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- 1. What is scenario analysis?**
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A4S

CFO LEADERSHIP NETWORK

TCFD CLIMATE SCENARIO ANALYSIS

**A guide for finance teams on
frequently asked questions**



THE PRINCE OF WALES'S
CHARITABLE FUND



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INTRODUCTION

The Task Force on Climate-related Financial Disclosures (TCFD) recommendations were published in 2017 to establish a consistent global standard for climate-related financial risk disclosures, covering both the financial and non-financial sectors. It is now the most widely recognised international initiative for businesses to assess and report the impacts of climate change.

Scenario analysis, a key recommendation of the TCFD, allows a company to understand and quantify the risks and uncertainties it may face under different hypothetical futures. It helps in decision making and allows businesses to shape their strategy. In the light of scenario analysis outcomes, businesses can focus on those key risks and opportunities that most materially impact their business models. This, in turn, allows them to develop their mitigation plans and respond appropriately to these risks through strategic decisions.

Performing scenario analysis can be a challenging and demanding task due to the complexities that it carries. Climate scenarios are particularly challenging given the timescale, complexity of the scientific models, and the multi-faceted nature of consequences of each scenario require real skill and judgment to help simplify and focus on the key elements. As scenario analysis is highly analytical and modelling-based, the commitment and involvement of finance teams from the outset is critical. Finance teams bring the skillset that is required to understand the modelling process and to help businesses embed and translate the scenario analysis outcomes into strategic decisions.

We have produced the following frequently asked questions (FAQs) to help finance teams enhance their knowledge of scenario analysis and to guide them through the process. This guide is based on our work with companies across multiple sectors and the insights we have gained supporting TCFD implementation since its inception.

The guide is mainly aimed at non-financial companies and the questions that are addressed within this guide are:

- 1. What is scenario analysis?**
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Although scenario analysis may appear challenging at first, the most important thing is to start somewhere and to develop your capabilities as you gain experience. In addition to this FAQs guide, you can find additional TCFD guidance on the [A4S website](#) and also on the [TCFD Knowledge Hub](#). It is also important to note that climate scenarios continue to evolve. These FAQs provide guidance available as of the date of publication.



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WHAT IS SCENARIO ANALYSIS?

Scenario analysis is a process of examining and evaluating possible future events and is used in a forward-looking assessment of risks and opportunities. A scenario is a hypothetical construct that describes a path of development leading to a particular future outcome. Scenarios are not forecasts or predictions, and do not provide a full description of the future, but rather highlight central elements of a possible future.

Scenario analysis is a very useful tool to assist critical strategic thinking. It can be used to test the conventional idea of the future by offering different possible alternatives. Its use in a climate change context is increasingly useful as it helps organizations understand how potential climate risks and opportunities could evolve and impact their business.

The use of climate scenarios is recommended by the Task Force on Climate-related Financial Disclosures (TCFD) as a tool to identify and assess how various combinations of climate-related risks may affect organizations and their financial performance.

The TCFD recommendations specifically recommend that organizations consider a set of scenarios, including a '2°C or lower scenario' in line with the 2015 Paris Agreement. This low-carbon scenario is centred on 'transition' risks and looks at the rapid changes (policy, technology, market and reputational risks) that will be needed to cut emissions in line with the Paris Agreement. Organizations also conduct 'physical' risks scenarios that focus on risks, such as temperature rise, sea level rise, and changes to the frequency and severity of extreme weather events, including droughts and storms.

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WHY SHOULD BUSINESSES CONDUCT SCENARIO ANALYSIS?

Scenario analysis has been used by businesses since the 1970s to inform their strategy and for stress testing purposes. However, its application to model climate-related issues is relatively recent. Predicting the exact timing and scale of physical climate change risks is impossible, although we know that they are most likely to manifest in the medium to longer term. This uncertainty makes it difficult for organizations to understand the potential impacts of climate change on their business performance. It is critical for organizations to evaluate the business implications of climate-related risks and opportunities to be able to shape future strategic thinking and to design appropriate risk management strategies in response to these risks.

Scenario analysis is a well-established tool used by business for the following reasons:

- It provides a holistic view of the various possibilities that the future can offer.
- It allows a better analysis of the circumstances and evolutions of the different future states being explored.
- It provides a logical and transparent process to manage and communicate complex issues.
- Scenario analysis assists in better planning and establishing action plans. Trigger points can be used in deploying strategy in a more meaningful way.
- It allows business to stress test their current strategy against various future outcomes and allows more rapid responses in case of future shocks.
- It can also aid capital allocation by testing portfolios of assets and investment opportunities and identify weakness.

Fundamentally, scenario analysis allows organizations to test their current strategies against a set of scenarios, which allows them to develop contingency plans in response to possible future risks and opportunities.

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WHAT ARE THE DIFFERENT SCENARIOS THAT BUSINESSES CAN CONSIDER?

Climate-related scenarios have been used by scientists and policy analysts to assess future vulnerability to climate change. Producing these scenarios requires estimates of future population levels, economic activity, the structure of governance, social values, and patterns of technological change. Economic and energy modelling also are often used to analyse and quantify the effects of such drivers in climate change.¹

Scenarios can broadly be assigned into two categories:

Scenario 1

Those that articulate different policy outcomes (ie level of temperature increase) and the energy and economic pathways that would result, with some probability, in achieving temperature increases around the desired outcome (transition scenarios).

The International Energy Agency (IEA) scenarios follow this approach.

Scenario 2

Those that start with a range of atmospheric greenhouse gas (GHG) concentration and articulate the likely resulting temperature ranges.

For example, the IPCC uses this method to develop scenarios pathways to describe different climate futures.

These are based on the volume of GHGs emitted in the years to come.

1. TCFD Technical Supplement: The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities (p. 12)



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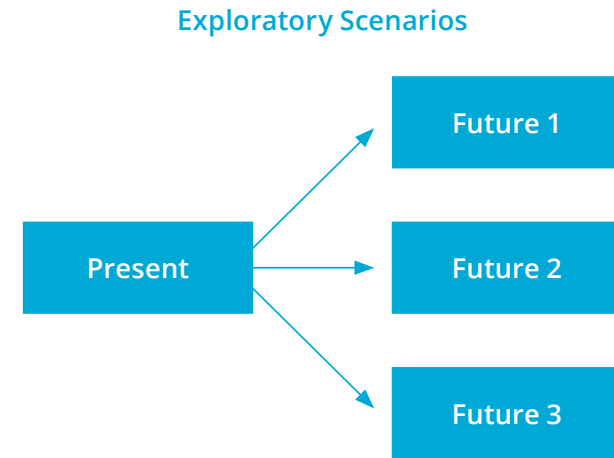
EXPLORATORY AND NORMATIVE SCENARIOS

Scenarios can either be exploratory or normative as shown:

Exploratory scenarios

Exploratory scenarios examine a range of plausible futures, based on potential trajectories of economic, social and physical drivers. These scenarios describe how the future might unfold, according to known processes of change or as extrapolations of past trends. Exploratory scenarios can be used for high-level problem identification and to determine potential climate-related risks and uncertainties that could arise from different plausible future states. For example, IPCC scenarios account for the current level of GHG concentration in the atmosphere and model how that could change over the years resulting in different levels of temperature change.

