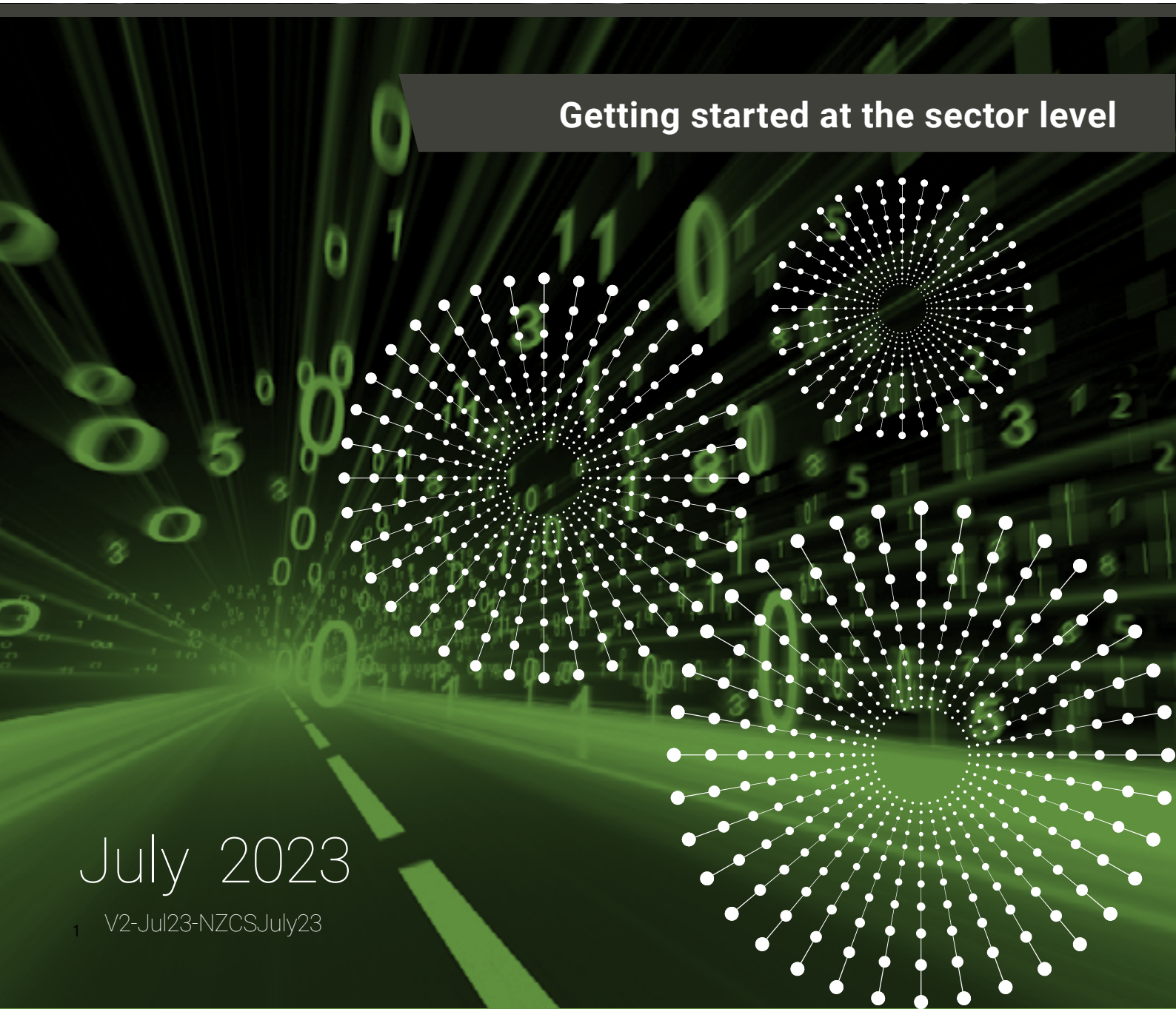
XRB | Te Kāwai Ārahi Pūrongo Mōwaho
EXTERNAL REPORTING BOARD

Staff Guidance

Sector scenario development

How to develop high quality, consistent and comparable sectoral scenarios for climate-related disclosures under NZ CS 1



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Contents

Who is this guidance for and what can you expect from it?

Purpose of this guidance

This guidance aims to promote and facilitate sectoral engagement and participation in scenario analysis, to improve the quality and comparability of scenario analysis and disclosures by individual climate reporting entities (CREs).

Who is this guidance for?

The intended audience is CREs, industry bodies and consultants engaged in developing climate-related scenarios at sectoral scale in Aotearoa New Zealand.

This guidance has been written with the following use cases in mind:

- Someone trying to understand **if and why** they should participate in a sector scenario analysis process.
- Someone from an industry body who wants to **obtain external support from a service provider** and needs to understand what a sector scenario process looks like.
- Someone within **a CRE** wanting to assess if, and how much, it can rely on sector-level scenario analysis work at their entity's level.
- A **service provider** who wants to ensure that their proposal is a good fit with the overall scope of the exercise and the capabilities of its potential client.

How to use this guidance

This guidance assumes a general understanding of scenario analysis as a tool for making flexible long-term plans. You can find an introduction on the XRB's or TCFD's websites.

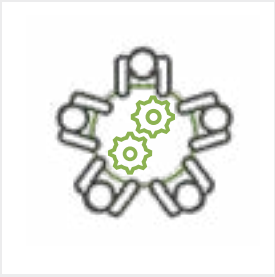
We have structured this XRB Staff Guidance in accordance with the six-step scenario analysis process recommended by the TaskForce on Climate-related Financial Disclosures (TCFD). Each of the six sections of this Guidance contains:

- specific recommendations on **Consistency and Comparability;**
- the **Key Outputs;** and
- **Conditions for success**

Key messages

The purpose of sector-level scenario analysis is to support high-quality, consistent and comparable entity-level scenario analysis

It is complex to bridge from global and national scale scenarios to those that are relevant for individual entities. Sector scenarios provide a valuable interim step and so help to improve consistency and comparability across entity-level disclosures.



Individual CREs benefit by participating in the development of sector scenarios

Sector-level scenario development reduces costs by doing collectively what each entity would otherwise do individually. Beyond this, participation in the process is a learning opportunity, which will ultimately make entity-level scenario analysis more valuable for your entity.

High levels of sector engagement, and diversity of perspectives from outside the sector, are key.

To be plausible and decision-relevant for entities, sector-level scenario analysis requires entities across a sector to meaningfully engage in the process. Diverse expertise, experience and perspectives, combined with climate, policy and futures insights from a range of external sources, provide the key ingredients for relevant and compelling scenarios that will be of most value to individual entities.

Scenario analysis involves grappling with uncertainty and make judgments.

Sector participants are required to think creatively, interrogate their own mental models, and be frank. This process can be unsettling, but is a well-established method for developing resilient strategic plans, the first step to address the challenge of our changing climate.

Getting from scenario analysis to transition planning

A 'HOW TO' OVERVIEW

How could climate change affect our sector?

What are the critical uncertainties our sector needs to prepare for?

Development of sector scenarios

(optional but recommended)

Benefits

- ✓ Comparability in disclosures
- ✓ Bridge between global and national analysis
- ✓ Rationalise costs
- ✓ Build a cross-sector understanding of climate-related risks;
- ✓ Create sectoral collaboration to address climate-related risks and opportunities

How could climate change affect my entity?

What are the critical uncertainties we need to prepare for?

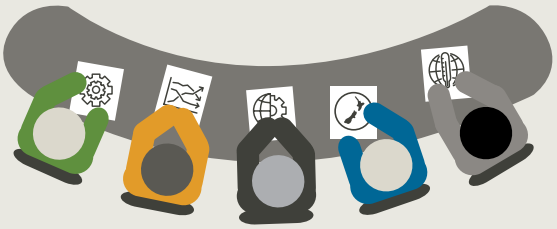
Are there gaps or weaknesses in our current strategy, business model, and/or operations?

If business as usual is not a credible option anymore, what are my options to become more resilient and seize opportunities?

