

# **ISCA Climate Disclosure Guide** Volume 2

First Steps in Conducting Climate-Related Scenario Analysis

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#### About ISCA's Sustainability and Climate Change Committee

ISCA's Sustainability and Climate Change Committee (SCCC) comprises individuals with significant experience and subject matter expertise in sustainability-related matters.

The SCCC promotes the relevance of sustainability, climate change and related advances to business strategy and the accountant's role in advancing these agenda. It also furthers the adoption of quality sustainability reporting and advocates Singapore's interests in relation to sustainability reporting standards and requirements. These are executed with the support of three sub-committees – the Sustainability Reporting Quality Sub-Committee; Sustainability Excellence Sub-Committee; and Education Sub-Committee.

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### FOREWORD

The process of climate-related scenario analysis may seem intimidating to many companies, but it may not be as abstract a concept as one would imagine.

Most companies have in place risk management procedures to monitor and manage risks and they would already be disclosing their policies and exposures in relation to these risks in their financial statements, including quantitative disclosures such as sensitivity analyses. Consistent with the global scrutiny on climate change, it is a natural step to extend these processes to climate-related issues.

Instead of viewing this demand as a cost, companies should seek to understand why climaterelated disclosures are important to the decision making of investors and evaluate whether their concerns are relevant to the business. Companies would very likely find assessing climate-related risks to be as critical as financial risks and warrant as much attention in their regular business planning and risk management processes.

This publication builds on the introduction to climate reporting that is set out in the ISCA Climate Disclosure Guide – *Taking First Steps Towards Climate-related Disclosures* and takes inspiration from the TCFD's *Guidance on Scenario Analysis for Non-Financial Companies* and other experiences and sources to delve into the topic of climate-related scenario analysis, which is a useful tool to develop an understanding of how climate-related risks may affect the company's businesses, strategies, and financial performance over time.

Regardless of how advanced a company may be in its sustainability reporting journey, by getting started with the climate-related scenario analysis exercise companies will find that this would be a useful tool to understand the implications of climate change for its business and vice versa. Companies can then innovate and convert climate-related risks into opportunities that could make the business more efficient. Reiterations and finetuning of this exercise will help businesses to achieve climate resilience.

As companies mature in their sustainability reporting, they look to ways to provide even more decision-useful information for investors for reasons beyond compliance, including climate-related scenario analysis. We hope that this guide provides practical advice to companies looking to implement climate-related scenario analysis and that companies may benefit from this process.

The guide was developed with the support of Singapore Exchange Regulation, Green Finance Industry Taskforce, ISCA's Sustainability and Climate Change Committee (SCCC) and SCCC Sustainability Excellence Sub-Committee. We would like to extend our deepest thanks and gratitude to everyone who has contributed to this publication.

# THE TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES

Participants in financial markets require clear, comprehensive, high-quality information on the impacts of climate change which include the risks and opportunities presented by rising temperatures, evolving climate-related policies, and emerging technologies in our changing world. Hence, the Financial Stability Board created the Task Force on Climate-Related Financial Disclosures (TCFD) in 2015 to develop consistent climate-related financial risk disclosures for use by companies, banks, and investors in providing information to stakeholders.

The TCFD Recommendations are designed to solicit **decision-useful**, **forward-looking information** that can be included in mainstream financial filings. The recommendations are structured around **four thematic areas** that represent core elements of how organisations operate: **governance**, **strategy**, **risk management**, **and metrics and targets**.

Governance	Strategy	Risk Management	Metrics and Targets	
Disclose the organization's governance around climate- related risks and opportunities.	Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material.	Disclose how the organization identifies, assesses, and manages climate-related risks.	Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.	
Recommended Disclosures	Recommended Disclosures	Recommended Disclosures	Recommended Disclosures	
<ul> <li>a) Describe the board's oversight of climate-related risks and opportunities.</li> </ul>	<ul> <li>a) Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term.</li> </ul>	<ul> <li>a) Describe the organization's processes for identifying and assessing climate-related risks.</li> </ul>	<ul> <li>a) Disclose the metrics used by the organization to assess climate- related risks and opportunities in line with its strategy and risk management process.</li> </ul>	
<ul> <li>b) Describe management's role in assessing and managing climate-related risks and opportunities.</li> </ul>	<ul> <li>b) Describe the impact of climate- related risks and opportunities on the organization's businesses, strategy, and financial planning.</li> </ul>	<ul> <li>b) Describe the organization's processes for managing climate-related risks.</li> </ul>	<ul> <li>b) Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.</li> </ul>	
	c) Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.	c) Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management.	c) Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.	

Source: Final Report on the Recommendations of the Task Force on Climate-Related Financial Disclosures

#### Scenario analysis – A key recommendation of the TCFD

Scenario analysis is a well-established method for developing strategic plans that are more flexible or robust to a range of plausible future states. This makes sense given the potential varied climate-related risks, both physical and transition risks, that could occur in the short, medium and long term.

For example, scenario analysis may answer the following questions for physical and transition risks:

For **physical risks**, what could be the risk of sea level rising to Singapore and how would that impact properties and operations in certain locations in the short, medium and long term, under different scenarios, e.g. a 1.5°C, 2°C and 3°C scenario?

For **transition risks**, What could be the potential impact of the introduction of carbon taxes in Australia, under different scenarios, e.g. 1.5°C, 2°C and 3°C scenarios, across short, medium and long term time horizons?

We delve deeper in the following paragraphs.

#### **Physical risks**

Physical climate-related scenarios are particularly relevant for companies exposed to acute or chronic climate change, such as those with the following characteristics:

- Fixed assets which are long-lived
- Locations or operations in climate-sensitive regions, e.g. coastal and flood zones
- Reliance on availability of water
- Value chains exposed to the above

While some climate models tend to focus on physical risks for time frames beyond 2050, companies may also focus on shorter term time frames as they consider the lifetime of their current assets.

#### Transition risks

A key type of transition risk scenario is the 1.5°C to 2°C scenario (which under some sources is also referred to as Net Zero by 2050 scenario), which lays out a pathway and an emissions trajectory consistent with holding the increase in the global average temperature to well below 2°C above pre-industrial levels. Under the Paris Agreement in 2015, nearly 200 governments agreed to strengthen the global response to the threat of climate change by "holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels". This could be achieved through policy changes such as carbon taxes or phasing out of certain industries. Therefore, a 1.5°C or well below 2°C scenario provides a common reference point that is generally aligned with the objectives of the Paris Agreement and will support investors' evaluation of the potential magnitude and timing of transition-related implications for individual companies.

#### Key benefits on performing a scenario analysis

- Understanding how the company might perform under different hypothetical climate futures would allow management and the board to appreciate how the company could be impacted over different scenarios and timeframes, thereby informing strategic and financial decisions for the benefit of the company and its stakeholders.
- 2. Scenario analysis helps companies identify indicators to monitor the external environment and better recognise when the environment is moving toward a different scenario state (or to a different stage along a scenario path). This allows companies the opportunity to reassess and adjust their strategies and financial plans accordingly which they have considered as part of the scenario analysis conducted.
- 3. Scenario analysis can assist investors in understanding the robustness of companies' strategies and financial plans and in comparing risks and opportunities across companies.
- 4. Companies build resilience through "rehearsing for the future" by testing a company's business strategy against a set of scenarios, development of contingency plans to possible future threats or opportunities, establishment of trigger points to set contingency plans in motion, thereby providing a basis for continuous monitoring and strategy adjustment.

#### Challenges

However, it is appreciated that climate-related scenario analysis does have its challenges which include but are not limited to availability and granularity of data and information. Some examples might include the granularity of data obtained from public sources and models (country vs. city level data) or even the limitation of the variability of company financials as the scenario looks at potential future states for which the company might not have projections for just yet.

In addition, the use of climate-related scenario analysis to assess potential business implications is not at a mature stage and many companies are still at the start of their journey. Therefore, sharing experiences and approaches to climate-related scenario analysis will be very useful for the business community. Refer to Learning experiences and insights section on pages 27 to 31.

#### Where is climate-related scenario analysis being featured?

Given the benefits of conducting a climate-related scenario analysis, in response to the urgent, long-tailed, uncertain futures of climate change, we see that scenario analysis has been featured across various frameworks, standards and regulations. These include:

#### **TCFD Recommendations**

Recommended Disclosures<sup>1</sup> b) and c) of the Strategy element

Describe the impact of climate-related risks and opportunities on the organisation's businesses, strategy, and financial planning.