Companies can use a combination of both exploratory and normative scenarios. However, TCFD guidance recommends an exploratory approach where organizations focus on a range of scenarios spanning a number of plausible futures. With an increasing expectation for firms to demonstrate a forward-looking understanding of climate-related risks, a new climate-related metric that several institutional investors have begun to use and disclose is implied temperature rise (ITR).³ An ITR metric attempts to estimate a global temperature rise associated with the greenhouse gas emissions of a single entity (eg a company) or a selection of entities (eg those in a given investment portfolio, fund, or investment strategy). ITR metrics provide an exploratory scenario that aims to provide a forward-looking view of carbon exposure that can be applied to a wide range of industries, companies, and asset classes



Different pathways leading to different plausible futures

Representation of exploratory scenarios²

2. TCFD's Guidance on Scenario Analysis for Non-Financial Companies (p. 16)



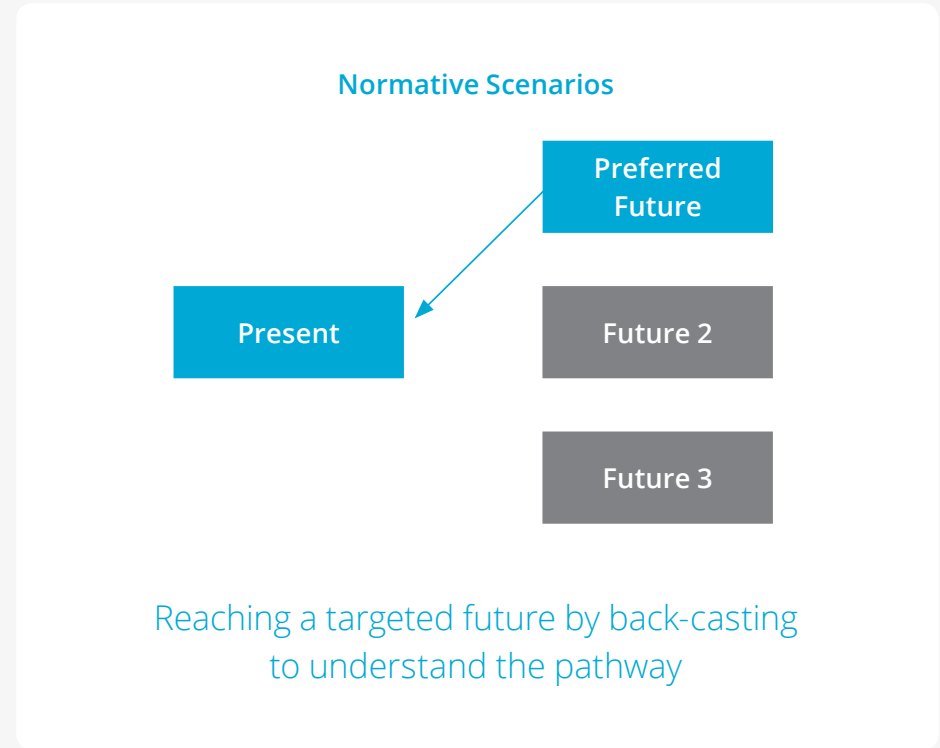
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EXPLORATORY AND NORMATIVE SCENARIOS

Normative scenarios

Normative scenarios describe a prespecified future, presenting a future state that is achievable (or avoidable) only through certain actions. The scenario then back-casts plausible pathways from this specified future state to the present in order to inform decisions on what is needed to achieve that preferred future. Examples of normative climate-related scenarios are those targeting net-zero emissions in 2050. Normative scenarios are typically used for assessment and setting of specific targets and implementation plans, rather than assessment of climate-related risks and uncertainties.



Representation of normative scenarios²

3. TCFD Consultation | Forward-Looking Financial Sector Metrics (p. 7)



TCFD Climate Scenario Analysis
A GUIDE FOR FINANCE TEAMS ON FREQUENTLY ASKED QUESTIONS

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PHYSICAL AND TRANSITION RISKS

There are different exploratory climate scenarios that an organization may consider based on the impacts or risks that it is trying to assess. The TCFD recommends looking at two different categories of risks associated with climate change:

1. Transition risks arising from the society's transition into a low carbon economy and
2. Physical risks arising from changes in global climate.

Transition risks and climate scenarios

Scenario analysis can be used to assess transitional risks. Scenario pathways that are designed to deliver a defined limit to warming are commonly referred to as 'transition scenarios'. They typically present plausible assumptions about the development of climate policies and the deployment of 'climate-friendly' technologies to limit GHG emissions. Transition scenarios draw conclusions, often based on modelling, about how policy and technology regarding energy supply and GHG emissions interact with economic activity, energy consumption, and GDP among other key factors. These scenarios can reflect a faster or slower transition depending on different rates of change of key parameters (eg the rate of technology development and deployment; changes and timing of key policies; etc). The IEA and others produce a number of transition scenarios.

Transition risks can translate into potential financial impacts in the following ways:

Type	Climate-Related Risks ⁵⁶	Potential Financial Impacts
Transition Risks	Policy and Legal <ul style="list-style-type: none"> - Increased pricing of GHG emissions - Enhanced emissions-reporting obligations - Mandates on and regulation of existing products and services - Exposure to litigation 	<ul style="list-style-type: none"> - Increased operating costs (e.g., higher compliance costs, increased insurance premiums) - Write-offs, asset impairment, and early retirement of existing assets due to policy changes - Increased costs and/or reduced demand for products and services resulting from fines and judgments
	Technology <ul style="list-style-type: none"> - Substitution of existing products and services with lower emissions options - Unsuccessful investment in new technologies - Costs to transition to lower emissions technology 	<ul style="list-style-type: none"> - Write-offs and early retirement of existing assets - Reduced demand for products and services - Research and development (R&D) expenditures in new and alternative technologies - Capital investments in technology development - Costs to adopt/deploy new practices and processes
	Market <ul style="list-style-type: none"> - Changing customer behavior - Uncertainty in market signals - Increased cost of raw materials 	<ul style="list-style-type: none"> - Reduced demand for goods and services due to shift in consumer preferences - Increased production costs due to changing input prices (e.g., energy, water) and output requirements (e.g., waste treatment) - Abrupt and unexpected shifts in energy costs - Change in revenue mix and sources, resulting in decreased revenues - Re-pricing of assets (e.g., fossil fuel reserves, land valuations, securities valuations)
	Reputation <ul style="list-style-type: none"> - Shifts in consumer preferences - Stigmatization of sector - Increased stakeholder concern or negative stakeholder feedback 	<ul style="list-style-type: none"> - Reduced revenue from decreased demand for goods/services - Reduced revenue from decreased production capacity (e.g., delayed planning approvals, supply chain interruptions) - Reduced revenue from negative impacts on workforce management and planning (e.g., employee attraction and retention) - Reduction in capital availability

Examples of Climate-Related Transition Risks and Potential Financial Impacts⁴

4. **Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures** (p. 72)



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PHYSICAL AND TRANSITION RISKS

Physical risks and climate scenarios

Climate scenarios help in assessing physical risks by projecting patterns of physical impacts attributable to climate change. They typically present the results of global climate models (referred to as 'general circulation models') that show the response of the Earth's climate to changes in atmospheric GHG concentrations. IPCC scenarios based on 'Representative Concentration Pathways' (RCPs) are examples of physical climate change scenarios adopted by the IPCC in its 5th Assessment Report. These look at potential local-level changes in climate such as flooding or drought that can lead to loss of crop production or famine.

Physical risks can translate into potential financial impacts in the following ways:

Type	Climate-Related Risks ⁵⁵	Potential Financial Impacts
Physical Risks	Acute	<ul style="list-style-type: none"> - Reduced revenue from decreased production capacity (e.g., transport difficulties, supply chain interruptions) - Reduced revenue and higher costs from negative impacts on workforce (e.g., health, safety, absenteeism) - Write-offs and early retirement of existing assets (e.g., damage to property and assets in "high-risk" locations)
	<ul style="list-style-type: none"> - Increased severity of extreme weather events such as cyclones and floods 	
Physical Risks	Chronic	<ul style="list-style-type: none"> - Increased operating costs (e.g., inadequate water supply for hydroelectric plants or to cool nuclear and fossil fuel plants) - Increased capital costs (e.g., damage to facilities) - Reduced revenues from lower sales/output - Increased insurance premiums and potential for reduced availability of insurance on assets in "high-risk" locations
	<ul style="list-style-type: none"> - Changes in precipitation patterns and extreme variability in weather patterns 	
	<ul style="list-style-type: none"> - Rising mean temperatures 	
	<ul style="list-style-type: none"> - Rising sea levels 	

Examples of Climate-Related Physical Risks and Potential Financial Impacts⁵

5. Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures (p. 72)

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WHAT FACTORS SHOULD BE CONSIDERED WHILE SELECTING SCENARIOS?