Entity-level scenario analysis

Benefits

- ✓ Test resilience of business model and strategy under different climate scenarios
- ✓ Identify potential risks and opportunities that could be better managed or harnessed



What are the actions needed to address climate-related risks and opportunities?

When, and how much resource will be dedicated to these actions?

How to survive and thrive in a much more uncertain world?

Transition planning

Benefits

- ✓ The climate-related risks and opportunities identified during the scenario analysis process will likely require changes to the core strategy, governance, risk management practices and systems, and metrics and targets.

This is likely to mean strategic pivots, transformation of operations, and change of business models.

Guidance overview

Aotearoa New Zealand Climate Standard 1 (NZ CS 1) requires entities to disclose details of how they have undertaken climate-related scenario analysis. To help achieve consistent and comparable disclosures, sectors may choose to collectively develop sectoral climate-related scenarios that can support entity-level disclosure.

Overview of Scenario Development Steps	Process	Key Outputs
1. Engage stakeholders Bringing together industry leadership, iwi/Māori, climate expertise, and economic and policy insights is vital when developing climate-related scenarios at sector level. Diverse viewpoints and expertise helps to contextualise the sector's current position and shed light on the climate-related risks and opportunities it faces. Building a common view of the sector, core baseline of knowledge, and fostering a future mindset can help establish a solid foundation for the scenario analysis process.	**1.1** Engage leading stakeholders and CREs first. **1.2** Clearly describe the process and its expected outcomes. **1.3** Seek out core baseline knowledge. **1.4** Foster a future mindset. **1.5** Assess the context and external environment. **1.6** Allocate roles and responsibilities. **1.7** Get external support. **1.8** Set milestones.	- *Project charter* - *Briefing paper on climate context*
2. Define the problem It is important to clearly define and agree the system boundaries of the sector. A process of participatory systems mapping may help with this.	**2.1** Define the scope of the sector as part of defining the problem. **2.2** Define the scope of the scenario analysis. **2.3** Define a time horizon. **2.4** Map the sector and its system boundaries.	- *Focal question/s* - *Scope of sector* - *Time horizon/s* - *Mapping of the sector*
3. Determine critical uncertainties Understanding which driving forces will have the greatest influence in shaping outcomes for the sector and related entities is an essential step in creating climate-related scenarios. Assessing the level of uncertainty for each driving force will help to define what each scenario should explore and the key differentiating characteristics between scenarios by allowing uncertainties to play out in different ways.	**3.1** Identify driving forces. **3.2** Categorise driving forces for their influence and uncertainty. **3.3** Understand views on interactions and impacts of critical uncertainties. **3.4** Use scenario axes to develop a scenario matrix.	- *Scenario axes* - *Critical uncertainties* - *Conceptual model (interactions and impacts)*

4. Select temperature outcomes and pathways Scenarios need to describe the temperature outcome and the path taken to reach it. In scenario analysis, there may be many, markedly different pathways toward a given future temperature outcome, with divergent risks and opportunities along each pathway.	**4.1** Select temperature outcomes and pathways. **4.2** Start with the fundamentals and build a richer picture over time. **4.3** Select scenarios.	- *Temperature outcomes* - *Emissions pathways*
5. Draft narratives and quantify The drafting of narratives that provide rich, compelling illustrations of the temperature outcomes and pathways selected will bring alive plausible future events. Quantification of aspects of each narrative may assist entities to characterise the financial impacts of climate-related risks and opportunities.	**5.1** Draft scenario narratives. **5.2** Quantification: caution advised. **5.3** Draw on higher-level scenarios, pathways and projections.	- *Scenario narratives* - *Quantification* - *Scenario process and limitations*
6. Check quality and plan review Sectoral scenarios do not remove the need for scenario analysis by individual CREs. This step is about checking that the output(s) of the process achieved the objectives set at the beginning.	**6.1** Quality check. **6.2** The role of sectoral scenarios in CRE disclosure. **6.3** Continuous improvement. **6.4** Build on momentum.	- *Quality check* - *Final report* - *Monitoring plan* - *Reiteration and review plan*

The role of sectoral scenarios

NZ CS 1 includes a requirement to disclose details of how an entity has undertaken scenario analysis. To help achieve consistent and comparable disclosures, sectors may choose to work together to develop sectoral climate-related scenarios that can be used to support entity-level disclosure.

There is a wide gulf between published 'meta' climate-related scenarios from organisations such as the Intergovernmental Panel on Climate Change (IPCC) and what is relevant to an individual entity.

Sectoral scenarios offer a practical and flexible means of bridging the divide.

Although not mandatory, sectoral collaboration is likely to provide greater comparability and lead to higher quality scenarios, while imposing fewer resource demands on CREs, compared to CREs undertaking scenario analysis independently (see Figure 1).

CREs choosing to go their own way should be aware that primary users will be expecting them to describe how their scenarios compare with those used by other entities in their sector and across sectors, and to explain why they have chosen to deviate.

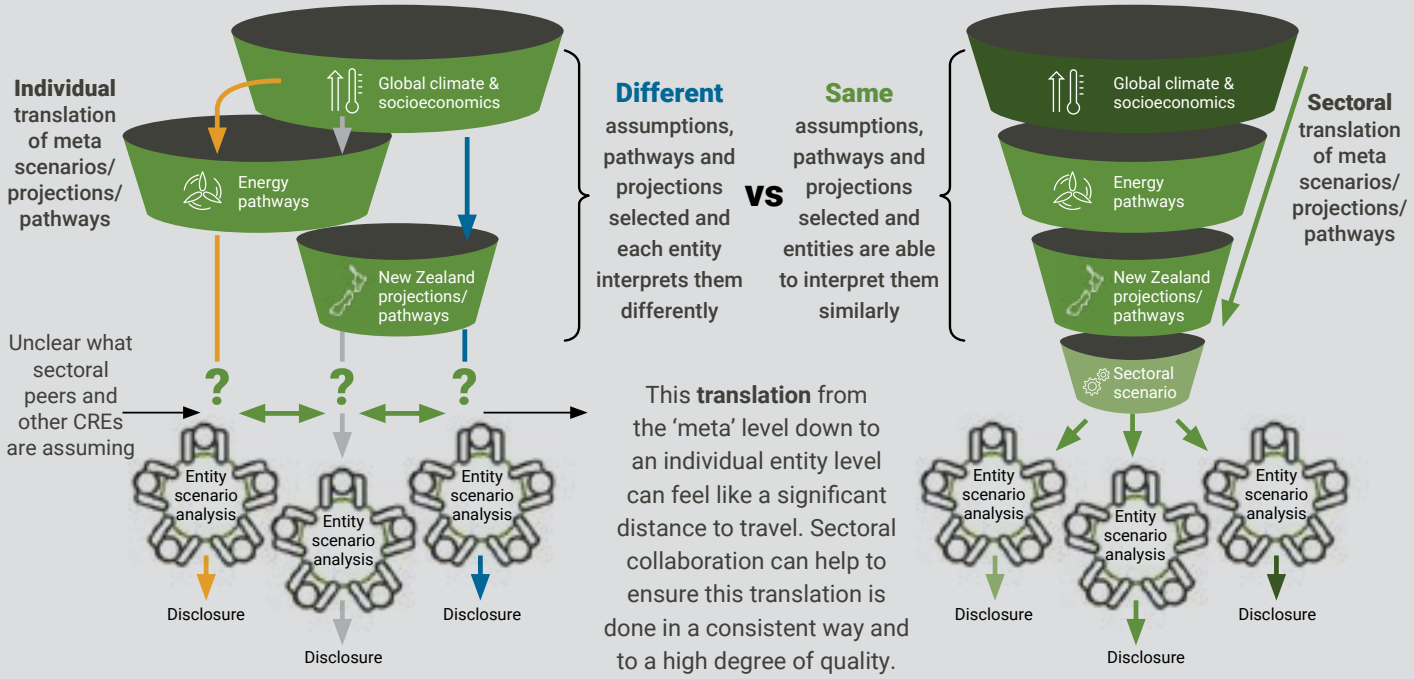


Figure 1: The role of sectoral scenarios in creating a shared scenario architecture

The objectives of sector scenarios

The following objectives can be stated to potential participants in a sector scenario exercise:

1. Translate the global and national meta-scenarios and potential pathways into tangible potential consequences for the sector.
2. Develop common sector scenarios supporting entities' scenario analysis for better comparability.
3. Build a cross-sector common understanding of climate-related risks and opportunities, and of the scenario analysis process.
4. Support the wider sector, including entities that are not CREs, to prepare for climate-related risks and opportunities.