[...] If climate-related scenarios were used to inform the organisation's strategy and financial planning, such scenarios should be described.

Describe the resilience of the organisation's strategy, taking into consideration different climaterelated scenarios, including a 2°C or lower scenario.

Organisations should describe how resilient their strategies are to climate-related risks and opportunities, taking into consideration a transition to a low-carbon economy consistent with a 2°C or lower scenario and, where relevant to the organisation, scenarios consistent with increased physical climate-related risks.

Organisations should consider discussing:

- where they believe their strategies may be affected by climate-related risks and opportunities;
- how their strategies might change to address such potential risks and opportunities;
- the potential impact of climate-related issues on financial performance (e.g., revenues, costs) and financial position (e.g., assets, liabilities); and
- the climate-related scenarios and associated time horizon(s) considered.

#### SGX's Listing Rules

#### Paragraph 4.15 of Practice Note 7.6<sup>2</sup>

[...] The issuer should describe how resilient its strategies are to climate-related risks and opportunities, taking into consideration a transition to a lower-carbon economy consistent with a 2°C or lower scenario and, where relevant, scenarios consistent with increased physical climate-related risks.

<sup>&</sup>lt;sup>1</sup> <u>https://www.fsb.org/wp-content/uploads/P141021-4.pdf</u>

<sup>&</sup>lt;sup>2</sup> http://rulebook.sgx.com/rulebook/practice-note-76-sustainability-reporting-guide



# **IFRS Sustainability Disclosure Standards** Paragraph 15 of ED IFRS S2<sup>3</sup>

The ISSB discussed the proposed requirement in draft IFRS S2 for an entity to disclose its resilience to climate-related changes or uncertainties.

The ISSB tentatively decided to require an entity to prepare these disclosures using a method of climate-related scenario analysis that requires it to consider all reasonable and supportable information available at the reporting date without undue cost or effort. Such information could include information about past events, current conditions and forecasts of future economic conditions. Reasonable and supportable information available at the reporting date without undue cost or effort, which is a concept used in specific circumstances in the IFRS Accounting Standards, such as in IFRS 9 Financial Instruments.

The ISSB also tentatively decided to require an entity, when selecting a method of climate-related scenario analysis that is commensurate with its circumstances, to take into consideration: the degree to which the entity is exposed to climate-related risks and opportunities; and the entity's available skills, capabilities and resources for conducting climate-related scenario analysis.

Refer to page 14 for full list of disclosures required by ED IFRS S2 (which are subject to change at the time of publication).

The requirements in ED IFRS S2 are consistent with the TCFD Recommendations and recommended disclosures. However, in comparison with the TCFD's guidance to meet the TCFD Recommendations, ED IFRS S2 requires additional information regarding resiliency on details on how any resilience analysis or assessment has been conducted, including the results of the analysis of climate resilience and how the analysis has been conducted.

Exposure Draft (ED) IFRS S2 Climate-related Disclosures is currently under deliberation by the International Sustainability Standards Board (ISSB) at the time of publication and is expected to be issued in the first half of 2023. Both the Monetary Authority of Singapore (MAS) and Singapore Exchange (SGX) had indicated that they will consider<sup>4</sup> aligning reporting requirements with the IFRS Sustainability Disclosure Standards when they are issued. These Standards are expected to form a global baseline of sustainability disclosures that aim to meet investor and public policy needs.

 <sup>&</sup>lt;sup>3</sup> <u>https://www.ifrs.org/projects/work-plan/climate-related-disclosures/</u>
 <u>https://www.mas.gov.sg/news/parliamentary-replies/2022/reply-to-parliamentary-question-on-the-adoption-of-sustainable-</u> finance-amongst-financial-institutions



Singapore-incorporated companies not listed on the Singapore Exchange might soon be required to disclose climate-related information, and, by extension, perform climate-related scenario analysis. In June 2022, the Accounting and Corporate Regulatory Authority (ACRA) and the Singapore Exchange Regulation (SGX RegCo) jointly set up the Sustainability Reporting Advisory Committee (SRAC)<sup>5</sup> to advise on a sustainability reporting roadmap for Singapore-incorporated companies, beyond companies listed on SGX. The SRAC will also provide input on the suitability of international sustainability reporting standards for implementation in Singapore. The SRAC intends to issue its recommendations for public consultation<sup>6</sup> in 2023.

<sup>&</sup>lt;sup>5</sup> <u>https://www.businesstimes.com.sg/companies-markets/acra-sgx-regco-set-sustainability-reporting-advisory-committee</u>

<sup>&</sup>lt;sup>6</sup> <u>https://www.mof.gov.sg/news-publications/speeches/opening-remarks-by-ms-indranee-rajah-minister-in-the-prime-minister-s-office-second-minister-for-finance-at-the-roundtable-for-professional-services-on-sustainability-on-1-december-2022-the-treasury</u>

# **OVERVIEW OF CLIMATE-RELATED SCENARIO ANALYSIS**

#### How does climate change impact companies?

Social and economic activities are the main driving forces of climate change, which in turn, affects these activities drastically.

Companies may undertake **mitigation efforts** to reduce greenhouse gases (GHG) emissions, such that **collectively with other companies**, they may lessen the adverse impact of climate change on the planet. They may also anticipate such adverse impact and take **adaptation measures** to minimise the effect of climate change on their activities.

The complex interactions between the social and economic activities, along with mitigation and adaptation efforts, determine the effect that climate change will have on the global natural and business ecosystem.

With reference to the SENSES Toolkit *Primer for Climate Scenarios*, their relationships may be illustrated as follows<sup>7</sup>:



Socioeconomic development comprises a myriad of factors like population, economic activity, urbanisation, education, social equality, consumption patterns, lifestyles, and institutions. These factors determine the way we live, including how we use energy and land which results in the emissions of greenhouse gases into the climate. For example, different dietary preferences are met with the use of land for livestock and agriculture which leads to the emission of greenhouse gases like methane and nitrous oxide, which in turn cause climate change. Climate change has impacts on natural and human systems, e.g. through droughts or floods, and influences social and economic activity.

**Mitigation pathways** investigate emissions reductions strategies to stay below a certain warming limit, whereas **adaptation pathways** study adaptation measures to limit the impact of climate change on socioeconomic activities.

<sup>&</sup>lt;sup>7</sup> https://climatescenarios.org/primer/how-are-socioeconomic-development-and-climate-change-connected

Climate-related scenario analysis provides insight into these complex relationships on a macro or entity-specific level, as applicable. Furthermore, to be able to more specifically demonstrate the **climate impacts** on a company's financials, impact pathways could also be used.

Impact pathways are a useful tool to visually map out the cause-and-effect relationship between climate events and company's business and financials, i.e. they describe the impact that the climate has on socioeconomic development that is relevant to the company. Example impact pathways are presented below.



#### What is a climate-related scenario analysis?

The TCFD Recommendations describe scenario analysis as follows<sup>8</sup>:

Scenario analysis is a process for identifying and assessing the potential implications of a range of **plausible** future states under conditions of uncertainty. Scenarios are hypothetical constructs and not designed to deliver precise outcomes or forecasts. Instead, scenarios provide a way for organisations to consider how the future might look if certain trends continue or certain conditions are met. In the case of climate change, for example, scenarios allow an organisation to explore and develop an understanding of how various combinations of climate-related risks, both transition and physical risks, may affect its businesses, strategies, and financial performance over time.

<sup>&</sup>lt;sup>8</sup> <u>https://assets.bbhub.io/company/sites/60/2020/09/2020-TCFD\_Guidance-Scenario-Analysis-Guidance.pdf</u>



#### What are scenarios?

The TCFD Recommendations describe scenarios as follows8:

Scenarios basically describe two things — an **outcome** at a certain time horizon, and a **pathway** from today to the selected outcome.

**Scenario outcomes** refer to the endpoint of a scenario, usually a temperature target such as limiting temperature rise by 2050 to 1.5°C in alignment with net zero pledges.

**Scenario pathways** refer to the political, technological, and economic developments and associated risk drivers (e.g., which sectors and regions bear the most emissions reductions, or which energy technologies win out in different economies) that lead to a particular scenario outcome; there can be distinctively different pathways leading to the same outcome.