Several factors need to be considered while developing scenarios, for example (1) the scope and areas of focus, (2) the time horizon, (3) the number of scenarios being considered, and (4) the sources of these scenarios.

Scope of the analysis

As per the TCFD guidance, organizations need to consider how climate-related risks and opportunities impact their business to be able to appropriately incorporate the potential effects of climate change into their planning processes and strategic decision making. Hence, scenario analysis should ideally encompass the organization as a whole, including its supply and distribution chains. However, it is very difficult for an organization to assess in detail the impact of climate change on all its business areas by conducting one cycle of scenario analysis. Rather, prioritising its key business areas and conducting the process in a phased approach over a number of years will allow the organization to (1) adequately focus on material high risk areas hence ensuring depth as well as breadth of the analysis and, (2) embed the scenario analysis results into its diverse business processes in a systematic manner.

The phased approach can be based on geographies, business units, asset classes or even product lines such that at the end of the multi-year exercise, the organization has been able to address climate risk exposures across all its operations and value chain. TCFD recommends that organizations should determine materiality for climate-related issues consistent with how they determine the materiality of other risks. The finance team can play a very key role in helping the business conduct this materiality assessment and in defining the scope of scenario analysis.

Time horizon

Scenarios describe a future outcome at a particular point over a time horizon. There is a trade-off involved when choosing the appropriate time horizon. If it is too short, developments may not be sufficiently differentiated whereas if it is too long, uncertainties may overwhelm useful analysis. An equilibrium needs to be met such that the time horizons result in outcomes that are plausible, realistic and can translate into strategic actions for the organizations.

Time horizons usually depend on the objective of the scenario analysis, with shorter ones being useful to analyse risks over typical business planning periods or to assess regulatory capital requirements. Longer time horizons are useful to gauge exposures to structural changes in the economy, financial system or society and usually carry higher levels of uncertainty.

While setting climate-related time horizons, companies should expand their analysis beyond their traditional planning periods to capture the impacts of climate change fully. The TCFD's recommendations do not specify time frames for short, medium, and long term given that the timing of climate-related impacts on businesses will vary. Instead, the TCFD recommends organizations to define time frames according to the life of their assets, the profile of the climate-related risks they face, and the sectors and geographies in which they operate.



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WHAT FACTORS SHOULD BE CONSIDERED WHILE SELECTING SCENARIOS?

Number of scenarios selected

Multiple scenarios allow a company to analyse the impacts of diverse sets of assumptions that result in different outcomes. This allows the organization to assess a range of outcomes, thereby developing a better understanding of its potential risk exposures and opportunities.

Many companies start with two scenarios, usually at opposite spectrums of temperature outcomes. This is usually simple to understand and easier to build. However, most scenario methodologies recommend three or four scenarios. Multiple scenarios allow a company to explore how different sets of assumptions can result in very different outcomes. These different outcomes allow a better and more informed assessment across a wider range of potential risks, opportunities, and uncertainties.

TCFD recommendations do not stipulate a suggested number of scenarios, but rather ask companies to disclose strategy resilience informed by 'different climate-related scenarios, including a 2°C or lower scenario'. This guidance suggests that companies, irrespective of the number of scenarios selected, should still look at a low-carbon transition scenario.

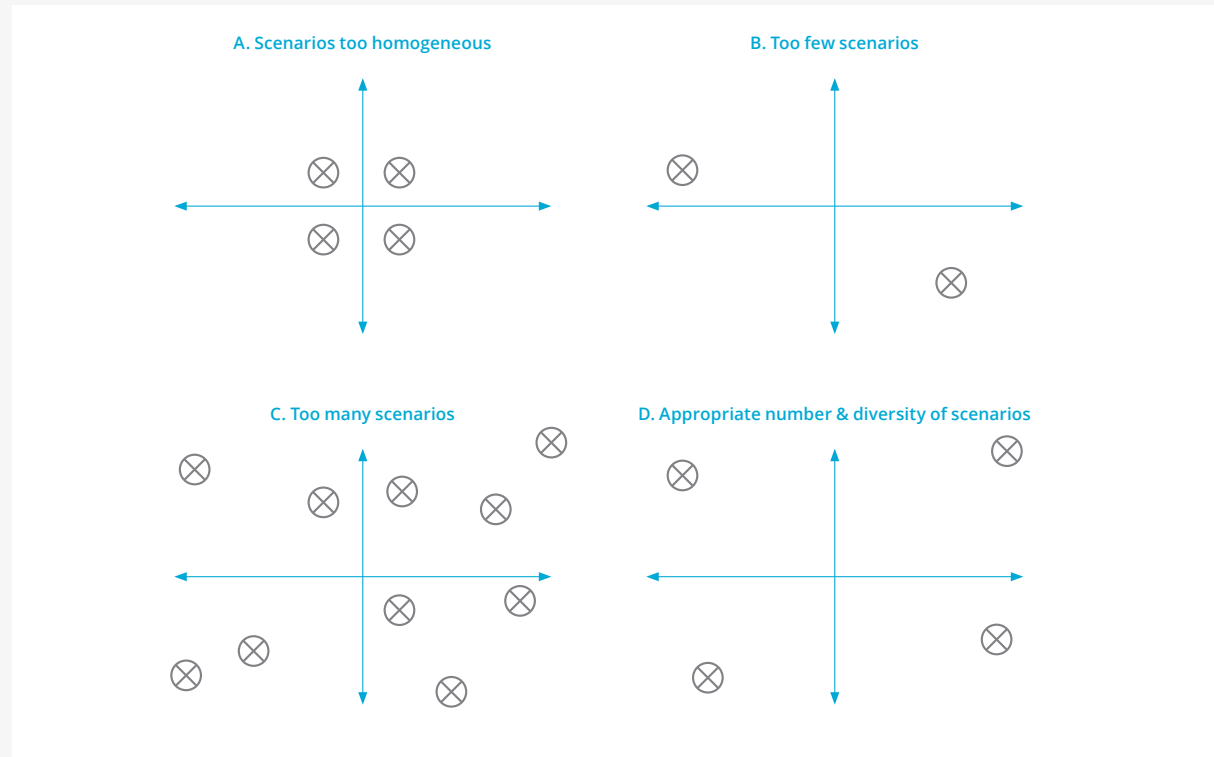


Illustration of the variations in number and type of scenarios. The vertical and horizontal axes represent different drivers used to construct the scenario.⁶

6. TCFD's Guidance on Scenario Analysis for Non-Financial Companies (p. 74)



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WHAT FACTORS SHOULD BE CONSIDERED WHILE SELECTING SCENARIOS?

Sources of scenarios

Companies tend to use either existing publicly available scenarios (e.g., IPCC, IEA, NGFS⁷ or other published scenarios) or develop their own scenarios. They may sometimes use a combination of both.

Publicly available scenarios are typically developed by international research or policy groups. Such scenarios include useful information about plausible pathways for emissions, physical climate change, environmental impacts, and socioeconomic conditions. They are based on extensive analysis and modelling of key factors such as demography, energy demand projections, emission pathways, carbon budgets and policy and technology assumptions. However, they may sometimes be very academic and too global and will need to be adapted to provide sufficient sector analysis or company specific outcomes.