Another longer-term objective (although beyond the scope of this guidance) is to build on sectoral collaboration to address some of the climate-related risks and opportunities identified in a sector level transition plan. Some actions can be more effectively tackled at a sector-level (e.g., participation in the regulatory process, joint research, funding of enabling innovation).

Sector participants will need to actively make judgement calls

Active participation on the part of the sector is essential. The work cannot be done by an external provider and handed over for sectoral consideration. It is vital that those involved in making decisions, and living with the consequences of those decisions, are part of the process of scenario development and analysis for this process to be of strategic value.

Scenario analysis involves grappling with uncertainty. That requires an acceptance that logically defensible judgements must be made where it is not possible to generate predictive data. Sector participants are required to think creatively, interrogate their own mental models, and be frank about sharing their views with others who are doing the same.

The relationship of this guidance with TCFD guidance

The TCFD has published comprehensive guidance on the use of scenario analysis in disclosing climate-related risks and opportunities that is highly relevant to all entities.[1] The XRB's guidance complements the TCFD scenario analysis guidance by showing how it can be put into practice at sectoral scale in New Zealand to promote consistent, comparable and high-quality disclosures.

This guidance sets out a process for sectors to collaborate on the development of climate-related scenarios supporting CRE disclosure requirements. It assumes some degree of familiarity with the terminology and approaches underpinning climate-related scenarios but does not require expertise in these fields. In building on existing sources and what constitutes orthodoxy at the time of writing, it aims to support practitioners and funding bodies in coming to a shared understanding.

This approach is ideal for sectors coming together for the first time to undertake scenario analysis. It is also one that can be consistently adopted by all CREs disclosing under Aotearoa New Zealand Climate Standards, as the TCFD provide ample guidance supporting its use. A shared starting point simplifies the task for preparers and gives comfort to primary users of disclosures that a common approach to scenario analysis has been followed, while retaining flexibility for differences within and between entities and sectors.

The TCFD has outlined a six-step approach to scenario analysis in its 2020 guidance (Figure 2).

Climate-related scenario process
1. Engage stakeholders
2. Define the problem
3. Determine critical uncertainties
4. Select temperature outcomes and pathways
5. Draft narratives and quantify
6. Assess strategic resilience

Figure 2: ***The six-step approach to climate-related scenario analysis.*** *Entities can follow this approach to climate-related scenario analysis adapted from the TCFD's six-step approach*

Technical concepts

Driving forces:	Broad scale, external factors that may affect the outcomes of the focal question(s), also known as 'drivers'.
Focal question:	A question that guides a project or a process by providing clarity, direction, and boundaries. A focal question should be specific, short, precise, and reflect the desired outcome and the domain of the project.
Participatory systems mapping:	A method for building and analysing causal system models in groups.
Critical uncertainties	The driving forces that are most influential and most uncertain. These will define the range of scenarios required to explore the potential futures.
Conceptual model:	A simple representation of a system focused on the relationship you expect to see between your variables.

See also:

- The definitions of physical and transition risks in NZ CS 1 (page 12)
- The 'fundamentals of climate-related risk' in XRB's guidance for all sectors (page 25) for further detail on important terms such as hazard, exposure, or vulnerability.

1. Engage stakeholders

Bring stakeholders onboard and assess the external environment.

Bringing together the right blend of industry leadership, iwi/Māori, climate expertise, and economic and policy insights is vital when developing climate-related scenarios at sector level. Diverse viewpoints and expertise help to contextualise the sector's current position and shed light on the climate-related risks and opportunities it faces.

1.1 Engage leading stakeholders and climate reporting entities first

Most sectors in New Zealand have a group of recognised leaders, often key participants in peak bodies or sectoral umbrella groups, whose involvement in a project will serve as a catalyst for others to join. Securing their involvement early in the process will likely bring others to the table.

CREs should be encouraged to participate from the outset, but other entities within the sector who are not required to disclose may also bring valuable insights.

Within CREs, make sure there are decision makers (e.g., chief risk officer, strategy lead, or a board member that is responsible for the strategic integration of climate related risks), and individuals who thoroughly understand how the sector operates.

It is also important to secure the participation of:

- climate science and data providers;
- experts in mātauranga Māori;
- policy makers and regulators;
- any advocacy or consumer groups with a specific interest in the sector; and
- for financial institutions, experts and academics focused on climate risk transmission channels.

Bringing in outside perspectives will reduce the risk of 'groupthink' and defaulting to business-as-usual norms.

Finally, contracting a specialist consultant or project administration team may bridge any capacity gaps and increase accountability for progressing the work.

1.2 Clearly describe the process and its expected outcomes

People frequently approach scenario analysis from different perspectives and have different expectations of what the process entails and will produce. This is true within an entity and a sector.

It is therefore important at the outset of a scenario analysis process to clearly define the objectives, milestones, deliverables and key outputs. Clarifying how CREs can use the outputs and employ them in their own disclosure is also essential (i.e., as inputs for further analysis at the entity level).

Setting project rules regarding avoiding anti-competitive conduct, clear expectations around collaboration and information sharing, particularly in areas of potential commercial sensitivity, should be tackled early in the process. At the time of writing, the Commerce Commission is preparing further guidance that CREs should refer to, once available. The prohibition on contracts, arrangements and understandings that substantially lessen competition in Part 2 of the Commerce Act 1986 are not a barrier to a collaborative project, but CREs should ensure they understand the law.

1.3 Seek out core baseline knowledge

It can be useful to start a sectoral scenario process with a knowledge sharing workshop led by climate scientists and sectoral experts with a grounding in climate-related risks and opportunities.

Indeed, setting the scene for sectoral participants unfamiliar with the implications of climate change is often crucial. Ultimately, participants need to be able to make informed decisions about how climate-related risks and opportunities might plausibly affect the sector in years and decades to come. Doing so will require an understanding of where and how climate-related risks and opportunities might arise, not only through physical geography, but also via factors such as value chains, market access, technologies, consumer preferences, labour availability and regulatory factors.

1.4 Foster a future mindset

A future mindset is key to the success of scenario analysis. Participants need to be clear about what they are (and are not) doing in developing climate-related scenarios for the sector.

We recommend sectors adopt the TCFD view of what scenarios are and are not (see Table 1).

Fostering a certain mindset in a group of participants is not easy and requires facilitation skills.

This is about creating open-mindedness, trust, and empowerment among participants.

This takes time, and participants should have enough room for reflexion and discussions. They should not be rushed through the process, nor talked to/at most of the time.

To be empowered, participants should be given the required knowledge to have a good understanding of the problem and its potential consequences so they can then apply their own specific expertise to this common ground.

Future-mindedness is optimistic. It isn't that the world is rosy, that positivity is the answer, or that "everything will just work out." This is about creating the confidence about our collective ability to take action and shape outcomes. This is about deliberately looking for upside, possibility and orienting toward finding opportunity.

Future-mindedness is pragmatic. This means acknowledging that unknown events beyond our control will likely change the situation, and thinking through what that might look like.

This is about stimulating people's imagination, pushing participants to think out-of-the-box and be innovative.

Being systematic about looking at a perspective, and then asking about the opposite, helps to move participants from "being right" to a more exploratory discussion.

Being non-judgemental is important to enable the expression of a full range of views. This is one of the reasons the facilitator should not be in a position of authority (see section 1.7).