Scenarios are **not forecasts or predictions** — they are "**what-if**" **narratives** designed to inform and challenge strategic thinking. Scenarios also are not intended to represent a full description of the future, but rather to highlight central elements of a possible future, draw attention to the key factors that may drive future developments, and explicitly identify critical uncertainties and assumptions around a path and outcome. They help companies to answer the question: What may be the potential implications for our strategy if the future described in the scenario came to pass?

#### **Objectives of scenario analysis**

To a company, the primary objective of scenario analysis is not only to meet disclosure requirements or demands for information but to inform it about how climate-related risks may affect its strategy over time.

It is performed to help companies consider the **resilience** of its strategy to climate-related risks. TCFD suggests the following three characteristics<sup>8</sup> of resilience:

Resistance	•	Capacity of a business to actively or passively maintain desirable operational
		and financial performance in the face of change
Recovery	•	Time it takes for a business's operational and financial performance to recover
		to desired levels following adverse change
Robustness	•	Probability that a business will not cross an undesirable (and possibly
		irreversible) performance threshold following adverse change



#### Scenario analysis characteristics

In order to fulfil the objectives above, a robust scenario analysis should possess the following characteristics, as suggested by TCFD<sup>9</sup>:

Plausible	• The events in the scenario should be possible and the narrative credible (i.e.
	the descriptions of what happened, and why and how it happened, should be
	believable).
Distinctive	Each scenario should focus on a different combination of the key factors.
	Scenarios should be clearly differentiated in structure and in message, not
	variations on a single theme.
	• Multiple scenarios should be used to explore how different permutations and/or
	temporal developments of the same key factors can yield very different
	outcomes.
Consistent	Each scenario should have strong internal logic.
	• The goal of scenario analysis is to explore the way that factors interact, and
	each action should have a reaction.
	• Neither actors nor external factors should completely overturn the evidence of
	current trends and positions unless logical explanations for those changes are
	a central part of the scenario.
Relevant	Each scenario, and the set of scenarios taken as a whole, should contribute
	specific insights into the future that relate to strategic and/or financial
	implications of climate-related risks and opportunities.
Challenging	Scenarios should challenge conventional wisdom and simplistic assumptions
	about the future.
	• When thinking about the major sources of uncertainty, scenarios should try to
	explore alternatives that will significantly alter the basis for business-as-usual
	assumptions.

#### **Disclosures**

Disclosures relating to scenario analysis should be tailored towards assuring readers that the company has **adequately considered and prepared** for climate-related issues in its business strategy. The TCFD suggests for companies to use these disclosures to demonstrate strategy resilience.

<sup>9</sup> https://www.tcfdhub.org/scenario-analysis/

To do so, the list of disclosure requirements in paragraph 15 of ED IFRS S2 provides a good guide:

#### Climate resilience

- 15 [...] Specifically, the entity shall disclose:
  - (a) the results of the analysis of climate resilience, which shall enable users to understand:
    - (i) the implications, if any, of the entity's findings for its strategy, including how it would need to respond to the effects identified in paragraph 15(b)(i)(8) or 15(b)(ii)(6);
    - (ii) the significant areas of uncertainty considered in the analysis of climate resilience;
    - (iii) the entity's capacity to adjust or adapt its strategy and business model over the short, medium and long term to climate developments in terms of:
      - the availability of, and flexibility in, existing financial resources, including capital, to address climate-related risks, and/or to be redirected to take advantage of climaterelated opportunities;
      - (2) the ability to redeploy, repurpose, upgrade or decommission existing assets; and
      - (3) the effect of current or planned investments in climate-related mitigation, adaptation or opportunities for climate resilience.
  - (b) how the analysis has been conducted, including:
    - (i) when climate-related scenario analysis is used:
      - which scenarios were used for the assessment and the sources of the scenarios used;
      - whether the analysis has been conducted by comparing a diverse range of climaterelated scenarios;
      - (3) whether the scenarios used are associated with transition risks or increased physical risks;
      - (4) whether the entity has used, among its scenarios, a scenario aligned with the latest international agreement on climate change;
      - (5) an explanation of why the entity has decided that its chosen scenarios are relevant to assessing its resilience to climate-related risks and opportunities;
      - (6) the time horizons used in the analysis;
      - (7) the inputs used in the analysis, including—but not limited to—the scope of risks (for example, the scope of physical risks included in the scenario analysis), the scope of operations covered (for example, the operating locations used), and details of the assumptions (for example, geospatial coordinates specific to entity locations or national- or regional-level broad assumptions); and
      - (8) assumptions about the way the transition to a lower-carbon economy will affect the entity, including policy assumptions for the jurisdictions in which the entity operates; assumptions about macroeconomic trends; energy usage and mix; and technology.
    - (ii) when climate-related scenario analysis is not used: [...]

Subsequent to the exposure draft, the ISSB added<sup>10</sup> a requirement to IFRS S2 for an entity to disclose whether and how it uses climate-related scenario analysis to inform the identification of climate-related risks and opportunities.

In using and disclosing the assumptions used in climate-related scenario analysis, companies should ensure that these assumptions are **consistent** with those used in the financial statements. This is consistent with the principle in paragraph 80 of ED IFRS S1 *General Requirements for Disclosure of Sustainability-related Financial Information*:

80 When sustainability-related financial disclosures include financial data and assumptions, such financial data and assumptions shall be consistent with the corresponding financial data and assumptions in the entity's financial statements, to the extent possible.

For guidance on the impact of climate-related risks on a company's business and operating environment and their potential implications on its financial statements, refer to <u>ISCA Technical</u> <u>Bulletin 1 Addressing Climate-Related Risks in Financial Statements and Audits of such Financial</u> <u>Statements</u>.

<sup>&</sup>lt;sup>10</sup> <u>https://www.ifrs.org/content/dam/ifrs/meetings/2023/january/issb/ap4a-climate-related-disclosures-using-scenario-analysis-to-assess-climate-resilience.pdf</u>



# AN OVERVIEW APPROACH TO PERFORM SCENARIO ANALYSIS

#### **General approach**

Leveraging the TCFD publications and other literature and industry experience, the following steps provide a possible approach towards performing a climate-related scenario analysis.

#### 1. Choose scenario parameters

- Choose the relevant scenarios that would capture strategic alignments to governments and policies or stress testing scenarios, e.g. 1.5°C to align to net zero by 2050 pledges and 4°C to stress test against physical risk.
- Time horizons should align with the company strategy and try to capture a full picture of the potential risks, e.g. 2030 as a shorter term timeframe and 2050-2080 for longer term.
- Baseline year should be a recent business-as-usual year that would capture the business familiarity.
- For physical risks, it may be better to choose higher-warming scenarios like 3°C-4°C with 2°C as baseline, whereas for transition risks, it may be better to choose a lower-warming scenario like 1.5°C with 2°C as baseline, so the scenarios take into account the more extreme outcomes for the purpose of risk planning.
- Refer to page 22 for examples of commonly used scenarios and guidance on scenario choice.
- Geographical and business coverage should take into account the material business areas.
- 2. Identify the relevant climate-related risks and opportunities that should be explored
- The long list of climate-related risks can be used here (i) physical risks: acute and chronic risks; (ii) transition risks: policy and legal, technology, market and reputation risks.
- Climate-related opportunities can be classified into five major categories: resource efficiency, energy source, products and services, markets, and resilience.
- Risks and opportunities should be evaluated against the characteristics of the business operations, which include and are not limited to:
  - Geographic location of the company's value chain (upstream and/or downstream)
  - Company's assets and nature of operations
  - Structure and dynamics of the company's supply and demand markets
  - Company's customers
  - Company's other key stakeholders
- Refer to page 33 for a list of examples to begin with.

- 3. Map out relevant business and financial implications of the risks and opportunities
- Impact pathways, as discussed on page 12, can be used to map the potential business and financial impacts from the relevant climate-related risks and opportunities.
- If possible, leverage existing business and financial drivers and indicators that the business is already using that could be linked to climate-related risks, in order to narrow down the list of relevant implications.
- For further reference, refer to page 33 for potential financial impacts related to the specific categories of climate-related risks and opportunities identified by the TCFD.
- 4. Shortlist most relevant impacts for your business based on the internal stakeholder validation
- Based on internal discussions, you can further shortlist the relevant business and financial impacts that are related to climate-related risks and opportunities. However, be mindful that subjective shortlisting could eliminate material financial indicators and the impact can only be determined through the financial modelling in step 6 below.
- Refer to App B for suggestions on how to engage internal stakeholders and facilitate these discussions.
- 5. Develop qualitative narrative for each scenario
- Using the impact pathways, as discussed on page 12, describe how each driver develops and its impact over the time horizon, as well as how the drivers could interact.
- Develop scenario narratives describing assumed cause-effect relationships among drivers, how drivers play out into the future (pathways), and anticipated outcomes.
- 6. Set up the criteria and calculations for the development of the quantitative impacts of climate-related risks and opportunities on your financials (quantitative assessment only)
- For the shortlisted impacts, develop quantification criteria that would model the potential correlations between the climate-related risks and opportunities and your financials.
- Data from publicly available sources can be used for the scenario-specific inputs on physical and transition risks, e.g. flood risk factors or carbon prices.

