Financial Implications	Mitigation Activities
Acute	Heat waves		✓	✓	• Increased costs due to increased use of centrifugal refrigerating machines in manufacturing facilities • Cost increase due to increased use of air conditioners in office buildings	• Improve the efficiency of equipment whose power consumption fluctuates and continuously monitor the power usage • Optimize operational efficiency of fab facilities and room temperature control
Chronic	Rising mean temperatures		✓	✓	• Increased capacity of centrifugal refrigerating machines in new manufacturing facilities • Increased capacity of air conditioning equipment in office buildings	• Reduce cooling costs by designing energy-efficient buildings • Devise and implement improvement measures by monitoring energy consumption

1) As part of our efforts to meet stakeholders' non-financial demands, we seek opportunities to create value with our customers while addressing their needs from a company-wide perspective and working with customers.

SK hynix classified the impacts of key factors identified by the materiality assessment of climate-related risks and opportunities into short/medium/long-term, and reported the financial implications and mitigation activities of each factors

Source: SK hynix, TCFD Report 2022, https://mis-prod-koce-homepage-cdn-01-blob-ep.azureedge.net/web/attach/4325948666031769.pdf, accessed on October 11, 2022

Example from TCFD adopter

Consumer Discretionary | Example: NSK, Japan

NSK's scenario analysis and its impact on financial position

Medium to Long-term future

Classification			Identified Risks		Financial Impact	Short-term		Medium to Long-term	
						Status of NSK Initiatives	Financial Impact	NSK Countermeasures	Financial Impact
Risk	Physical	Acute	Increasingly severe natural disasters caused by climate change*	Production suspension due to in-house flood damage	●	Implementing flood countermeasures	●	• Making regular confirmations using hazard maps, etc. • Implementing appropriate countermeasures against flooding and other risks	Minimal impact
				Supply suspension due to flood damage at suppliers	●	Implementing flood countermeasures	●	• Source diversification of suppliers	Minimal impact
	Transition	Legal	Transition to decarbonization/ electrification	Introduction and strengthening of automobile fuel efficiency regulations and ZEV regulations lowers demand for products geared toward internal combustion engines and transmissions.	●	Developing products	●	• Strengthening development, sales, and production of products for ZEV	●
				Decreased demand for machinery and facilities that produce automotive internal combustion engines and transmissions	●	Developing products	●	• Strengthening product development for machine tools that address the processing of core components that replace automobile internal engines and transmissions and of materials that lower automobile weight, and the electrification of automobile parts	●
			More stringent regulations pertaining to greenhouse gas emissions	Rising carbon prices lead to increased costs for components, raw materials, and energy procurement, and in line with this, higher costs for developing new materials and methodologies, and for capital investments.	●	Reducing CO_2 emissions	●	• Promoting decarbonization in NSK business activities • Employing self-help efforts to cut costs and appropriately reflect in pricing	Minimal impact
		Reputation	Increasingly sophisticated decarbonization requests from customers	Rising development costs and capital investments for decarbonization, as well as stagnation of efforts results in reduced credibility and not being selected by customers.	●	Reducing CO_2 emissions	●		Minimal impact

Degree of Negative Impact		Degree of Positive Impact	
small	●	small	●
medium	●	medium	●
large	●	large	●

- NSK disclosed the financial impacts, indicated as the table above, over medium to long-term horizon. When there is almost no impact, it is indicated as "Minimal impact"

- These climate scenarios are created based on 1.5°C to 2°C scenario
- In estimating the financial impact, the risk of inundation, the number of days of outages and damage due to inundation, and the projected carbon tax price are calculated using data published by public agencies

Source: NSK, Information disclose based on TCFD recommendation, https://www.nsk.com/sustainability/TCFD/, accessed on October 9, 2022

Example from TCFD adopter

Automobile and components | Example: Renault, France

Renault's climate-related risks and its impact on business activity

TRANSITION RISKS	SHORT-TERM (< 2030)	MEDIUM-TERM (2030-2040)	LONG-TERM (2040-2050)	DESCRIPTION AND IMPACT ON THE GROUP'S PERFORMANCE
REGULATORY AND COMPLIANCE RISKS	⊗	⊗		CO_2 emissions regulations for vehicles are frequently updated to apply increasingly stringent standards. In Europe, the CAFE emissions target of 95g CO_2/km for new passenger cars as of 2020 was adjusted in 2021 to apply the WLTP standard. In the event of non-compliance, a penalty payment of 95 euros per excess gram per vehicle sold is due. Based on current sales volumes, each excess gram of CO_2/km would incur a penalty of approximately €120 million. Regulatory changes may also introduce traffic bans or restrictions for certain vehicles. These changes may impact R&D costs and/or production costs, arising from the need to adapt our vehicles to the new standards.
TECHNOLOGY RISKS	⊗	⊗		The Group is building its offering around lesser-polluting vehicles, in particular by expanding electric vehicle ranges and designing hybrid solutions for internal combustion engines. The introduction of these technologies, which offer different performances in terms of cost, customer service and CO_2 emissions, may not match the market's expectations and pace of growth. CO_2e emissions reduction targets will also entail the adjustment of industrial processes and the rollout of low-carbon production technologies in the short and medium terms. The necessary modernization of plants to increase their energy efficiency may push up production and R&D costs.
RISKS RELATED TO MARKET CHANGES	⊗	⊗	⊗	Combined with regulatory changes, the transition to a low-carbon economy may bring about behavioral changes among consumers, such as a shift toward smaller or more energy-efficient vehicles or toward shared mobility, more quickly than anticipated. A mismatch between the product/service offering and consumer expectations would expose the Group to a decline in revenues.

PHYSICAL RISKS	SHORT-TERM (< 2030)	MEDIUM-TERM (2030-2040)	LONG-TERM (2040-2050)	DESCRIPTION AND IMPACT ON THE GROUP'S PERFORMANCE
EXTREME WEATHER EVENTS/NATURAL DISASTERS		⊗	⊗	Some extreme weather events may disrupt or, in more serious cases, temporarily interrupt the activity of a number of the Group's production and logistics facilities. An increased frequency or intensity of floods, hurricanes or droughts, combined with higher temperatures and sea levels, can push up risk prevention and maintenance costs, as well as insurance premiums.
RESOURCE SCARCITY	⊗	⊗	⊗	The increasing scarcity of some natural resources, such as water, may directly impact the automotive industry. It may oblige the Group to make investments to reduce its consumption or pay financial compensation to residents living near production facilities or to local communities. Furthermore, the use of new raw materials such as cobalt may generate upward price pressure, as sales of electrified vehicles steadily grow.
STRUCTURAL GEOGRAPHIC AND GEOPOLITICAL CHANGES		⊗	⊗	Climate change may lead to structural and geopolitical changes in certain regions. Because the Group has many sites around the world, this could directly impact its activity. Instability in one region or country could require the Group to adjust its industrial strategy. Regional and geopolitical instability can also create weaknesses in the supply chain ecosystem and oblige the Group to reorganize its value chain, pushing up purchase costs.

- Renault analysed climate-related risks into two categorised: transition risks and physical risks. It also included information on the potential impact on business activity and supply chains from short-term horizon to long-term horizon.
- Renault also evaluated the impacts on the company's financial statement (e.g., R&D cost, revenue, production cost, maintenance cost)

Source: Renault climate report 2021, https://www.renaultgroup.com/wp-content/uploads/2021/04/220421_climate-report-renault-group_8mb.pdf, accessed on October 9, 2022.

Q&A

Our contact details

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