Defining what scenarios are and are not	
ARE	**ARE NOT**
Products of internal insights and collaborative learning	**Products of external consultants**
Plausible alternative futures	**Probalistic predictions**
Siginificantly different views of the future	**Variations around a single reference case or value**
Specific, highly decision-focused views of the future	**Generalised views of feared or desired futures**
Movies of the evolving dynamics of the future	**Snapshot descriptions of an endpoint in time**

***Table 1:* What scenarios are and are not.** *The TCFD recommend applying these 'rules of engagement' in framing what scenarios are and are not (adapted from[3]). We recommend entities do likewise in conducting their scenario analysis.*

1.5 Assess the current context and external environment

Before exploring how future events might plausibly unfold, participants should reach a shared understanding of the climate context the sector currently operates within.
This typically includes an analysis of:

- **Physical risks:** past and present sensitivity to acute and chronic physical climate hazards, such as the impacts of storms, heatwaves, droughts, or longer-term shifts in temperature, sea level, etc.;
- **Transition risks:** past and present sensitivity to economic, regulatory, legal, market and societal moves to address climate change, such as emissions pricing, shifts in consumer preferences, or changes in energy and transport costs; and
- how these climate-related trends and shifts have interacted with wider driving forces of change to influence outcomes, such as reducing the return on investment in some market segments compared to others, or increasing competition for skilled staff.

This information allows the identification of current impacts of climate change and a better understanding of the range of issues, knowledge gaps, and implications of forward-looking risks and opportunities.

This phase of the analysis is grounded in the past and present (referred to in NZ CS 1 as 'current impacts'), and with a relatively clear base of qualitative (and perhaps quantitative) evidence to support the conclusions reached. Starting from a solid footing of this nature is important given the level of uncertainty involved.

This baseline needs to be discussed and agreed by the group of participants.

Key outputs to document: Project charter, briefing paper on climate context

Clearly document participant roles and responsibilities, project objectives, planned steps, milestones and deliverables.

Document the findings of the sector's assessment of the climate context and external environment.

1.6 Allocate roles and responsibilities

It is essential to identify the major functions and allocate responsibilities to individuals that have the required skills and knowledge. An indicative list of functions is below:

- **Project administration:** Monitor progress and maintain participants' active engagement.
- **Facilitation:** Ensure everyone's role is clear, and that everyone contributes. Foster a futures mindset. Ensure the group remains focused on the agreed objectives and outputs.
- **Climate expertise:** Set the scene. Build a common group understanding of past, present and future climate change implications.
- **Sectoral expertise:** Identify driving forces. Translate climate-related impacts into risks for the sector operations and business models. Draft the scenario narratives.
- **Mātauranga Māori expertise:** Weave Māori knowledge and perspectives into the process at every stage.
- **Key stakeholder representation:** Avoid siloed thinking and help identify driving forces and risks (e.g., adjacent sector representatives, policy makers and regulators, advocacy or consumer groups).

1.7 When to get external support, and which roles should not be outsourced

Contracting a specialist consultant or project administration team may bridge any capacity or capability gaps. It may also help to clarify accountability for the steady progression of the process and the quality of the outputs.

However, ownership by the sector representatives is vital. As stated by the TCFD, scenario analysis is an **explicitly participatory process**. It cannot be a service provided to a group or an entity attempting to analyse its climate-related risks and opportunities. Consultants can facilitate, but key decision makers must engage in the development and analysis of scenarios if they are to be of value in assessing strategic resilience.

For example, the drafting of the narratives for each scenario should be done by the group, not by a consultant.

It is also essential for the facilitator to not perform any of the other roles because it can be a source of tension and lead to lower quality.

1.8 Set milestones to keep the process on track for high quality outputs

A built-in review process including regular milestone updates is a useful way of monitoring whether quality expectations are being met and scheduling aligns with CRE disclosure requirements.

We suggest using the list of outputs in this guidance (described at the end of each phase) and from TCFD's scenario quality check factors table (see appendix 1) and aligning it with the objectives defined at the beginning of your sector scenario process.

Conditions for success

1	Convene a diverse leadership group with sufficient standing to legitimise the project. Ideally members of the group should have the power to influence outcomes and effect change within and beyond the sector.
2	Employ facilitators to help navigate any points of potential confusion or contention that could slow progress. Scenario analysis processes can stall unless facilitated well.
3	Seek diverse participation from across (and beyond) the sector, both for leadership roles and in assessing the context and external environment. Expect to seek input from additional perspectives, beyond those initially envisaged.

2. Define the problem

Define the focus of the scenarios, their scope and time horizons

The analysis should be sufficiently broad to account for the interests and concerns of all participants without being so general as to undermine the decision-relevance of the scenarios. Sectors should consider adopting the TCFD's suggested focal question: "How could climate change plausibly affect our [sector], what should we do, and when?"

2.1 Define the scope of the sector

TCFD scenario guidance recommends selecting a focal question which pragmatically constrains the scope of the scenarios, while allowing sufficient flexibility to explore future possibilities of interest to participants and end-users.[3]

A way to think about the focal question is to ask what the entities would need to know to make better decisions. The goal is to ensure the analysis is useful for entities.

At a sector level, beyond reaching agreement on the focal question, an important consideration is to clearly define the scope of the sector. If this is not done, this can lead to a lack of clarity of what has been considered in scenario development and confusion among CREs and other entities as to whether they can make use of the scenarios. For example, for a very broad sector such as agriculture, it is important to describe the sub-sectors (and ideally any exclusions).

We encourage sectors to describe the boundaries of the sector in terms of which regions and/or other geographies the sector interacts with specifically. For example, what are the sources of key supplies, the export markets, where do technology inputs come from and where do products go at end of life.

We suggest avoiding the use of the world "value-chain" to define the boundaries characterised in this step because there is a specific definition of this term in NZ CS that might not be aligned. This could create confusion for entities when they do their own scenario analysis.

It is also important to consider what other sectors have developed, or are developing, to reduce the risks of overlap or inconsistencies.

2.2 Define the scope of the scenario analysis

The scope of the scenario analysis is bounded by the focal question. There are nevertheless key decisions to be taken regarding how the focal question will be applied to the subsequent selection of drivers of change, and to data gathering stages.

For example: What role will international developments play in climate outcomes for the sector? How will these be represented in the scenarios? How will developments affecting the sector be factored into the scenarios?

Participants must decide what is in and out of scope of the analysis, bearing in mind the needs of CREs in making disclosures about the impacts and financial impacts of climate-related risks and opportunities.

Consistency and comparability: Use a shared focal question across sectors

The TCFD define a focal question for use in climate-related scenario analysis as: "How could climate change plausibly affect our [sector], what should we do, and when?"[3]

We recommend that all sectors use this question for their first scenario analysis. This will improve the level of comparability and coherence across disclosures. Rigorous lines of enquiry flow from this question, providing the scenarios with enough specificity to support high-quality disclosures on the part of CREs.

These include:

- Which specific physical and transition risks and opportunities are plausible for our sector?
- When, where and how could they materialise?
- What do entities in our sector need to know more about in order to be better prepared?
- What could the sector collectively do to enhance its climate resilience?

2.3 Define a time horizon

When selecting time horizons, a range of factors should be considered including emissions reduction targets, the useful life of assets or infrastructure commonly employed in the sector, and the availability of supporting data. This is particularly important in sectors where long-term investments in assets or infrastructure are common.

Sectors should also challenge norms in selecting the time horizon for the analysis, as climate-related risks and opportunities may keep evolving beyond typical planning processes timescales.[4]

Sectors needing to consider physical risk in greater detail may opt to extend the timeline of their analysis. Post-2050, the physical impacts of different IPCC Shared Socioeconomic Pathways (SSPs) become much more pronounced, providing greater insight into how novel risks may emerge. It is also possible to reflect these long-term impacts in short-term scenarios. While this is still relatively uncommon in scenario analysis (due to the tendency to rely on Integrated Assessment Model (IAM) and other economic model outputs) there are approaches available that seek to help achieve this. As noted by Stiglitz et al "IAMs have very limited value […] They fail to provide much in the way of useful guidance, either for the intensity of action, or for the policies that deliver the desired outcomes."