- 7. Compare the results by scenario and risk type to develop understanding of the relevant risks for your business (quantitative assessment only)
- Once all impacts are quantified, the scenario analysis would allow comparison between the total results in selected scenarios. This can be done by timeframe, country or risk type as well in order to gauge which risks have the most significant impacts to which parts of the business.
- 8. Based on the quantification models, develop relevant metrics and targets to track the performance against the various risks in the relevant scenarios (quantitative assessment only)
- Based on the items that have been quantified, develop relevant metrics that would help in tracking the performance and climate-related risk exposure, or climate opportunity capitalisation, on a regular basis.
- These metrics could include the following:
  - Amount and extent of assets or business activities vulnerable to transition or physical risks
  - Proportion of revenue, assets, or other business activities aligned with climate-related opportunities
  - Price on each ton of greenhouse gas emissions used internally, i.e. internal carbon price
- 9. Develop strategy responses to the most material risks in financial terms in the form of mitigation and adaptation solutions
- Based on the risks which are identified as most material in the various scenarios, consider coming up with a list of mitigation and adaptation strategies to manage and minimise the risk exposure to the business and financials.
- 10. Iterate scenario analysis periodically and evaluate scenario analysis process
- Work towards the **Scenario analysis characteristics** listed on page 14.

Companies could begin the climate-related scenario analysis with a qualitative approach (i.e. skip steps 6 to 8) for a number of cycles to mature further in the process before embarking on a quantitative analysis, as quantifying a scenario prematurely may lead to inaccurate outcomes.

A company could consider taking on a quantitative analysis after its climate-related scenario analysis begins to exhibit most of the ideal characteristics for a scenario analysis found under the **Scenario analysis characteristics** section on page 14.



#### Other considerations

#### Number of scenarios

Typically, companies choose two to four scenarios covering a range of outcomes for transition and physical risks that they face. Transition risks tend to increase with more stringent emissions or temperature targets, while physical risks tend to increase with higher emissions and temperature outcomes.

The key principle is that the number of scenarios **include differences that are sufficiently great** to capture the key impacts and uncertainties of the drivers a company has identified.

The range of scenarios should be sufficiently diverse in order to create challenging "what-if" analyses and capture a wide range of assumptions about uncertain futures. By considering different outcomes, a company can better assess the range of its potential risks, opportunities, and uncertainties.

Beginning with two scenarios at opposite ends of temperature outcomes may be a practical way to start, gain experience, and generate buy-in to the scenario process. However, with two scenarios, there may be a tendency to interpret one as "good" for the company and one as "bad," introducing bias into the scenario analysis.

Four scenarios may be optimal to help to avoid bias from ranking the scenarios while keeping the exercise manageable. These four scenarios should cover the range of key uncertainties and drivers relevant to a company.

The TCFD Recommendations suggest for one of the scenarios to include a 2°C or lower scenario. ED IFRS S2 requires the disclosure of whether the entity has used a scenario aligned with the latest international agreement on climate change.

#### Time horizon(s)

Choosing a time horizon involves a trade-off between too short — where developments may not be sufficiently differentiated — and too long — where uncertainties may overwhelm useful analysis.

In setting time horizons for its scenario analysis, a company should consider:

- Time horizons that are compatible with (1) the company's capital planning and investment horizons; and (2) the useful life of major company assets
- Time horizons that are harmonised or anchored with those of national and international climate policy communities (e.g. 2030 and 2050)

#### Models

The use of models could help in drafting scenario narratives, e.g. in explaining climate-related financial risk transmission channels, and quantifying aspects of the scenarios. Models are formal constructs — represented in mathematics and diagrams — that are used to understand more complex, real-world systems, such as the physical climate system. Models include the following types<sup>8</sup>:

		What they are		Examples of model inputs		Examples of model outputs
Physical Climate	•	Projects physical climate changes	•	Projections of emissions and other	•	Temperature changes
Models		based on different driving forces		radiative forcing drivers (e.g.	•	Precipitation changes
				Representative Concentration	•	Others such as wind speed, humidity,
				Pathways*)		evapotranspiration, snow cover, snow
			•	Incoming and outgoing solar radiation		melt, sea ice cover, and sea ice melt
			•	Solar radiation reflection and absorbed		
			•	Observed historical climate		
Impact,	•	Analyses the outputs of physical	•	Biological properties and physical	•	How changes in climate variables
Adaptation, and		climate models to understand or		climate conditions (for agriculture-		interact to produce changes in the crop
Vulnerability		quantify exposures to either physical		related topic)		production quantity and quality (for
(IAV) models		or transition climate risks				agriculture-related topic)
Integrated	•	Combines multiple specific sectoral	•	Socioeconomic development	•	Linkages between economic, social,
Assessment		models to understand the		assumptions (e.g. Shared Socio-		and technological development and
Models (IAMs)		socioeconomic drivers of emissions,		Economic Pathways*)		the evolution of the climate system
		feedbacks between economic growth	•	Population	•	Impacts and mitigation in a cost-
		and climate change, rate and direction	•	Gross Domestic Product		benefit framework
		of change toward a low-carbon future,	•	Assumptions around policy, climate,	•	Estimates for the social cost of carbon
		and the role of different technologies,		land use, existing and emerging		
		policies, and societal preferences		technologies, etc.		

\* Refer to page 22 on the Intergovernmental Panel on Climate Change



# **Common global scenarios**

The scenarios below are highly established globally and are commonly used as inputs to the models above:

The	•	The IPCC was created by the World Meteorological Organization and			
Intergovernmental		the United Nations Environment Programme to provide governments at			
Panel on Climate		all levels with scientific information that they can use to develop climate			
Change (IPCC)					
Change (IFCC)		policies.			
	•	It provides regular assessments of the scientific basis of climate			
		change, its impacts and future risks, and options for adaptation and			
		mitigation via comprehensive reports every six or seven years.			
	•	Shared Socio-Economic Pathways <sup>11</sup> (SSPs) offer a systematic			
		exploration of possible socioeconomic futures in terms of widely			
		different predispositions to mitigate and adapt to climate change. They			
		comprise five different parratives of the world's future augmented by an			
		expanding set of projections, e.g., for population, economic activity,			
		urbanisation, and income inequality.			
	•	Representative Concentration Pathways <sup>12</sup> (RCPs) classify the			
		stringency of different warming limits and constitute projections of			
		greenhouse gas emissions and concentrations and their combined			
		radiative forcing:			
		RCP Forcing Temperature Emission Trend			
		1.9     1.9 W/m2     ~1.5 °C     Very Strongly Declining Emissions			
		2.6     2.6 W/m2     ~2.0 °C     Strongly Declining Emissions       4.5     4.5 W/m2     ~2.4 °C     Strongly Declining Emissions			
		4.5     4.5 W/m2     ~2.4 °C     Stowty Declining Emissions       6.0     6.0 W/m2     ~2.8 °C     Stabilising Emissions			
		8.5 8.5 W/m2 ~4.3 °C Rising Emissions			
	•	The RCPs can be combined with the SSPs to derive emissions and			
		concentration scenarios that take up the socioeconomic assumptions			
		underlying the SSPs and then impose climate policies to reach the end			
		of century radiative forcing levels as defined by the RCPs.			
International	•	The IEA is made up of 31 member countries and 8 association			
Energy Agency		countries to shape a secure and sustainable energy future.			
(IEA) Global Energy	•	Their work spans a variety of programmes and initiatives, helping			
and Climate (GEC)		ensure energy security, tracking clean energy transitions, collecting			
Model		data, or providing training around the world.			
	1	The IEA's GEC is the principal tool used to generate detailed sector-			
	•	The IEA's GEC is the principal tool used to generate detailed sector-			
	•	by-sector and region-by-region long-term scenarios across IEA's			
	•	by-sector and region-by-region long-term scenarios across IEA's			

https://climatescenarios.org/primer/socioeconomic-development
 https://climatescenarios.org/primer/mitigation



Central Banks and	•	The NGFS is a group of Central Banks and Supervisors willing, on a
Supervisors		voluntary basis, to share best practices and contribute to the
Network for		development of environment and climate risk management in the
Greening the		financial sector and to mobilise mainstream finance to support the
Financial System		transition toward a sustainable economy.
(NGFS) Scenarios	•	The NGFS scenarios provide a common and up-to-date reference point
Portal		for understanding how climate change (physical risk) and climate policy
https://www.ngfs.net/		and technology trends (transition risk) could evolve in different futures,
ngfs-scenarios-		in namely orderly; disorderly; hot house world; or too little, too late
portal/		scenarios.