An organization may therefore choose to develop its own set of climate-related scenarios to address the company-specific risks and opportunities that it faces over a time horizon that suits its requirements. Developing in-house scenarios however require multiyear organizational commitment as well as external expertise.



FINANCE TOP TIPS

The finance team can provide valuable input in the scenario selection process. Identifying the material risk areas for scenario analysis requires the understanding and access to financial data. Finance is the gatekeeper to accurate and robust data, and the finance team can validate the integrity of the underlying inputs to the model. Their financial skillset can also help in assessing the various sources of scenarios before finalising whether they will adopt publicly available scenarios, or they will develop them in-house. If the latter option is chosen, the process will most naturally sit within the finance team's remit given their regular interaction with modelling exercises. If publicly available scenarios are chosen, finance professionals can still play a role in analysing the assumptions and their respective impacts to be able to make the right selection. Developing in-house scenarios requires multiyear organizational commitment and sufficient transparency around the process and content and description of the scenarios to meet investor requirements. As a starting point, to promote transparency and comparability, companies may choose to use public scenarios before progressing to a more tailored, company-specific scenario process.

7. [NGFS Scenarios Portal](#)



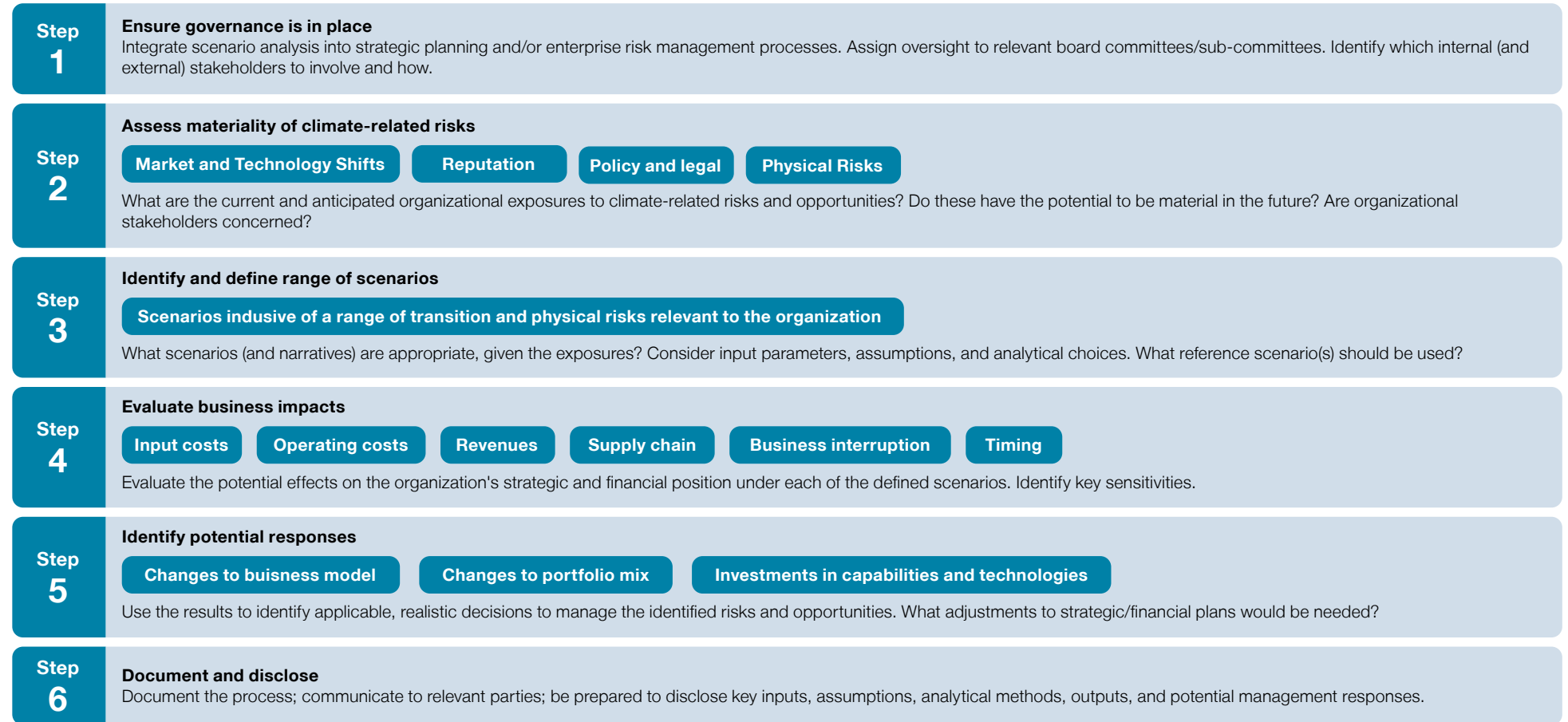
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WHAT ARE THE DIFFERENT STEPS INVOLVED IN DEVELOPING SCENARIO ANALYSIS?

TCFD recommends a six-step framework for developing scenario analysis for evaluating climate-related risks and opportunities, as shown below. The following pages break down the six-step framework.



Six-step framework for developing scenario analysis recommended by TCFD.⁸

8. TCFD Technical Supplement: The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities (p. 7)

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STEP 1 ENSURE GOVERNANCE IS IN PLACE

The first step in developing scenario analysis is to build and improve the level of awareness about climate change and associated risks among the board members and senior management. This involves informing and educating them on the ways in which climate change risks manifest and impact the business and the organization. This information should then be disseminated across those important business lines and corporate functions that would be instrumental to the scenario analysis process. These include risk management, finance, CSR and environment teams, investor relations, commercial teams, procurement and marketing.

The scenario process needs a well-defined governance framework and clear reporting lines to senior levels. Ideally, the scenario process would report to the CEO as a critical strategic function.⁹ A steering group consisting of relevant C-suite executives can be set up to oversee the scenario process. The board should be kept informed of the progress of the process to ensure it is in line with the company's other policies such as the climate change policy. Top leadership support and sponsorship are key pre-requisites contributing to the success of the whole process.

Once the sponsorship and commitment from leadership team have been established, it is important to align management and functional leaders to promote ownership and accountability. A core internal team, with representation from all relevant functions, should be set up to own and deliver the scenario analysis process.

External stakeholders such as investors, bankers or auditors may also be usefully consulted in the development process. Additional insights may also be gained from insurance partners and the pension fund management team.

9. TCFD's Guidance on Scenario Analysis for Non-Financial Companies (p. 10)



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STEP 2 ASSESS MATERIALITY OF CLIMATE-RELATED RISKS

Before formulating scenarios, it is important for a company to understand its climate risk exposures and use the process of materiality assessment to prioritize these risks. As companies may not be able to address all the risks initially, a materiality assessment is an important tool to optimize resource allocation.

The TCFD cautions organizations against prematurely concluding that climate-related risks and opportunities are not material based on perceptions of the longer-term nature of some climate-related risks. Each organization faces company-specific and sector-specific climate-related risks and opportunities. Business impacts may also vary significantly depending on various factors such as the geographic location of the organization and its supply chain, its business model, its target market as well as its stakeholders.

While assessing the materiality of climate-related risks points to consider include:

- The areas of the business impacted by climate risks.
- The evolution and likelihood of these risks and their financial impacts over time.
- The possible outcomes caused by climate risks.

There are many methods to identify relevant climate risks, trends, driving forces, and related uncertainties. For example, Social, Technology, Economic, Environmental, and Policy (STEEP) analysis can be applied at local, national, or global levels to identify relevant drivers.