2.4 Mapping the sector and its system boundaries

Another important foundation is to develop a shared view of the sector and its associated system boundaries. While each participant will likely have their own mental model of the sector, these could be substantially different across participants. Explicitly mapping it will increase the likelihood that everyone has a shared perspective and reduce the risks of blind spots. Mapping the sector will also help to put driving forces into context, as well as being useful in the next step for defining the scope of the work.

A common question about boundaries is: Where to stop? (e.g., when trying to define scope 3 GHG emissions). The answer relies on a materiality assessment. Therefore, having a map of the value chain will help participants appreciate where to draw limits, based on expected climate impacts and how material they might be for some parts of the sector. It will also highlight information gaps (such as the origin of some key materials, or critical geographic dependencies).

We encourage sectors to be specific and complete to ensure the resulting map reflects the circumstances of the sector in Aotearoa New Zealand, such as providing accurate descriptions of the up and downstream entities the sector interacts with. Although maps produced overseas might provide a useful starting point, the maps produced by CREs should be New Zealand-specific, not generic.

We recommend using robust methods of participatory **systems mapping** (see some different approaches here and an example on page 5 here). In the initial stages of using scenario analysis, more simple visual approaches such as a rich picture or shared mental model may be easier to agree and develop.

Key outputs to document: Focal question, scope and timeframes

Document the focal question the scenarios will explore, the scope of the sector and the analysis. This include the sectoral and spatial boundaries (visually if desired), timeframes, and any notable 'out of scope' exclusions.

Mapping of the sector's ecosystem and value chain

Conditions for success

1	Follow the TCFD guidance when selecting a focal question, starting with a core climate-related risk and opportunity focus. This will align the analysis with work underway in other sectors and at national and international scale. Clearly define the sector including any exclusions.
2	Allow additional lines of enquiry to be developed and incorporated under the focal question as necessary. These will help to fill knowledge gaps and anchor the analysis in the decision-specific requirements of participating entities.
3	Scope the analysis in a way that makes sense to participants, allowing international or cross-sectoral factors to play a role if they are essential to making sense of the future. If desired, used systems methodologies to map the sector, potentially visually or otherwise.
4	Set time horizons for the analysis which are relevant to the sector's needs, considering capital allocation and asset lifecycles, strategic decision-making horizons, wider objectives such as New Zealand's legislated emissions budgets and net-zero 2050 target and expected climate impacts.
5	Build the focal question into the framing of all project documentation, ensuring participants have a clear and consistent understanding of their purpose when engaging in the work.

3. Identify driving forces and critical uncertainties

Find the most significant and uncertain drivers of change

Driving forces **(also known as 'drivers') are typically broad scale external factors which influence the direction of future change. Understanding which driving forces will have the greatest influence in shaping outcomes for the sector is an essential step in creating climate-related scenarios. Assessing the level of uncertainty surrounding each driving force will help to define what each scenario should explore and provide the key differentiating characteristics between scenarios by allowing** critical uncertainties **to play out in different ways.**

3.1 Identify driving forces at sectoral scale

The goal is to construct a conceptual understanding of the business environment and its various climate-related relationships.

Three questions typically underpin the identification of driving forces in climate-related scenario analysis:[5]

1. What are the key factors which will influence climate-related risks and opportunities?
2. Will these factors be influential over the full-time horizon of the scenarios?
3. Are the most influential factors certain and predictable or can they change materially over time?

Driving forces are commonly identified in a workshop setting by exploring the focal question across different dimensions, e.g., social, technological, economic, environmental and political (STEEP, see Appendix 2 for details). They can be grouped by macro, micro and decision scales as suggested by the TCFD at page 76 here.

3.2 Categorise driving forces for their influence and uncertainty

The identified driving forces should next be categorised for their relative influence and uncertainty. The focal question should be at the forefront of thinking in making these categorisations. One method for doing so is by using an impact-uncertainty matrix (see the illustrative example in Figure 4).[6] The driving forces that are most influential and most uncertain are known as 'critical uncertainties' and provide a means of differentiating the scenarios. Different scenarios will explore the different ways these critical uncertainties could go.

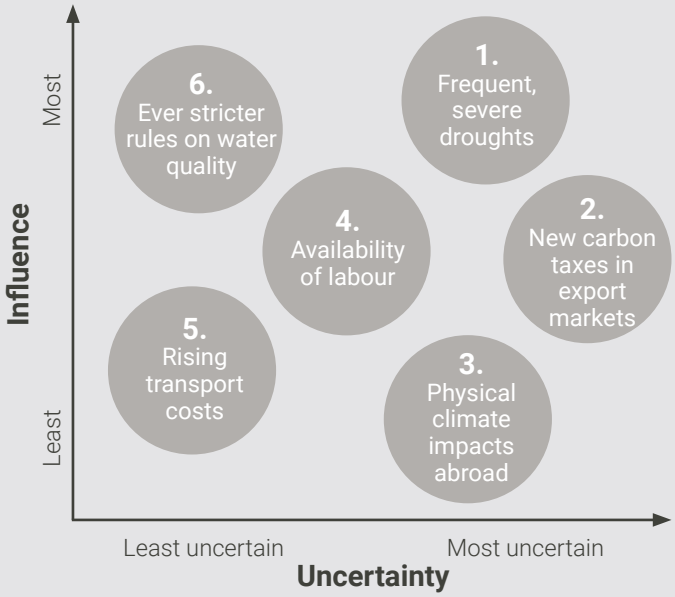


Figure 4: ***Plotting illustrative driving forces on axes of influence and uncertainty for the agriculture sector.*** *Participants have decided drivers 1 and 2 are the most influential and uncertain. Driver 3 is considered uncertain but less influential, driver 6 is considered highly influential and is felt to be a near certain factor in all scenarios.*

3.3 Understand views on interactions and impacts of critical uncertainties

It is useful at this stage of the process to elicit views from participants on how the critical uncertainties interact with the entity, and with each other, to influence future outcomes.[7] The mental models participants hold of these interactions will shape their understanding of how the scenario will play out. Surfacing, challenging and enhancing participants' mental models in this way is a key aspect of scenario analysis.[8]

Discussions, interactive workshops, and/or conceptual modelling can make it easier to come to a shared understanding of how the sector may be affected by climate-related risks and opportunities in the future. For example, the interactions between the critical uncertainties and the impacts on a sector can be plotted on a whiteboard in a workshop setting to create a simple conceptual model.[9]

Sectors may choose to plot driving force interactions in a structured visual format (see the illustrative example in Figure 5).[10]