The following diagram sets out an example of how physical climate models and IAV models can be used to identify key physical risks and relevant publicly available data sources.



Source: Report by the UN Environment Programme's Principles for Sustainable Insurance Initiative Insuring

the climate transition - Enhancing the insurance industry's assessment of climate change futures



#### Scenario choice

In order for companies to have significant results from the scenario analysis, they should choose scenarios that would be aligned to the global findings on climate science, as well as to the global transitioning pathways. The main principles companies should follow to choose their scenarios include data availability, i.e. whether the data that is available to them corresponds to the scenarios and can be used as a reference in the analysis, as well as the robustness of the data sources for the scenarios (e.g. IPCC, IEA or NGFS). Some sources may be more applicable for certain industries, e.g. the NGFS scenarios may be more widely used by the financial sector.

The following table summarises the main sources for reference when choosing scenarios and the scenarios that align to the two example warming levels. Companies should note that there are other scenarios with different sets of assumptions that may also be used and the company should choose the set of assumptions that works best for the purposes of their scenario analyses and the objectives they want to achieve.

	1.5°C scenario alignment	4°C scenario alignment
General note	Alignment to net zero by 2050 pledges	Closer to business-as-usual to
	and fast transitioning to a low carbon	stress test against physical risk
	economy	
IPCC Assessment	SSP1-1.9 or SSP1-2.6 (RCP 2.6 as per	SSP3-7.0 or SSP5-8.5 (RCP
Report 6	Assessment Report 5 (AR5))	8.5 as per AR5)
IEA	IEA Net Zero by 2050 scenario (NZE	IEA Stated Policies Scenario
	2050)	(STEPS)
NGFS	NGFS Net Zero 2050	NGFS Current Policies

#### Conclusions, strategy options and signpost metrics

Companies may approach the analysis of their scenarios by formulating questions to guide the responses of internal stakeholders when considering the scenario outcomes. These internal stakeholders may include the board of directors, executive management and teams from risk management, investor relations, finance, etc.

Consider resilience of	•	How might the current strategy perform over time in each scenario?
current strategy to	•	Will the current strategy make the business vulnerable to the impact
identified climate-		of any climate-related risk at any point in time?
related risks	•	How should the business better prepare itself for the outcomes in
		the various scenarios?

The guiding questions may include the following:

Consider how the	•	How can the company better position itself to take advantage of
current strategy may		opportunities that might come along?
adapt to identified	•	Are there any alternative strategies to improve business viability if
climate-related risks		the identified transition or physical risks are realised?
	•	Is there any strategy that might help the company respond to the
		possible outcomes from multiple scenarios?
	•	What indicators, or signpost metrics, should the company track that
		should trigger a reassessment of the business strategy or execution
		of an alternative strategy?
Reassess	•	Do the driving forces and key assumptions remain valid?
assumptions before	•	How should the scenario analysis be updated to incorporate latest
the next scenario		scientific or jurisdictional developments and revisions to business
analysis exercise		strategy?

**App B** on suggestions for how to engage internal stakeholders and facilitate these discussions may also be applicable.

Along with the rest of the exercise, **oversight by the board of directors and executive management** is critical to ensure that there is sufficient communication and collaboration between the relevant teams and the objectives of the scenario analysis exercise are met.

#### Possible roadmap to embark on scenario analysis

The TCFD suggests the following progression to develop scenario analysis capabilities over time:

Just starting	Gaining experience	Advanced experience
Organizations may choose to start with qualitative scenario narratives or storylines to help management explore the potential range of climate change implications.	The scenarios and associated analysis of development paths 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 may be warranted. Quantitative approaches may be achieved by using existing external scenarios and models (e.g., those provided by third-party providers) or by organizations developing their own, in- house modeling capabilities.

Source: TCFD's page on scenario analysis

At the ISSB meeting in January 2023<sup>10</sup>, the ISSB Staff Members considered stages of progression similar to the above in discussing requirements for the use of scenario analysis to assess climate resilience when applying IFRS S2. The ISSB's intention was to require disclosures "using a method of climate-related scenario analysis commensurate with the entity's circumstances" and to put organisations "on a path to the application of more sophisticated approaches". The ISSB has identified the following as primary aspects of such circumstances:

- The degree of the entity's exposure to climate-related risks and opportunities
- The skills, capabilities and resources available to the entity to conduct climate-related scenario analysis

The primary aspects above might be useful to guide companies in determining where they are in the process and where they need to be eventually.

	Getting started	Progressing over time
Scope	Begin from areas of the	Include more components of the business
	business that can provide	as company gains more comfort over pilot
	business insights via pilot	testing.
	testing.	
Time	<ul> <li>Match national policy, e.g. S</li> </ul>	ingapore's 2030 Nationally Determined
horizon(s)	Contribution and net-zero by	2050.
Number of	Start with two scenarios,	Progress to four scenarios.
scenarios	e.g. temperature increase	
	of 1.5°C (climate mitigation	
	scenario) and 4°C (climate	
	adaptation scenario).	
Assumptions	Assume smooth physical	Incorporate disorderly assumptions.
	and transition changes.	• For example, despite the Paris Agreement's
		goal to substantially reduce global
		greenhouse gas emissions to limit the
		global temperature increase in this century
		to 2°C while pursuing efforts to limit the
		increase even further to 1.5°C, the UN
		Climate Change reported in October 2022
		that the combined climate pledges of 193
		Parties under the Paris Agreement could
		put the world on track for around 2.5°C of
		warming by the end of the century. This

Companies may plan for the implementation of scenario analysis with the following in mind:



	Getting started	Progressing over time
		indicates that changes in national policies
		might not always be quick enough to effect
		the desired improvements in climate action
		practices.
Qualitative or	Understand the impacts of	Obtain necessary data.
quantitative	climate-related risks and	• Proceed with quantification gradually, e.g.
assessment	opportunities from a	quantify impacts through directional
	qualitative perspective in	indications and then develop more detailed
	order to assess strategy	quantitative models later.
	meaningfully.	• What can be quantified? Driving forces,
	Investment in a	constraints, assumptions, and logic from the
	quantitative assessment	scenario narrative are often used as inputs
	should only take place	to models to quantify pathways and
	after the qualitative	outcomes of the scenario. Expected losses
	narrative has been well-	are relatively easy to quantify.
	considered and informed.	
Strategy	Identify options that address imp	pacts occurring across multiple scenarios to
	enhance resilience effectively.	

#### Learning experiences and insights

ISCA spoke to two companies to find out more about where they are in the climate-related scenario analysis and what they can share about the process.

#### Wilmar International Limited

#### Perpetua George

#### General Manager, Group Sustainability

Wilmar is an agribusiness group whose businesses include oil palm cultivation, oilseed crushing, edible oils refining, sugar milling and refining, manufacturing of consumer products, specialty fats, oleochemicals, biodiesel and fertilisers as well as flour and rice milling.

#### Leveraging existing disclosures

Wilmar's climate reporting originated from the implementation of the requirements of the CDP (formerly known as the Carbon Disclosure Project) in 2008. With the introduction of the TCFD Recommendations in 2017, Wilmar found that one of the immediate tasks was to align existing disclosures to those recommendations and related stakeholder expectations.

This necessitated piecing together the various elements of its existent reporting and identifying the gaps to be filled. For example, the approach undertaken in Wilmar's CDP reporting back then focused on the reduction of emissions and did not necessarily highlight climate-related risks or opportunities. Notwithstanding this, existing disclosures could be leveraged to support a qualitative analysis to provide insight into the resilience of its strategies.