The TCFD provides a summary of the typical categories of climate-related driving forces that an organization should consider when assessing climate-related risks. These include:

MARKET AND TECHNOLOGY SHIFTS

Policies and investments to deliver a low carbon emissions economy.

- Reduced market demand for higher carbon products/commodities
- Increased demand for energy-efficient, lower-carbon products and services
- New technologies that disrupt markets

REPUTATION

Growing expectations for responsible conduct from stakeholders, including investors, lenders, and consumers.

- Opportunity to enhance reputation and brand value
- Risk of loss of trust and confidence in management

POLICY AND LEGAL

An evolving patchwork of requirements at International, national, and state level.

- Increased input/operating costs for high carbon activities
- Threats to securing license to operate for high carbon activities
- Emerging concern about liabilities

PHYSICAL RISKS

Chronic changes and more frequent and severe extremes of climate.

- Increased business interruption and damage across operations and supply chains with consequences for input costs, revenues, asset values, and insurance claims

FINANCE TOP TIPS

The finance team is invaluable in this process by:

1. Providing the financial data required to conduct the materiality assessment,
2. Understanding and assessing the evolution and likelihood of the risks and
3. Analysing the possible outcomes caused by the risks on the various areas of the business.

Finance professionals can also ensure that the assumptions are in line with other financial processes, such as long-term forecasts or the viability statement.



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STEP 3 IDENTIFY AND DEFINE RANGE OF SCENARIOS

Once the key climate risks have been identified, organizations need to consider the following:

- Assumptions (eg those related to policy changes, technology development/deployment, energy mix, price of key commodities or inputs, geographical tailoring of transitional and physical impacts, and timing of potential impacts)
- Parameters (eg discount rate, GDP, other macro-economic variables, demographic variables)
- Scenario development considerations (eg choice of scenarios, time horizons, supporting data and models, refer to FAQ 4 above)
- Understanding the availability of robust and accurate company data required as inputs to the model
- Identifying and developing pathways (understanding how climate risk attributes translate into financial impacts)

A good starting point for organizations could be considering the relevant scenarios developed by the NGFS, IEA and the IPCC. These scenarios are credible and based on scientific logic and can be used to assess companies' future vulnerability to climate change. They are based on predictions of future population levels, economic activity, social values, and patterns of technological change and can hence be used as meta-scenarios to provide overall context and sets of macro trends. These can then be adapted to reflect company or sector-specific considerations.

FINANCE TOP TIPS

Finance professionals should ensure that the assumptions and parameters used in the modelling exercise are in line with other financial processes, such as long-term forecasts or the viability statement. This alignment is key to integrating the outcomes of the scenario analysis process into the organization's financial planning and forecasting. Data availability is also an important consideration for the finance team. In the absence of appropriate data, gap filling may be required based on logical extrapolation techniques using realistic assumptions.



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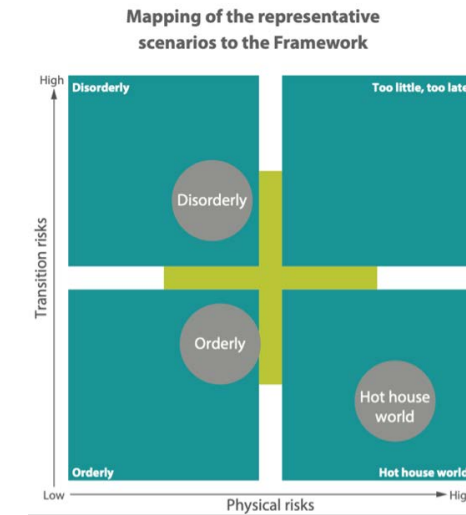
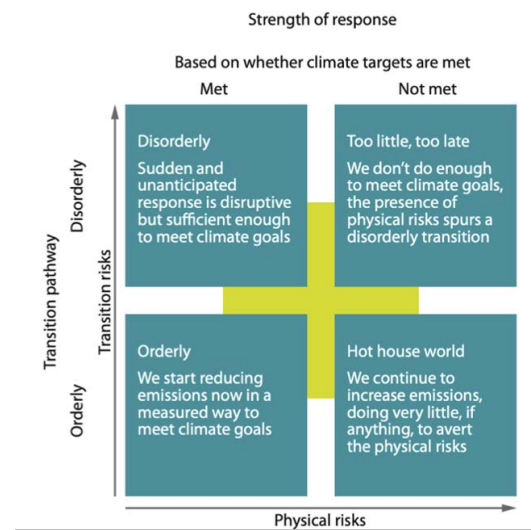
NETWORK FOR GREENING THE FINANCIAL SYSTEM (NGFS) CLIMATE SCENARIOS¹⁰

NGFS Climate Scenarios were developed to provide a common starting point for analysing climate risks to the economy and the financial system. While they were developed primarily for use by central banks and supervisors, they can also be useful to the broader financial, academic and corporate communities. The scenarios developed under the framework include a set of three representative scenarios, each covering one of the following dimensions:

- **Orderly:** Early, ambitious action to a net zero CO₂ emissions economy
- **Disorderly:** Action that is late, disruptive, sudden and / or unanticipated
- **Hot house world:** Limited action leads to a hot house world with significant global warming and, as a result, strongly increased exposure to physical risks

The Orderly and Disorderly scenarios explore a transition which is consistent with limiting global warming to below 2°C. The Hot house world scenario leads to severe physical risks.

Five alternate scenarios have also been produced to explore different assumptions, such as different temperature targets, policy responses and/or technology pathways.



10. NGFS Scenarios Portal

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STEP 4 EVALUATE BUSINESS IMPACTS

Once the scenarios have been run, the next step is to analyse the results under each defined scenario. The TCFD Technical Supplement for scenario analysis suggests the following lenses through which these results can be interpreted:

- **Earnings** – what are the impacts on earnings (expressed as EBITDA, EBITDA margins, EBITDA contribution, dividends)?
- **Costs** – how are operating/production costs impacted over time?
- **Revenues** – how are revenues from key commodities/ products/ services impacted over time?
- **Assets** – what are the implications for asset values over time? Are there any risks of stranded assets?
- **Capital Allocation/ investments** – what are the implications for capex and other investments?
- **Timing** – what conclusions does the organization draw about development of costs, revenues and earnings across time?
- **Responses** – what information does the organization provide regarding how these risks will be managed or how the business will adapt in relation to potential impacts?
- **Business Interruption due to physical impacts** – what is the organization's conclusion about its potential business interruption/productivity loss due to physical impacts both direct effects on the organization's own assets and indirect effects of supply chain/product delivery disruptions?

Using these metrics to evaluate the impacts of climate risks allows the firm to understand specifically how climate risks can impact its business model and strategy. Scenario modelling at the individual firm level may be preferred as climate risks may impact companies in the same sector or industry in different ways. Scenario analysis results should be analysed and shared across the business, so they can easily be translated into clear strategic actions/responses.



FINANCE TOP TIPS

Scenario analysis provides a clear picture of how revenues, costs and earnings are impacted under each scenario. Analysing these impacts on the business is critical for the business to be able to develop an appropriate mitigation action plan.

The results and the responses should be captured in the regular financial processes such as capital allocation, budgeting, forecasting and reporting.

Finance professionals should also consider the following:

1. **Impairment considerations:** Scenario analysis results can help inform the annual impairment exercise that companies undertake. Climate-related risks could be an impairment indicator for an organization's assets or specific cash-generating units. Companies should incorporate the scenario analysis results into their future cash flow projections and also consider reporting climate risk considerations within their impairment note to the financial statements.
2. **Useful lives of assets:** Climate-related risks can impact the expected useful lives of an organization's assets and can potentially create stranded assets. Organizations should review the useful lives of their impacted assets, as identified by scenario analysis, and reassess their annual depreciation or amortization charges.
3. **Changes in fair value of assets:** Climate-related risks should be factored into the fair value calculations of assets where appropriate. These climate risks should then be disclosed as an assumption used in the fair value calculations, along with the other assumptions.
4. **Recognition of new provisions and contingent liabilities:** Climate-related risks could lead to recognition of additional provisions such as provision for onerous contracts and decommissioning or rehabilitation costs as a result of regulatory changes. New laws or regulations can also result in potential litigation charges leading to the recognition of contingent liabilities.