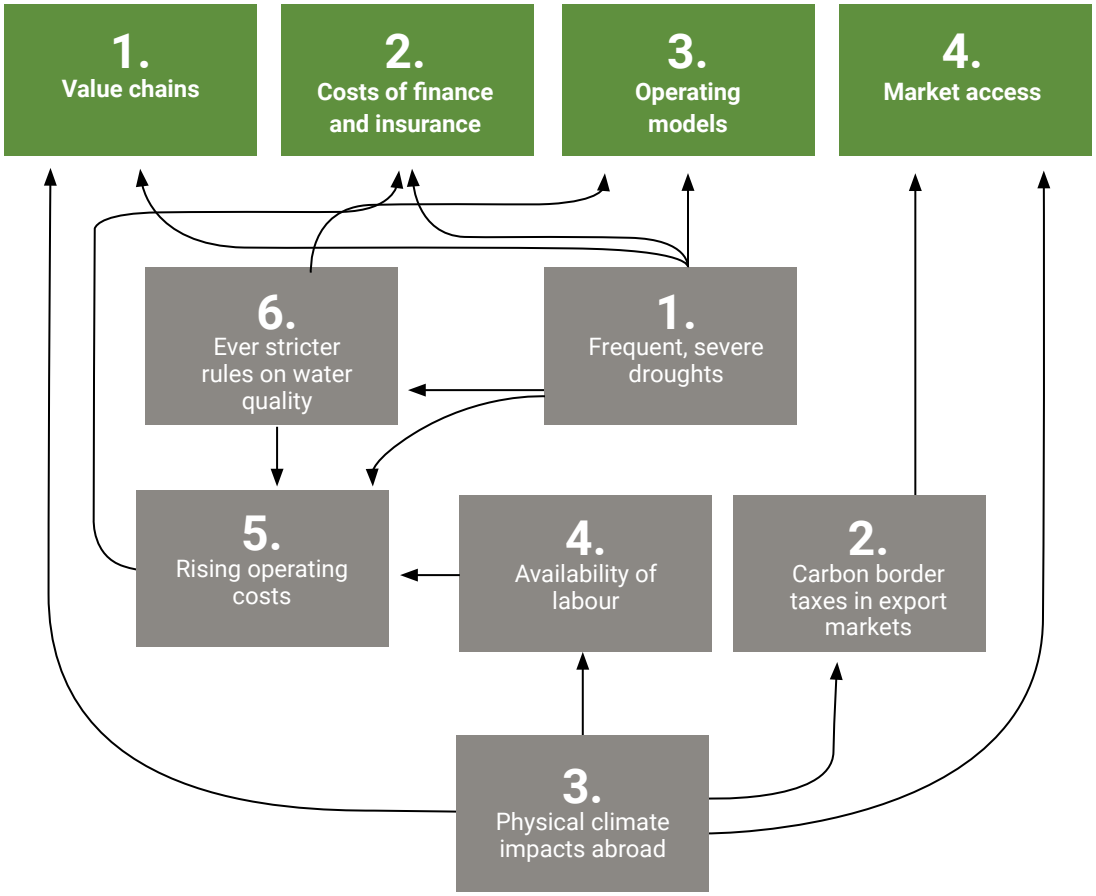


Figure 5: ***A simple conceptual model.*** *This simple model illustrates how driving forces interact with each other. This can help to clarify discussions and progress scenario development, and in later stages, also communicate quantification needs to modellers.*

By illustrating how participants see the sector in relation to the key driving forces they have identified, a conceptual model makes *explicit* the otherwise *implicit* views of stakeholders regarding the plausible future developments each driver may trigger. This allows different scenarios to be shown visually, their implications to be discussed in group settings, and even for their key variables to be quantified *if* the appropriate data and expertise are available to do so.

Interactions between driving forces and risks/opportunities

External factors drive change, and this change can result in risks and/or opportunities.

Driving forces being the external factors through which change happen, they are neutral by definition. The changes happening as a result can present specific risks and/or opportunities for a sector or an entity.

Some risks and opportunities can also be reinforced or mitigated by other, unrelated, driving forces.

3.4 Use scenario axes to develop a scenario matrix

Scenario axes are used to structure the development of a matrix which provides 'scenario themes' or 'logics'.[11] The critical uncertainties are typically chosen as scenario axes.

In the context of scenario analysis related to climate change impacts, it is often the case that more than two critical uncertainties are identified. This means that a sector (or entity) might benefit from developing several scenarios within a same quadrant of the matrix below, to explore several critical uncertainties (see also section 4.3).

We recommend using at least the scenario axes described in TCFD guidance that have been utilised by the Network for Greening the Financial System (NGFS)[12] (see figure 6, below).

This enable linking these scenarios with temperature outcomes and emission reduction pathways developed by international organisations such as the IPCC (see Appendix 3).

Doing so will enhance the consistency and comparability of scenarios across the economy.

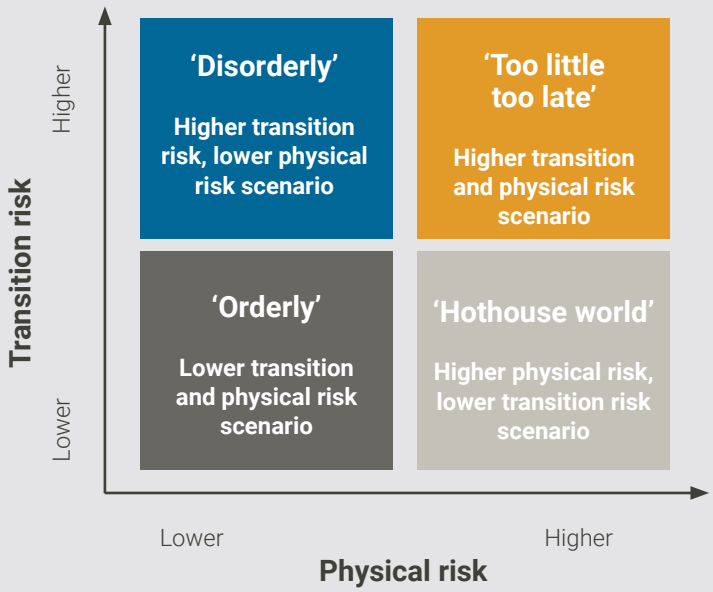


*Figure 6: **A scenario matrix.** This matrix maps physical and transition risk drivers against each other to create scenario themes. The scenario theme names are from the NGFS.*

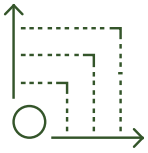
Thinking through how various critical uncertainties would play out under the logic of each quadrant in the scenario matrix is a **first step** toward scenario development (see Appendix 2).

Consistency and comparability: Use axes of physical and transition risk

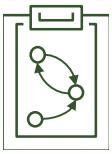
Selecting axes which enable scenarios to be developed based on temperature outcomes is the most practical option to get the climate-related scenario analysis process underway.
We recommend sectors select scenario axes of 'physical risks' and 'transition risks', as described in TCFD guidance and illustrated by the NGFS. Doing so across all sectors would:

- Ensure coherence in approach between sectors
- Signal commonalities in data needs and applications to data providers
- Link scenarios to existing scenario narratives and quantitative projections available globally, providing a high-level steer on their development

Key outputs to document: Scenario axes, prioritised driving forces, and a conceptual model



Document the driving forces elicited from participants, their ranking for influence and uncertainty, and the critical uncertainties the scenarios will be structured around.



Where participants have opted to develop a conceptual model of the sector and its relationship to the drivers, this should also be documented.

Conditions for success

1	Elicit driving forces in an open, participatory setting, encouraging inputs from a wide range of perspectives. Exploring many and varied driving forces is needed to provide useful insights when developing narratives.
2	Facilitate the process of assigning influence and uncertainty to driving forces carefully, in particular what is meant by 'uncertainty' in driving forces.
3	Where participants opt to develop a conceptual model it is important to account for differences of opinion on the anticipated impacts of critical uncertainties. Negotiating a shared view of the sector can require skilled facilitation.

4. Select temperature outcomes and emissions pathways

Multiple pathways to each temperature outcome generates scenario diversity

Scenarios need to describe a temperature outcome and the path taken to reach it. There can be many, markedly different emissions pathways to the same temperature outcome, with divergent risks and opportunities accompanying each pathway.

4.1 Select temperature outcomes and emissions pathways

The TCFD recommends that organisations describe the resilience of their strategies in relation to climate-related scenarios which focus primarily on temperature outcomes.[13] NZ CS 1 follows this approach, requiring CRE's to analyse, at a minimum, a 1.5°C scenario, a 3°C or greater scenario and a third scenario in their scenario analyses.