#### Identification of risks

Given the understanding of the business, the team was able to identify what were the relevant transition and physical risks. Following the identification of these key risks, Wilmar was able to identify the potential impact, for example both acute and chronic risks would impact productivity and yield of the business through the crop yield and disruption to physical operations. It was useful to understand these risks so that they could be responded to.

#### Quantification

After developing a qualitative analysis, the next step would be to quantify the scenarios and if possible, develop some linkage to the financials. It might be easier for companies to approach quantification from an expected costs approach to explore the possible consequences of specific decisions, such as expected carbon taxes or known expected costs of repair. However, it will be significantly more challenging to quantify matters that are speculative in nature, such as reputational loss or potential loss of customers.

#### Usefulness of reports

While the IPCC reports are helpful to understand the impacts of climate change, it might be necessary to gradually supplement this understanding with more precise reports. For example, geographical data such as rainfall amount relating to specific areas of operations might be essential to further refine their scenario analysis process and obtain deeper insights. Companies might find themselves having to utilise their knowledge of the sector which they are operating in, obtaining further information from sector experts (such as agronomists), and compile such information from multiple sources across the various medium, both in print or digital.

#### Structuring the team

As suggested above, the scenario analysis process involves a mix of qualitative scenarios and impact quantification, as well as an appreciation of what may be quantified. It is critical for finance and operational teams to work together and contribute their respective expertise to the process, especially when the sustainability report would be presented alongside the financial statements.



# CapitaLand Investment Limited

# Foo Peng Er

Vice President, Group Sustainability CapitaLand Investment Limited (CLI) is a leading global real estate investment manager with a strong Asia foothold. As at 31 December 2022, CLI had S\$132 billion of real estate assets under management, S\$88 billion of real estate funds under management held via six listed real estate investment trusts (REITs) and business trusts and more than 30 private vehicles across Asia Pacific, Europe and America. Its diversified real estate asset classes cover retail, office, lodging, business parks, industrial, logistics and data centres. Since 2019, it pledged its support for the TCFD Recommendations and voluntarily disclosed after 2017 its climate-related financial disclosures in the four key areas as recommended by TCFD.

#### Challenges of a growing global corporate

When preparing for the climate-related scenario analysis of its global portfolio, the challenges CLI faced included:

- A global footprint with over 400 operational properties that it owns in 20 countries
- Diverse asset types, which includes assets ranging from integrated development, retail, office, lodging, business parks, industrial, logistics and data centres
- The requirement for its climate-related scenario analysis to enable REIT-level disclosures, as there are six listed REITs within the CLI group

In studying how climate-related scenario analysis could be implemented, there was an option where CLI could identify its key markets, e.g. the top four to five major markets, to embark on the climate-related scenario analysis for these markets. This method was not adopted. CLI decided its global climate-related scenario analysis would cover its global portfolio as well as its six listed REITs, so that it could understand the unique environmental exposure of its asset classes in each market, especially in a volatile, uncertain, complex and ambiguous (VUCA) world. It embarked on piloting various climate physical risk platforms with selected CLI assets from around the world to identify a suitable platform and prepare for its group-wide global climate-related scenario analysis study.

#### Leveraging existing systems to enhance its disclosures

Another key challenge in adopting the TCFD Recommendations is preparing the relevant environmental data of its global portfolio to pilot the various climate scenarios. CLI has been tracking environmental performance data of its managed and owned operational properties via an online Environmental Tracking System since 2008. It had also been collecting environmental data for its third-party managed properties. In the earlier days, CLI tested available platforms such as the World Resources Institute's Aqueduct Water Risk Atlas to understand water-related risks and opportunities. With ready data, CLI then actively sought to review and testbed various climate platforms or software as a service (SaaS).



In 2021, it tested one physical risk platform with data for 200 assets in its global portfolio across the diverse asset types. After much deliberation, CLI continued on its search for other ready platforms and by end 2021, it commenced piloting another climate platform, which included transition risk in addition to only physical risk. Between 2021 and 2023, the climate models were updated in this platform and CLI is now in the midst of its 2022/2023 global climate-related scenario analysis to understand how the identified climate-related risks and opportunities could impact its future operations, draw conclusions on the financially material physical and transition risks and revalidate its current strategy. CLI and its six REITs will review their mitigation and adaptation plans and identify opportunities, in alignment with CLI's 2030 Sustainability Master Plan (SMP).

#### Phased approach

As new climate models and platforms are continually updated or unveiled, CLI did not wait for the climate-related scenario analysis exercise to be completed before implementing the other TCFD Recommendations.

- CLI incorporated climate change risks and opportunities assessment as well as an internal carbon price (ICP) for its new investments into operational assets and development projects. All new investments undergo an Environmental, Health and Safety Impact Assessment (EHSIA) during due diligence to identify any environmental (including climate change) risks and opportunities related to the asset or project site and its surroundings. This assessment includes transition and physical risk and opportunity considerations, and the ICP further helped quantify climate-related risks and opportunities for its new investments. In the absence of available information, data proxies may be deployed. Significant negative findings from this impact assessment would require additional capital expenditure to be put in place for risk mitigation.
- CLI embedded climate-related performance metrics and targets linked to the remuneration policies for members of senior management, such as the Balanced Scorecard and as a performance measure in CLI's Performance Share Plan Awards, granted to members of senior management.
- As part of its 2030 SMP, CLI established science-based carbon emissions reduction targets approved by Science Based Targets initiative (SBTi) to the well below 2°C scenario. In 2022, CLI elevated this target for Scope 1 and 2 emissions, which was approved by SBTi to be aligned to the 1.5°C scenario.

#### Ongoing iterative process involving multiple stakeholders

As a growth-focused company, facing evolving and escalating external stakeholder expectations and benchmarks, internal stakeholder engagement is key and iterative.



CLI set sustainability and climate-related performance metrics and targets linked to the remuneration policies for members of senior management, which are cascaded group-wide. This meant active engagement with colleagues on the ground, who must budget for and implement the necessary initiatives to help CLI achieve the environmental targets. This includes the country teams, operations teams, asset and investment teams, as well as the teams from the REITs. With metrics pegged to remuneration, corporate teams such as the Group Rewards and Corporate Planning teams are regularly engaged to better craft the key performance indicators, monitor and update the management and respective board committees.

US President Harry S. Truman once said, "Imperfect action is better than perfect inaction." This reflects the journey that CLI is on, in taking incremental steps to make consistent progress.

#### **Other resources**





Guidance on Scenario Analysis for Non-Financial Companies by TCFD https://assets.bbhub.io/company/sites/60/2020/09/2020-TCFD\_Guidance-Scenario-Analysis-Guidance.pdf

The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities by TCFD https://assets.bbhub.io/company/sites/60/2021/03/FINAL-TCFD-Technical-Supplement-062917.pdf Extracts and highlights from this Technical Supplement and other resources https://www.tcfdhub.org/scenario-analysis/



TCFD Climate Scenario Analysis – A guide for finance teams on frequently asked questions by A4S CFO Leadership Network

https://www.accountingforsustainability.org/en/knowledgehub/guides/tcfd-climate-scenario-analysis.html



Guide to climate scenario analysis for central banks and supervisors by NGFS https://www.ngfs.net/sites/default/files/medias/documents/ngfs\_guid e\_scenario\_analysis\_final.pdf





Model Guidance on Climate Disclosure by Sustainable Stock Exchanges (section 2.5) https://sseinitiative.org/wp-content/uploads/2021/06/Model-Guidance-on-Climate-Disclosure.pdf



# SENSES Toolkit by the European Research Area for Climate Services

https://climatescenarios.org/

# **COMMON CLIMATE-RELATED RISKS IN SINGAPORE'S CONTEXT**

This section sets out common transition risks and physical risks and related developments that may be applicable to companies in Singapore as a starting point to assess their external environment or as inputs to their scenario analysis. Similar risks and developments may also be observed of areas of operations or jurisdictions situated overseas.