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STEP 5 IDENTIFY POTENTIAL RESPONSES

These various scenarios represent the lenses through which organizations can assess a range of climate-related risks and opportunities they face. They can use these results to test the resilience of their current strategies and to shape future strategic thinking. The next step is to define mitigation actions or strategic responses to risks and opportunities highlighted by the scenario analysis process.

These responses may include:

- **Adapting** the business model in line with the outcomes of the assessment (including changes to the value/supply chains)
- **Rebalancing** the portfolio of assets to manage the exposure to climate risks
- **Investing** in technology upgrade or process changes to build resilience to future risks (for example carbon-efficient and environmentally – friendly innovation)

Once these responses have been identified and documented, they should be prioritized and developed into an action plan that is approved by the executive team/board. The mitigation and strategic actions should also be built into the company's business plans and incorporated within the budgeting and reporting cycles.

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STEP 6 DOCUMENT AND DISCLOSE

The final step in scenario analysis is to document and report the key elements of the process and the results of the exercise. Description and information on associated time horizons of the scenarios used helps in understanding the process. As well as understanding the impacts of climate-related risks and opportunities on companies, investors and external stakeholders are also keen to understand the strategic implications of scenario analysis (eg how is the company using this information to inform its M&A strategy, are new revenue streams being explored, are divestment options being considered, etc).

One of the key recommendations of the TCFD is that companies should report their climate risk exposures within their mainstream financial filings. They should be prepared to provide transparent information about the assumptions and key inputs underpinning their scenario analysis modelling, as well as reporting the results and the potential management responses.

Rating agencies, such as Moody's, review public companies' reports for climate-related financial information using artificial intelligence technology. The AI technology is used to determine whether the reports include information that appears to align with the TCFD's recommendations. This data helps investors understand how a company is integrating climate risks and opportunities in its strategy and forward planning. It also supports them in identifying areas where companies can improve their practices and disclosures related to climate risks and opportunities.

FINANCE TOP TIPS

Finance teams should be closely involved in drafting the disclosures of the scenario analysis process and results. The process should follow the same rigour and discipline of financial reporting. The TCFD recommendations note that a company should ensure its strategy and scenario disclosures comply with sound corporate reporting principles and are subject to appropriate controls and quality checks, including oversight and review by boards, audit committees, and management.



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HOW ARE PATHWAYS DEFINED AND WHAT DO SCENARIO OUTCOMES MEAN?

Climate-related scenarios describe both the outcome at a point in time and the pathway from today to that future outcome. Scenarios are based on a set of assumptions. The interactions of these assumptions with one another and their evolution over time define the pathways within that scenario. Any changes in assumptions and/or changes in the pathway will directly impact the outcome.

SCENARIO PATHWAYS

Pathways are plausible trajectories of development in different areas (policy and governance, socio-economical, technical, energy-industrial) of climate adaptation and mitigation. They evolve over time and can be combined with other assumptions or conditions to create scenarios. There is no single pathway to a particular scenario outcome. Rather, different combinations of driving forces and assumptions will result in different plausible development pathways. Multiple pathways reflect uncertainties that result in different ranges of global emissions, carbon budgets (cumulative emissions over time), and annual global GHG reduction levels consistent with a particular global temperature outcome. These uncertainties usually relate to climate system dynamics, economic conditions, energy use, available technologies, and the timing of policy actions. It is important to properly understand and define these assumptions as they can influence the final results.

'ORDERLY' AND 'DISORDERLY' PATHWAYS

Orderly pathways assume smooth physical changes in climate over time and assume that climate policies and technological actions are adopted globally in a coordinated and timely manner. These assumptions attempt to simplify what are otherwise complex development pathways. Most global climate scenarios, such as the IPCC scenarios, use orderly pathways in their scenarios. Companies need to appreciate that orderly pathways do not predict the future or represent realistic outcomes, but are useful to test different combinations of assumptions and bring out central elements of plausible future states through a simplified construct.

In a transition risk context, disorderly pathways assume variations in the implementation and effectiveness of climate policies globally. They characterize policy delays, lack of coordination and alignment in global policy implementation as well as technological, market, legal and social shocks. These disruptions lead to higher transition risks under these pathways. On the physical side, these shocks may occur when small changes at critical thresholds have large and disproportionate impacts on climate. These can then have serious business implications.

While choosing pathways, companies should assess the global technological, social and economic landscape as well as potential policy changes. In addition, companies are encouraged to introduce specific assumptions around policy or technology factors to adapt global scenarios to reflect their unique individual circumstances.



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SCENARIO OUTCOMES

The scenario outcome defines the potential climate state at a future point in time. It describes the climate-related risks and opportunities in which a company might find itself operating in the future. By choosing or constructing scenarios with different pathway characteristics and outcomes, companies can better understand the landscape of their risks, opportunities, and uncertainties.

Companies may choose between two to four scenario outcomes covering a range of future outcomes over an appropriate time horizon. The TCFD recommends testing and reporting the resilience of a company's strategy, taking into consideration different climate scenarios, including a '2°C or lower' scenario. By choosing a range of scenarios companies can ensure they are capturing both transition and physical risks. For example, they may choose from the following scenarios at both the low and high end of temperatures and emissions:

In general, more stringent climate policies relate to an increase in transition risks, and a failure to meet the climate-targets and an unchecked level of emissions result in more severe physical risks. In assessing transition risks, a company should consider using or developing a 1.5°C scenario for the '2°C or lower scenario' as suggested by the TCFD Guidance Report on scenario analysis. A 1.5°C is usually met with some degree of scepticism due to doubts that are raised around its achievability. It has nevertheless become more relevant with the support of growing research from organizations like the IPCC and the increasing commitments from countries and companies to become net-zero by 2050. A 1.5°C scenario helps a company consider a more diverse and stringent set of policies associated with emission reductions, broadening the spectrum of transition risks.

Scenario	Atmospheric carbon dioxide concentrations in 2100	Temperature increase to 2081-2100 relative to a 1850-1900 baseline	
		Mean	Full range
RCP1.9	393ppm	1.2°C	0.6-1.8°C
RCP2.6	421ppm	1.6°C	0.9-2.3°C
RCP4.5	538ppm	2.4°C	1.7-3.2°C
RCP6.0	670ppm	2.8°C	2.0-3.7°C
RCP8.5	936ppm	4.3°C	3.2-5.4°C

IPCC RCP Scenarios – Mean Temperature and full range associated with each RCP¹¹

11. IPCC, 2014 (RCP 1.9 was added in 2018)



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DOES SCENARIO ANALYSIS NEED TO BE QUANTITATIVE, OR CAN IT BE QUALITATIVE?

Qualitative scenarios describe possible futures in the form of narrative texts or 'story-lines'. These narratives describe a logical and internally consistent sequence of events with a beginning, middle, and an end. As the future is inherently uncertain, these narratives explore different possible future states. They describe developments in the economic, technical, environmental, and social dimensions. Scenario narratives are the qualitative part of a scenario that describes a hypothetical future over time and are used to develop a scenario before it can be quantified.

The qualitative narrative identifies and describes the drivers, constraints, assumptions, and logical relationships that lead to and define that hypothetical future. These usually cover developments in physical and transition climate-related risks and in socioeconomic conditions (such as demography, technology, and policies).