Temperature outcomes may be realised via different emissions pathways (e.g., orderly vs disorderly reductions), with different corresponding transition risk profiles. Selecting outcome and pathway combinations which challenge the sector to the greatest extent is recommended, although that does not necessarily mean designing reverse stress test scenarios.[14]

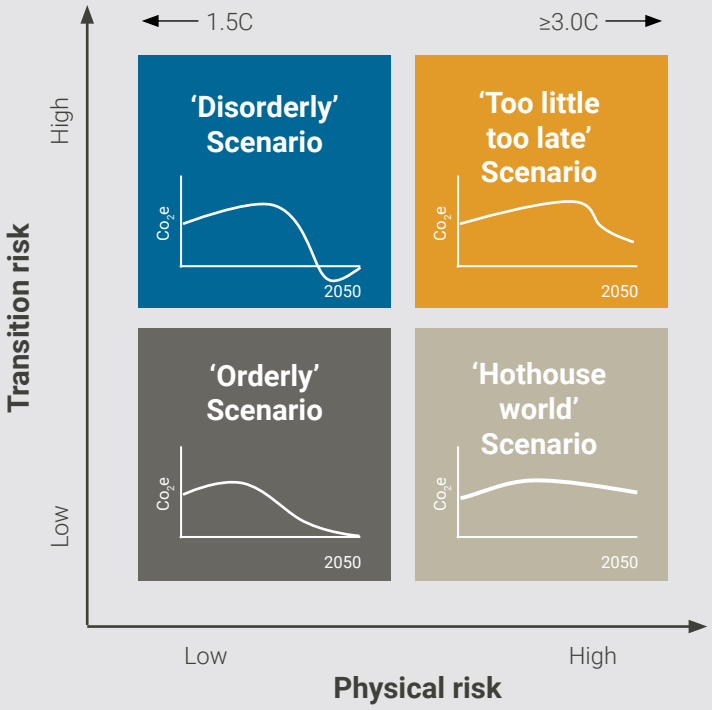


*Figure 8: **A scenario matrix developed using the NGFS scenario axes** (adapted from [15]). The graphs are illustrative of different emissions reduction pathways which broadly align with ~1.5°C, ≥2°C and ≥3°C temperature outcomes, noting that hothouse world is a higher physical risk scenario than too little too late tends to be.*

Consistency and comparability: Challenging scenarios

Sectors that explore multiple emissions reductions pathways leading to 1.5°C and ≥3°C outcomes will provide CREs with a greater range of options in selecting challenging scenarios for use in their own entity-level disclosures.

Combinations of emissions reduction pathways leading to a higher physical risk outcome (≥3°C) could be developed to illustrate transition/physical risk interaction. Similarly, different emissions reduction pathways aligning with a 1.5°C outcome will illustrate different aspects of transition risk and opportunity for CREs.

The NGFS provide guidance describing their use of outcome and pathway combinations.[15] The TCFD also offer guidance on the role and value of pathways in promoting scenario diversity.[16]

4.2 Start with the fundamentals and build a richer picture over time

The first iteration of a sectoral scenario analysis should cover, at minimum, the foundational aspects of climate-related risks and opportunities that participating entities see as most relevant and challenging (and therefore material to entities' primary users).

The greater the diversity of temperature outcomes and emissions pathway combinations, the richer the understanding of the plausible evolution of climate-related risks and opportunities Consideration should also be given to scenarios where New Zealand achieves net zero but the rest of the world does not, and vice versa.

4.3 Select scenarios

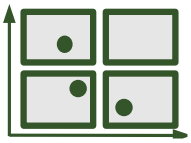
The minimum of three scenarios required in NZ CS 1 is not intended to constrain entities to only explore three scenarios. Participants in a sector-level process should keep the disclosure objective in mind and focus on using the scenario process to obtain the required strategic insights.. A systematic exploration might require more scenarios depending on the number of critical uncertainties identified.

When deciding how many and which scenarios to draft, participants should keep in mind the objectives they set themselves. If the objective is limited to supporting CREs in their individual disclosures, they could decide to focus on consistency and comparability, and therefore use three scenarios based on temperature outcomes and emission pathways. Individual entities could then use them to explore a richer variety of scenarios reflecting critical uncertainties specific to them.

However, if one of the stated objectives is to support the sector at large, including entities that are not CREs, then the number of scenarios should reflect the likely larger number of critical uncertainties resulting from the greater variety of entities.

For example, within the same value chain, such as dairy products, consumers perception of cows' GHG emissions can be a critical uncertainty for a producer of milk and for the entity processing it. While for a yogurt producer, the implication might be limited to a change in raw material. This yogurt producer might in turn consider that changes in standards and regulations for its final products could be a much more critical uncertainty. It might be hard to reconcile these views in a common scenario.

Key outputs to document: Temperature outcomes and emissions pathways



Document which temperature outcomes and emissions reductions pathway combinations have been selected for the scenario analysis. A brief explanation of the rationale underpinning why these have been chosen will likely be of benefit to CREs in making judgements on the work they will undertake at entity level.

Conditions for success

1	Be clear about the role of temperature outcomes in defining each scenario. Scenarios typically gain a name and various other distinguishing characteristics as they move through the development process, but it will be important for preparers and end users of disclosures to understand each scenario's temperature outcome at a glance.
2	Make explicit reference to pathways developed internationally, illustrating how the pattern of emissions reduction they follow have informed the development of each scenario's pathway.
3	Exploring alternative pathways to the same temperature outcome is particularly important in the analysis of potential future climate-related transition risks and opportunities.
4	Look deeply into what will robustly challenge existing value chains and business models across the sector. The aim of the exercise is ultimately to help CREs to understand how their business model and strategy may need to change to be more resilient to plausible future change.

5. Draft narratives and quantify

Develop compelling scenario narratives, and where appropriate, quantify them

Scenarios are plausible stories of the future which illustrate key developments relevant to strategic decision making. Drafting narratives that provide a rich, compelling illustration of the temperature outcomes and emissions pathways selected will bring alive plausible future events. Quantification of appropriate aspects of each narrative will assist entities to later characterise the financial impacts of climate-related risks and opportunities.

5.1 Draft scenario narratives

Good scenario narratives should focus on what matters most to key stakeholders and describe challenging, compelling, plausible and internally consistent visions of how the operating context may evolve over time.

A narrative is not a list of assumptions but a **story**. It should be a richly developed and evocative 'movie of the future'. The TCFD provides extensive guidance on how to draft scenario narratives in a creative and compelling way.[17] An example of a narrative is provided by the Aotearoa Circle marine scenarios.[18]

Fostering collective buy-in to what is a creative process will require participants staying committed, making sound stakeholder management a critical consideration. Participants should be involved in drafting, not just the facilitator or any consultants.

The critical uncertainties identified in Step 3, and any conceptual model of how forces interact with each other and the sector, provide the basis for the drafting process.

This approach to scenario analysis is a primarily qualitative one, particularly in its early iterations. It places a greater emphasis on ensuring the narratives resonate with participants as they will need to use these narratives in subsequent assessments of the resilience of their own individual strategies.

5.2 Quantification

The purpose of quantifying scenarios is to support the evaluation of strategy resilience, not to discover the precise future values of key variables.

Many aspects of climate-related scenarios lend themselves to quantification, at all stages of the process from inputs to outputs. Data projections that illustrate key aspects of the issues raised under each narrative often help to clarify what the full implications of the scenario may be.

Although the TCFD states that, if quantification of climate change is important for managing strategy and business outcomes, they also identify some quantification-related risks. Quantitative climate-related models may be too precise or complex or be commenced too early in the process. It is important to first prepare a qualitative narrative reflecting a sector's common understanding of the risks and opportunities.[19]

Quantification might be undertaken via estimation, extrapolation, modelling or statistical analysis. It is therefore essential to document the methods employed in quantifying the scenarios.

The most efficient means of quantifying aspects of a narrative may be through drawing on publicly available projections, pathways or higher-level scenarios which share the scenario's core assumptions, such as warming trajectory, emissions, economic development patterns or specific policy choices.[20] There are important caveats and limitations to bear in mind when combining these outputs. These are discussed further in section 5.3.

Where these data are too broad to be relevant, specialist modelling which illustrates the evolution of factors of interest can be undertaken to generate sector-specific quantification (where time, resources, data and expertise allow). Taking this option can be useful, as the outputs will be specifically tailored to the needs and interests of sectoral participants. This type of modelling is typically exploratory in nature but can nevertheless support initial assessments of the anticipated financial impacts accompanying a given narrative. If going down this route, employing a conceptual model developed at Step 3 will be useful in communicating to modellers:

- **what** it is that participants would like to quantify, and for what purpose;
- **how** they envisage the sector and its most influential driving forces function and are structured; and
- **where** existing models might most readily plug in to provide externally calibrated and validated inputs.

5.3 Drawing on higher-level scenarios, pathways and projections

Rather than starting from a blank page, sectors should develop their scenarios by incorporating relevant elements of the building blocks and assumptions provided by work already done at higher levels. This may include the IPCC's global scenarios and pathways, the NGFS scenarios, International Energy Agency (IEA) scenarios, and scenarios and projections of relevance in Aotearoa New Zealand that will help the sector to explore the implications of climate-related risks and opportunities in a domestic context.