#### **Common climate-related risks**

Transition risks	Physical risks
Policy and legal	Chronic
Increase in compliance costs due to changes in	Long-term changes in climate and
governing laws and regulations arising from	weather patterns, e.g. rising sea levels
transition to a low-carbon economy, e.g. carbon	and mean temperatures
tax, water tariffs, building standards, mandatory	Disruption of operations, productivity
climate reporting, etc.	and supply chain resulting from water
	stress, scarcity of crops, livestock and
Technology	raw materials, etc.
• Failure to adapt to the emergence of disruptive	Deterioration of the health and safety
technologies that are more resource-efficient and	of workers arising from worsening
less carbon-intensive	weather conditions
	• Necessity of adaptation measures, e.g.
Market	flood protection, cooling and heating
Loss of competitiveness due to changes in the	needs, etc.
expectations of customers and lenders for	Increase in insurance premiums
companies to be more environmentally friendly	
Downtime in operations due to disruptions of	Acute
supply chain, e.g. vendors failing to meet the	More frequent and damaging extreme
regulations of their jurisdictions	weather events such as floods and
Increase in insurance premiums	other natural disasters
	• Physical damage to inventory, property
Reputation	and infrastructure from extreme
Weakened social license to operate due to	weather events
increased stakeholder concerns over the	Surge in raw material prices and
company's impact on the climate	disruption of supply chain

Many climate-related risks, including but not limited to those in the table above, may also be viewed as **opportunities** to capitalise on emerging developments. For example, the adoption of new technologies could enable more efficient use of scarce natural resources and address supply constraints, or the development of greener products to cater to consumer demands could open new revenue streams or markets to the company.

Refer to App A for more information about climate-related risks, opportunities and their financial impact.

#### **Relevant developments in Singapore**

# Physical risks – Impact of climate change on Singapore

National Climate Change Secretariat (NCCS)<sup>13</sup>

Climate change affects Singapore's annual mean surface temperature, which has risen at an average rate of 0.2-0.3°C per decade since the 1980s. The recent ten years in 2010-2019 was the warmest decade on record at 27.95°C. The daily rainfall totals and frequency of days with heavier rainfall have also risen.

Additionally, the mean sea level has shown an annual increase of 3 mm per year over the last 15 years (on islandwide average). This makes adaptation measures a necessity for Singapore to prepare for the effects and to increase resilience to the effects of climate change.

#### Public Utilities Board (PUB)14

Climate change is causing more frequent and extreme rain events, and we have seen how torrential rain caused severe flooding in many other parts of the world. While it is not possible to cater for all extreme storm events and prevent floods entirely, the realities of climate change require us to build our flood resilience as a nation. We must continue to invest in flood protection measures and build flood resiliency in our critical infrastructure and our community. Stormwater management and building flood resilience is a shared responsibility, as Singapore is vulnerable to flood risks due to our topography and the effects of climate change. Together we can adapt, increase resilience and lower the flood risk.

The <u>PUB's webpage on flood management</u> provides a list of the following:

- Flood-prone areas which are low-lying places with a history of flooding
- Hot spots areas which are places that are not low-lying but have experienced flash floods

<sup>&</sup>lt;sup>13</sup> https://www.nccs.gov.sg/singapores-climate-action/overview/adaptation-overview

<sup>&</sup>lt;sup>14</sup> https://www.pub.gov.sg/news/pressreleases/2022PR17



#### Transition risks – Singapore's climate ambition

Based on a joint press release<sup>15</sup> by NCCS and Ministry of Sustainability and the Environment (MSE) in October 2022, Singapore's national climate targets will be updated as follows:

	As at Budget 2022 in March 2022	Press release in October 2022
Long-Term Low	Halve emissions from our 2030	Achieve net-zero by 2050
Emissions	peak to 33 million tonnes of carbon	
Development	dioxide equivalent (MtCO2e) by	
Strategy (LEDS)	2050, with a view to achieving net	
	zero emissions as soon as viable	
	in the second half of the century	
2030 Nationally	Peak emissions at 65 MtCO2e	Reduce emissions to around
Determined	around 2030	60 MtCO2e in 2030, after
Contribution (NDC)		peaking emissions earlier

The press release highlighted that these targets are contingent on technological advances and the economic viability of low-carbon technologies such as hydrogen and carbon capture, utilisation and storage (CCUS), as well as effective international collaborations in areas such as carbon credits and renewable energy imports.

More information on Singapore's mitigation and adaptation efforts may be found on the National Climate Change Secretariat's website.

#### Implications

These developments suggest that Singapore is experiencing the effects of climate change and government policy is shaping to mitigate those effects, along with other adaption efforts. Both aspects have to be considered when performing scenario analysis for business operations situated in Singapore or the region. For example:

As part of the Singapore Green Plan 2030, Singapore targets<sup>16</sup> to be a leading centre for green finance and services to facilitate Asia's transition to a low-carbon and sustainable future. This could mean access to additional channels of financing and potentially lower costs of borrowings to finance eligible projects. For a roadmap for businesses to access opportunities in green and sustainable finance, refer to ISCA's Green & Sustainable Finance: Guide for SMEs.

https://www.nccs.gov.sg/media/press-releases/singapore-commits-to-achieve-net-zero/
 https://www.greenplan.gov.sg/targets

- Carbon tax<sup>17</sup> is set at S\$5 per tonne of GHG emissions (tCO2e) and will be raised to \$25/tCO2e in 2024 and 2025, and S\$45/tCO2e in 2026 and 2027, with a view to reaching S\$50-80/tCO2e by 2030.
- Singapore adopts a circular economy approach<sup>18</sup> to reuse resources for as long as possible. This approach includes the introduction of Extended Producer Responsibility (EPR) for electrical and electronic waste (e-waste)<sup>19</sup> in 2021. EPR for e-waste is a regulated system to ensure the proper collection and handling of e-waste and the extraction of valuable resources from e-waste. The government is also exploring the feasibility of extending EPR to packaging waste<sup>20</sup>.
- In October 2022, Singapore launched<sup>21</sup> our national hydrogen strategy to accelerate transition to net zero emissions and strengthen energy security. Hydrogen could supply up to half of power needs by 2050.
- To lead the way for Singapore's decarbonisation journey, the public sector will commit<sup>15</sup> to achieve net zero emissions around 2045 under the GreenGov.SG<sup>22</sup> initiative. Under GreenGov.SG, the public sector will strive to attain ambitious sustainability targets in carbon abatement and resource efficiency and be a positive influence and enabler of green efforts, including but not limited to requiring Government agencies to purchase products that meet high efficiency or sustainability standards.

<sup>&</sup>lt;sup>17</sup> https://www.nccs.gov.sg/singapores-climate-action/carbon-tax/

<sup>18</sup> https://www.towardszerowaste.gov.sg/circular-economy/

<sup>&</sup>lt;sup>19</sup> https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/e-waste-management/extendedproducer-responsibility-(epr)-system-for-e-waste-management-system

<sup>&</sup>lt;sup>20</sup> https://www.nea.gov.sg/our-services/waste-management/mandatory-packaging-reporting

<sup>&</sup>lt;sup>21</sup> https://www.mti.gov.sg/Newsroom/Press-Releases/2022/10/Singapore-launches-National-Hydrogen-Strategy-to-accelerate-

transition-to-net-zero-emissions <sup>22</sup> https://www.greenplan.gov.sg/key-focus-areas/green-government/



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# **APP A – CLIMATE-RELATED RISKS, OPPORTUNITIES, AND FINANCIAL IMPACT**

#### Examples of climate-related risks and potential financial impacts

Туре	Climate-Related Risks	Potential Financial Impacts
	Policy and Legal	
	<ul> <li>Increased pricing of GHG emissions</li> <li>Enhanced emissions-reporting obligations</li> <li>Mandates on and regulation of existing products and services</li> <li>Exposure to litigation</li> </ul>	<ul> <li>Increased operating costs (e.g., higher compliance costs, increased insurance premiums)</li> <li>Write-offs, asset impairment, and early retirement of existing assets due to policy changes</li> <li>Increased costs and/or reduced demand for products and services resulting from fines and judgments</li> </ul>
	Technology	
	<ul> <li>Substitution of existing products and services with lower emissions options</li> <li>Unsuccessful investment in new technologies</li> <li>Costs to transition to lower emissions technology</li> </ul>	<ul> <li>Write-offs and early retirement of existing assets</li> <li>Reduced demand for products and services</li> <li>Research and development (R&amp;D) expenditures in new and alternative technologies</li> <li>Capital investments in technology development</li> <li>Costs to adopt/deploy new practices and processes</li> </ul>
sks	Market	
Transition Ri	<ul> <li>Changing customer behavior</li> <li>Uncertainty in market signals</li> <li>Increased cost of raw materials</li> </ul>	<ul> <li>Reduced demand for goods and services due to shift in consumer preferences</li> <li>Increased production costs due to changing input prices (e.g., energy, water) and output requirements (e.g., waste treatment)</li> <li>Abrupt and unexpected shifts in energy costs</li> <li>Change in revenue mix and sources, resulting in decreased revenues</li> <li>Re-pricing of assets (e.g., fossil fuel reserves, land valuations, securities valuations)</li> </ul>
	Reputation	
	<ul> <li>Shifts in consumer preferences</li> <li>Stigmatization of sector</li> <li>Increased stakeholder concern or negative stakeholder feedback</li> </ul>	<ul> <li>Reduced revenue from decreased demand for goods/services</li> <li>Reduced revenue from decreased production capacity (e.g., delayed planning approvals, supply chain interruptions)</li> <li>Reduced revenue from negative impacts on workforce management and planning (e.g., employee attraction and retention)</li> <li>Reduction in capital availability</li> </ul>