Scenario narratives should be clear and comprehensive to facilitate their use and interpretation by external stakeholders, such as investors. The scenarios' overall structure, internal logic, plausibility, and the likelihood of assumptions, amongst other should be considered as outlined right:

#	Factor	Check that the Scenario Narrative:
1	Time Horizon	Has a future cutoff time that is sufficiently in the future (e.g., 2030, 2050, 2100)
2	Focal Question	Has well-formulated and focused critical question(s) or potential decision(s) the company seeks to assess by scenario analysis
3	Driving Forces	Has a clearly articulated set of underlying causes of change in relation to the focal question, and that these driving forces derive from external social, technological, economic, environmental, and policy processes
4	Scenario Logic	Has a clearly stated relationship between various drivers and change, including the causal assumptions underlying the described relationship, and an internal consistency between various statements and assumptions that underpin the scenario storyline
5	Pathways	Has a clearly described trajectory between the present and the future outcome of the scenario that results from the drivers and related cause-effect relationships laid out by the scenario logic
6	Uncertainties	Has explicitly described the uncertainties and their sources surrounding how drivers may play out
7	Storyline	Presents a seamless and integrated narrative describing the causal train of events (pathways) and underlying drivers, assumptions, and affected systems
8	Plausibility	Is possible and credible as to the events it describes
9	Distinctive/ Diverse	Focuses on different assumptions about key driving forces in each scenario, and should have enough scenarios to provide diversity in pathways and outcomes
10	Consistency	Is consistent in the application of the scenario logic between scenarios
11	Relevance	Contributes insight into the futures that relate to the strategic and/or financial decisions facing a company
12	Challenging	Challenges conventional wisdom and simplistic assumptions about the future

Factors to assess in checking scenario quality¹²

12. TCFD's Guidance on Scenario Analysis for Non-Financial Companies (p. 30)



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QUANTITATIVE ANALYSIS OF SCENARIOS

In addition to having clear scenario narratives, describing future conditions that a company may face in numerical terms through graphs and trend data, enhances reporting and facilitates understanding and communication. It also demonstrates the discipline and the rigour with which the scenario analysis process has been conducted.

The TCFD recommends that information should be quantified where it is possible and where it adds value to the narrative. Any numerical descriptions should be clear and readily understandable to scenario users and serve a clear purpose in the scenario. Quantification can be applied to:

1. The descriptive aspects of the scenario narrative and driving forces including their development pathways and outcomes – eg the use of numbers to describe trends, events, and other aspects of the scenario narrative (such as gross domestic product growth, population growth, emissions increase).
2. More sophisticated representations of scenario pathways and outcomes often generated by mathematical models. These models aim at representing relationships between key drivers of the scenario and the resulting outcomes. In a quantitative model of a system, the relationship between the assumptions and effects are assigned a mathematical value. These correlation factors then define the pathways in the model and these pathways in turn determine the outcomes of the scenario.

Global climate is a complex phenomenon and involves systems level interactions of many variables. Climate-related models work by simplifying this complex system by taking certain assumptions and assigning some mathematical values to relationships. These models can therefore provide useful insights at a broader level, but have limitations when used at a granular level, as the built-in uncertainties associated with the assumptions get magnified.

Companies should undertake quantification in line with their evolving and maturing experience using scenarios. They should at least start the process and keep it simple and easy to start with, and then move onto more sophisticated quantitative models as they get more experienced with the process.

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HOW ARE SCENARIO ANALYSIS FINDINGS INTEGRATED WITHIN BUSINESS STRATEGY AND DECISIONS?

SCENARIO ANALYSIS HELPS IN TWO WAYS

1. Provides a systematic and logical process to test current strategy and assess the resilience of the business.
2. Helps inform strategy by revealing risk exposures and opportunities that a company may face in the future thereby aiding selection amongst a variety of strategic decision options.

Climate change is increasingly becoming a business issue due to the risks involved and the uncertainties that it carries. It is progressively threatening business resilience. Resilience attests the ability of a company to survive, adapt, and grow in the face of turbulent change. Scenario analysis plays a key role in building strategy resilience. A resilient strategy is able to tolerate disruptions or adapt to changes and uncertainties in the business environment and remains effective under most situations and conditions.

Type	Resilience has three characteristics – resistance, recovery, and robustness ¹³	Scenario analysis contributes to all three characteristics in the context of climate change
Resistance	The capacity of a business to actively or passively maintain desirable operational and financial performance in the face of change	Offers a perspective on how strategies and decisions would perform in different climate-related scenarios
Recovery	The time it takes for a business's operational and financial performance to recover to desired levels following adverse change	Helps in developing mitigation plans in responses to risks and opportunities identified, and reduces the likelihood of surprises
Robustness	The probability that a business will not cross an undesirable (and possibly irreversible) performance threshold following adverse change	Aids to broaden strategic thinking to better prepare when faced with various plausible futures

13. Grafton et, al., Realizing resilience for decision-making, 2019.

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APPLYING SCENARIOS TO GUIDE STRATEGY

The key question that scenario analysis answers is: How would existing and planned strategies, decisions, or actions perform under different climate futures (scenarios)?

This is a difficult question that many companies face. Understanding the potential implications of the scenarios' hypothetical conditions on the company's strategy helps in answering this question. In scenario analysis, each scenario is a lens through which an organization can assess the impacts and evolution of various climate-related risks and opportunities that it faces. It also stress tests its current strategy under different types and sources of pressures and reveals the adjustments that will be needed to increase the resilience of this strategy. Management can then develop appropriate responses to address these risk exposures.

Scenario analysis allows companies to adopt a prioritisation process by ranking the risks in order of importance and magnitude. They can then focus on the most material risks and opportunities to develop mitigation and strategic actions. These responses can be presented as an action plan that is approved by the executive team/board. The mitigation and strategic actions should also be built into the company's business plans and incorporated within the budgeting and reporting cycles.



FINANCE TOP TIPS

Finance professionals should align the scenario analysis process with the viability assessment process to make sure the stress-testing techniques and assumptions are consistent. In addition, by incorporating the mitigation and strategic actions into the business plans and within the financial reporting cycles, finance teams ensure that scenario analysis results are impacting the strategic direction of the organization.

MANAGING STRATEGY RESILIENCE THROUGH SCENARIO ANALYSIS

Effective strategy resilience involves managing change through continual improvement. This involves ongoing monitoring, adaptation, and transformation actions required to positively impact the three characteristics of resilience, i.e., resistance, recovery, and robustness.

This requires companies to periodically re-run their scenario analysis exercise, and to regularly monitor key indicators/inputs and to make adjustments where necessary. They should develop appropriate indicators/measures or thresholds to monitor the development of key drivers and uncertainties over time. This will allow them to monitor whether the uncertainties are evolving in a manner consistent with the scenario assumptions.

The TCFD Guidance Report on scenario analysis recommends the use of a type of metric – signpost metrics. These indicate whether scenario development pathways remain consistent with assumptions or are deviating towards a different outcome. Signposts may cover important trends, events, or dynamics (drivers) that determine scenario pathways. The report suggests the following signposts be used by companies:

- Introduction of carbon prices in a certain jurisdiction and trends in carbon prices.
- Changes in energy subsidies – fossil fuels versus renewables.
- Costs of renewable energy sources (eg wind, solar, biofuels).
- Trends in energy efficiency/intensity in major sectors.
- Carbon capture developments (eg carbon dioxide removal, carbon capture and storage, deforestation, reforestation).
- Development, costs, take up of certain technologies (eg battery technologies, electric vehicles).
- Frequency and intensity of storms, droughts, and floods and locations.
- Climate policy developments (eg multilateral, national, sectoral).

Companies should ensure that there is sufficient, easily available, cost-effective, reliable information available and that signposts are reviewed regularly.