Туре	Climate-Related Risks	Potential Financial Impacts
iks	Acute - Increased severity of extreme weather events such as cyclones and floods Chronic	<ul> <li>Reduced revenue from decreased production capacity (e.g., transport difficulties, supply chain interruptions)</li> <li>Reduced revenue and higher costs from negative impacts on workforce (e.g., health, safety, absenteeism)</li> <li>Write-offs and early retirement of existing assets (e.g., damage to property and assets in "high-risk"</li> </ul>
Physical Ris	<ul> <li>Changes in precipitation patterns and extreme variability in weather patterns</li> <li>Rising mean temperatures</li> <li>Rising sea levels</li> </ul>	<ul> <li>locations)</li> <li>Increased operating costs (e.g., inadequate water sup for hydroelectric plants or to cool nuclear and fossil fi- plants)</li> <li>Increased capital costs (e.g., damage to facilities)</li> <li>Reduced revenues from lower sales/output</li> <li>Increased insurance premiums and potential for reduced availability of insurance on assets in "high-ris locations</li> </ul>

Source: Final Report on the Recommendations of the Task Force on Climate-Related Financial Disclosures



# Examples of climate-related opportunities and potential financial impacts

Туре	Climate-Related Opportunities	Potential Financial Impacts
icy	<ul> <li>Use of more efficient modes of transport</li> </ul>	<ul> <li>Reduced operating costs (e.g., through efficiency gains and cost reductions)</li> </ul>
fficien	<ul> <li>Use of more efficient production and distribution processes</li> </ul>	<ul> <li>Increased production capacity, resulting in increased revenues</li> </ul>
urce E	<ul> <li>Use of recycling</li> <li>Move to more efficient buildings</li> </ul>	<ul> <li>Increased value of fixed assets (e.g., highly rated energy- efficient buildings)</li> </ul>
Resou	<ul> <li>Reduced water usage and consumption</li> </ul>	<ul> <li>Benefits to workforce management and planning (e.g., improved health and safety, employee satisfaction) resulting in lower costs</li> </ul>
	<ul> <li>Use of lower-emission sources of energy</li> </ul>	<ul> <li>Reduced operational costs (e.g., through use of lowest cost abatement)</li> </ul>
	<ul> <li>Use of supportive policy incentives</li> </ul>	- Reduced exposure to future fossil fuel price increases
Sourc	- Use of new technologies     - Participation in carbon market	<ul> <li>Reduced exposure to GHG emissions and therefore less sensitivity to changes in cost of carbon</li> </ul>
ßy	<ul> <li>Shift toward decentralized energy</li> </ul>	<ul> <li>Returns on investment in low-emission technology</li> </ul>
Ener	generation	<ul> <li>Increased capital availability (e.g., as more investors favor lower-emissions producers)</li> </ul>
		<ul> <li>Reputational benefits resulting in increased demand for goods/services</li> </ul>
ces	<ul> <li>Development and/or expansion of low emission goods and services</li> </ul>	<ul> <li>Increased revenue through demand for lower emissions products and services</li> </ul>
l Servi	<ul> <li>Development of climate adaptation and insurance risk solutions</li> </ul>	<ul> <li>Increased revenue through new solutions to adaptation needs (e.g., insurance risk transfer products and services)</li> </ul>
ucts and	<ul> <li>Development of new products or services through R&amp;D and innovation</li> </ul>	<ul> <li>Better competitive position to reflect shifting consumer preferences, resulting in increased revenues</li> </ul>
<u> </u>	<ul> <li>Ability to diversify business activities</li> </ul>	
4	<ul> <li>Shift in consumer preferences</li> </ul>	

<ul> <li>Access to new markets</li> <li>Use of public-sector incentives</li> <li>Access to new assets and locations needing insurance coverage</li> <li>Participation in renewable energy programs and adoption of energy-efficiency measures</li> <li>Resource substitutes/diversification</li> </ul>	<ul> <li>Increased revenues through access to new and emergin markets (e.g., partnerships with governments, development banks)</li> <li>Increased diversification of financial assets (e.g., green bonds and infrastructure)</li> <li>Increased market valuation through resilience planning (e.g., infrastructure, land, buildings)</li> <li>Increased reliability of supply chain and ability to operat under various conditions</li> </ul>
<ul> <li>Participation in renewable energy programs and adoption of energy- efficiency measures</li> <li>Resource substitutes/diversification</li> </ul>	<ul> <li>Increased market valuation through resilience planning (e.g., infrastructure, land, buildings)</li> <li>Increased reliability of supply chain and ability to operat under various conditions</li> </ul>
	<ul> <li>Increased revenue through new products and services related to ensuring resiliency</li> </ul>

Source: Final Report on the Recommendations of the Task Force on Climate-Related Financial Disclosures

# **APP B – EXAMPLES OF INTERNAL STAKEHOLDERS TO ENGAGE**

# Table C2 Examples of Internal Stakeholders to Engage in Scenario Analysis

Function	Relevant Expertise	the Scenario Analysis
Brands, Marketing, Product Development	<ul> <li>Conduct customer, market analysis for business as usual</li> <li>Have already seen the impact of environmental, social, and governance (ESG)/climate change on customer/consumer behavior</li> <li>Understand customer/consumer behavior, needs, expectations, and trends</li> <li>Understand policy changes</li> </ul>	<ul> <li>Provide a forward-looking view on market's evolution, customers, consumer change in behavior, need, expectation, social activism in different scenarios, and time horizon</li> <li>Provide insight into possible political and legal evolution in certain markets</li> </ul>
Procurement/ Supply Chain	<ul> <li>Understand the complexity of the supply chain</li> <li>Have already seen the physical impact of ESG/climate change on suppliers and supplies</li> </ul>	<ul> <li>Provide views on vulnerabilities and opportunities in the supply chain under a range of climate change impacts</li> </ul>
Site/Operations	<ul> <li>Understand assets, technologies, infrastructure, market demand, and supply</li> <li>Link between the upstream and downstream value chain</li> </ul>	Understand the implications of local climate changes on operations
Research and Development (R&D)/Innovation/ Technology	Work on future technological development	<ul> <li>Provide views on plausible technological developments and breakthroughs</li> </ul>
Advocacy/Public Affairs	Global and regional policy trends	<ul> <li>Provide views on future developments of climate policy and international and national climate action</li> </ul>
Sustainability/ESG	<ul> <li>Understand environmental and social impacts of business</li> </ul>	<ul> <li>Provide insights on environmental and social cause-effect relationships of climate change</li> </ul>

# Table C3 Examples of Engagement Topics and Questions

Looking at the Current Situation	Looking Back	Looking Forward
<ul> <li>What current climate-related risks do you think the company faces today and that could affect business strategy and ambitions?</li> </ul>	<ul> <li>What previous trends, cycles, or risks related to climate do you think might reoccur and impact business strategy and ambitions?</li> </ul>	<ul> <li>In your view, which climate-related risks do you think the company needs to get right to fulfill its ambition and mission?</li> </ul>
What climate-related risks do you think are being underestimated by the company in their ability to meet their		<ul> <li>What emerging trends or signals related to climate change concern you?</li> </ul>
• What is your recent experience of actual climate-related impacts on your specific activity (and more broadly on the company's business)?		<ul> <li>What do you think could be the potential implications on your specific activity (and more broadly on the company) for climate factors — such as (1) an increase in average global temperature and (2) a low- carbon economy — and when could these occur?</li> </ul>

Source: TCFD's Guidance on Scenario Analysis for Non-Financial Companies

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