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HOW SHOULD BUSINESSES REPORT THEIR SCENARIO ANALYSIS FINDINGS TO RESPOND TO INVESTORS' AND OTHER STAKEHOLDERS' NEEDS?

Investors want to understand how a company is positioning itself strategically and responding to climate-related risks and opportunities. In short, investors seek to be confident that companies are adequately assessing climate risks and incorporating them in strategic thinking. Other disclosure elements that investors find useful are:

- The impact of climate-related issues on:
 - Products and services
 - Capital expenditures and capital allocation and a company's sensitivity to carbon pricing, if applicable.
- Details and description of scenarios that have been considered.
- Results of the scenario analysis exercise highlighting material climate-related risks and opportunities over the long and medium term.
- Mitigation strategies and strategic responses to the risks identified by scenario analysis.

In a status report released in 2020, the TCFD ranked disclosure elements that expert users found most useful for making financial decisions. Overall, expert users identified the single most useful disclosure element as a company's description of how its climate-related risks and opportunities have affected its business and strategy. The result of this study is presented in the table on the right:

Recommended Disclosure	Disclosure Element	Score	Var.*	Rank
Strategy b)	How climate-related issues have affected business and strategy	1.1	0.1	1
Metrics and Targets a)	Key metrics on climate-related issues for most recent period and historical periods	1.3	0.2	2
Strategy a)	The material climate-related issues identified for each sector and geography	1.3	0.3	3
Metrics and Targets b)	Scope 1 GHG emissions for the most recent period and historical periods	1.3	0.4	4
Metrics and Targets c)	Climate-related targets related to GHG emissions	1.3	0.4	5
Strategy a)	The material climate-related issues identified	1.4	0.2	6
Metrics and Targets b)	Scope 2 GHG emissions for the most recent period and historical periods	1.4	0.4	7
Metrics and Targets c)	The timeframes over which climate-related targets apply	1.4	0.4	8
Metrics and Targets c)	Key performance indicators used to assess progress against climate-related targets	1.5	0.4	9
Governance a)	Board consideration of climate-related issues for major capital expenditures, acquisitions, and divestitures	1.5	0.6	10

The top ten most useful disclosure elements¹⁴

14. TCFD 2020 Status Report (p.31)



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DISCLOSURE AROUND STRATEGY

The 2017 TCFD recommendations encouraged companies to 'describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.' To explain the climate-related aspects of its strategy, an organization can report the following:

- Their climate strategy, which involves mitigating risks and leveraging opportunities associated with climate change.
- The process to identify, manage and mitigate climate risks.
- How scenario analysis has informed their strategy, investments and resource allocation.
- Whether strategic alternatives/options were considered and chosen and how the strategic positioning will change following the results of the analysis.
- How these decisions impact the company financially.
- How they plan to adapt its business model in line with the results.
- Effectiveness, suitability and adaptability of their strategy under different climate future states.

DISCLOSURE AROUND SCENARIOS

Investors are interested in understanding the scenarios used, and what the outcome of the analysis means for the company and its business in the future. Companies should consider disclosing:

- A description of each scenario narrative, time horizon, and endpoints used by the company, with a rationale of why those scenarios were selected for the analysis.
- Sources of the scenarios.
- Important features of the scenarios, including the assumptions, limitations, key inputs to the models and drivers.
- A description of the pathways in the scenarios and the assumptions involved and the relationships between key drivers and their effects in the pathways.
- Insights from the scenarios that are relevant to their business, such as change in demand for a product or service requiring the company to adapt or change its business model, impact on the effectiveness of its current or planned strategy or any operational changes that may be required in the future.

The TCFD recommends transparency around the governance and management of scenario analysis. The company may wish to describe the internal processes, roles and responsibilities and flow of information associated with scenario analysis. This includes the role of different stakeholders, including the board, management and external parties involved in the process.

Some investors are asking for greater comparability in disclosures about scenarios. Efforts to enhance comparability should aim to increasingly harmonize the transparency around companies' scenario processes and the disclosure of results.



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DISCLOSURE ON METRICS USED TO ASSESS CLIMATE-RELATED RISKS AND OPPORTUNITIES

The TCFD issued proposed guidance in 2021 for organizations seeking to establish relevant metrics, targets, and transition plans around their climate-related risks and opportunities. A climate-related metric is a useful indicator of the level of climate risks and opportunities that an organization is exposed to. These indicators can also be used to measure progress against climate-related targets over time.

The table on the right provides examples from the proposed guidance of climate-related metrics that organizations can use to assess and quantify climate-related risks and opportunities. These cross-industry, climate-related metrics help improve comparability across companies for investors and other stakeholders.

Cross-Industry, Climate-Related Metrics	Example Unit of Measure
GHG emissions (Absolute Scope 1, Scope 2, and relevant, material categories of Scope 3 emissions, as well as carbon intensity)	MT of CO ₂ e
Carbon price(s) (external and shadow/internal)	Price in local currency, per MT of CO ₂ e
Proportion of assets and/or operating, investing, or financing activities materially exposed to physical risks, based on key categories of commonly accepted risks	Percentage
Proportion of assets and/or operating, investing, or financing activities materially exposed to transition risks, based on key categories of commonly accepted risks	Percentage
Proportion of assets and/or operating, investing, or financing activities aligned toward climate-related opportunities, based on key categories of commonly accepted opportunities	Percentage
Amount of senior management remuneration impacted by climate considerations	Percentage/amount in local currency or weighting
Amount of expenditure or capital investment deployed toward climate risks and opportunities	Local currency

Summary Table: Cross-Industry, Climate-Related Metrics¹⁵

15. Proposed Guidance on Climate-related Metrics, Targets, and Transition Plans (p.26)



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DISCLOSURE OF FINANCIAL IMPLICATIONS

The TCFD recommendations emphasizes the 'disclosure of the actual and potential impacts of climate-related risks and opportunities on the organization's business, strategy, and financial planning where such information is material.' Disclosure of the financial impacts of climate-related risks and opportunities is a key goal of the TCFD.

Disclosure of financial implications should be approached from two perspectives:

- The potential financial implications of the various scenarios and
- The financial implications for the company's strategy and related plans.

Currently, many companies (especially those at the start of their journey) are choosing to report their results qualitatively, that is explaining the results rather than quantifying them. While this does provide insight into climate risk exposures, companies should aim for quantification as they progress along their TCFD journey.



FINANCE TOP TIPS

Finance teams should be closely involved in drafting the disclosures of the scenario analysis process and results. They should also consider integrating the results within other areas of the financial statements (eg the impairment notes, fair valuation of assets, viability statement). The process should follow the same rigour and discipline of financial reporting. The scenario analysis model should be internally verified and should follow a strict assurance process before these results are externally published. Internal audit expertise can be used to validate whether the process is in line with the internal control framework necessary for other established financial processes. Finance teams should also work closely with external auditors before publishing scenario analysis results.



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ABOUT A4S

The Prince's Accounting for Sustainability Project (A4S) was established by HRH The Prince of Wales in 2004. Our aim is to make sustainable business business as usual.

We work with the finance and accounting community to:

- Inspire finance leaders to adopt sustainable and resilient business models
- Transform financial decision making to enable an integrated approach, reflective of the opportunities and risks posed by environmental and social issues
- Scale up action across the global finance and accounting community

A4S has three global networks: the Chief Financial Officers Leadership Network, a group of CFOs from leading organizations seeking to transform finance and accounting; the Accounting Bodies Network, whose members comprise approximately two thirds of the world's accountants; and the Asset Owners Network, which brings together Pension Fund Chairs to integrate sustainability into investment.

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- Enhancing Investor Engagement
- Debt Finance
- Implementing the TCFD Recommendations
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*coming soon

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