Drawing on these higher-level sources of plausible future pathways is as much of an art as it is a science. The IPCC, NGFS, IEA and others have developed projections for factors ranging from global average temperature to the price of carbon, global trade settings, or land use change, over multiple decades or even centuries. The various agencies and organisations involved in this work have done so for a range of different purposes, using different methodologies and assumptions. It is therefore essential to check that these are broadly consistent when combining scenarios (see Appendix 3).

The benefits of a sectoral scenario development guided by higher-level scenarios, pathways and projections include that:

- the findings of higher-level work can indicate the broad direction a scenario should take given a set of base assumptions;
- drawing logical connections from global to national and sectoral scale will provide useful building blocks for CREs to draw on in completing their own scenario analysis at entity scale;
- the comparability of sectoral scenarios will be greatly enhanced where sectors employ common assumptions and building blocks; and
- the consistency of sectoral scenarios will be greatly enhanced and facilitated by enabling the use of scenarios from adjacent sectors as inputs.

However, this higher-level information should be supplemented by insight and secondary research providing additional depth and detail specific to the sector wherever possible. For example, emerging technologies and business models and their impacts are often poorly captured in higher level scenarios. Academic literature and industry analyses often explore potential future developments in depth and can provide important specialist insights.

Consistency and comparability: Use a shared scenario architecture

We recommend sectors adopt a shared scenario architecture when combining higher-level building blocks and assumptions to develop their scenarios (Figure 9). This involves moving down from global climate and socioeconomic pathways to energy and emissions pathways, to national scale projections of impacts and policy responses.

For example, using the work of the IPCC with that of the NGFS, IEA, and domestic data providers such as He Pou a Rangi, Manaaki Whenua, GNS, NIWA and others involved in climate-related research and impact analysis, including academics and research groups.

Figure 9 provides a framework for selecting these higher-level building blocks, and Figure 11 in Appendix 1 provides some broad scenario architectures that sectors can draw on in combining these building blocks to build their own scenarios.

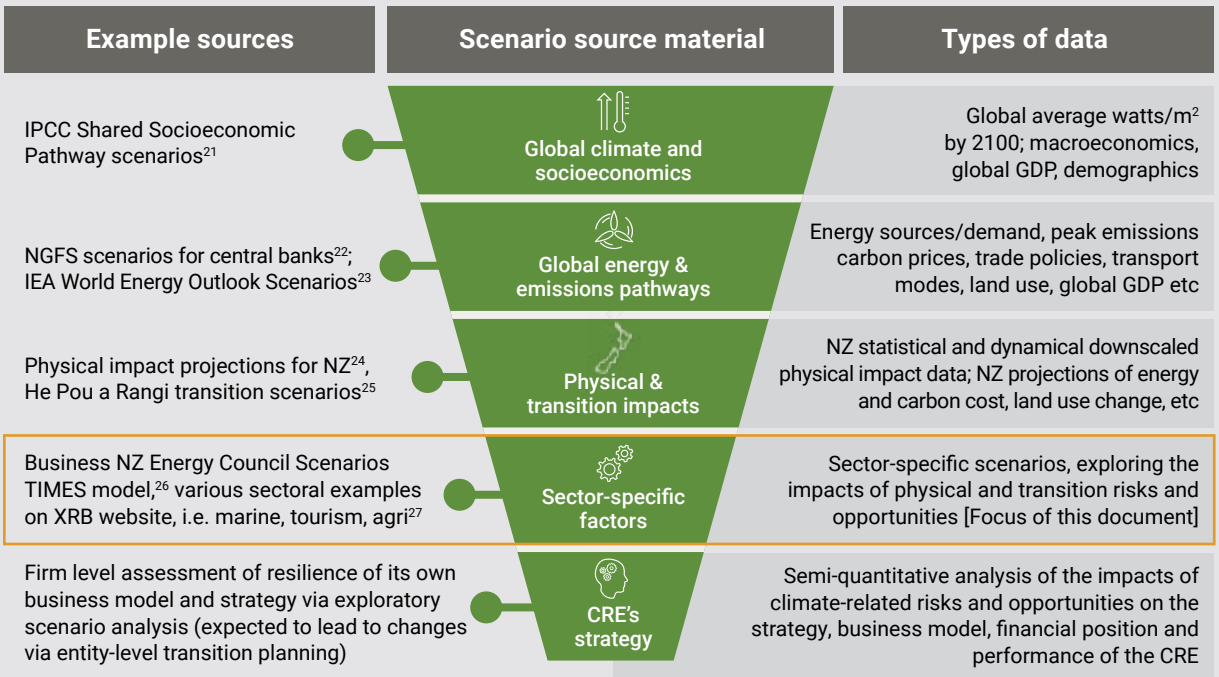
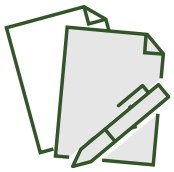


***Figure 9:* A shared architecture for structuring and beginning to quantify various aspects of a scenario narrative.** *This architecture combines higher-level, publicly available scenarios and projections to provide some broad guide rails for sectors to use in developing their own scenarios. If the underlying assumptions and building blocks each sector employs in developing their own scenarios are consistent, then the subsequent analyses undertaken will more readily align, and primary users will be in a position to compare findings more readily.*

Key outputs to document: Scenario narratives, quantification, and process



The narratives accompanying each scenario, including any data which have been developed or collated in support of the narrative.

A brief description of the process followed in developing the narratives (and any quantification) should be included to explain the work undertaken to CREs and primary users.

Conditions for success

1	The drafting of the scenario narratives needs to be a **collective creative process**. Ensure the narratives resonate with participants as they will need to use these narratives in subsequent assessments of the resilience of their own individual strategies.
2	A narrative is not a list of assumptions but a story. It should be a richly developed and evocative 'movie of the future'. Focus on what matters most to key stakeholders and articulate compelling, plausible and internally consistent visions of how the operating context may evolve over time.
3	Be clear that the purpose of quantifying scenarios is to support the evaluation of strategy resilience, not to discover the precise future values of key variables.
4	Describe how each scenario unfolds over the entire timeframe selected for the analysis rather than simply focusing on specific time-slices or endpoints. Sense-check the assumptions involved in developing the narratives against the critical uncertainties, and against the guide rails provided by the higher-level scenarios, pathways and projections of the specific architecture used.

6. Check quality and plan review

Sectoral scenarios should be clearly documented, designed in a way that has regard for entity-level analysis, and updated regularly

This step is to check if the output(s) of the process have achieved the objectives set at the beginning. Make sure that everyone got the value they expected. Sectoral scenarios do not remove the need for scenario analysis by individual CREs.

6.1 Quality check

The TCFD sets out 12 factors for assessing the quality of scenarios (see Appendix 1).[28] This checklist can also be a helpful means of monitoring the integrity of the scenario development process as it unfolds.

We recommended setting regular milestone updates as part of stakeholder engagement, which is the first step of the process (see step 1). There should be few surprises at this point regarding the quality of the result if this approach is adopted.

Ensuring the participation from across sectoral boundaries to incorporate the views and perspectives of those in the value chain provides a further check and balance on quality and coherence.

Finally, ensuring that the scenario development process is fully documented, and its outputs are transparent and publicly accessible is vital to its credibility.

6.2 The role of sectoral scenarios in CRE disclosure

A key purpose of developing sectoral scenarios is to support CREs in preparing their NZ CS 1 Strategy disclosures.

Under NZ CS 1, CREs will need to use scenario analysis to evaluate the resilience of their own business model and strategy under a minimum of three scenarios (one 1.5°C scenario, one ≥3°C scenario and a third scenario). The scenarios developed by sectors should aim to be a solid basis for this work, giving CREs the ability to subsequently analyse in greater detail the climate-related risks and opportunities the scenarios raise as necessary.

Sectoral scenarios cannot explore the implications of climate-related risks and opportunities to the level of detail CREs require. CREs will need to conduct their own analysis of the implications of the sectoral scenarios. Guidance on individual CRE level scenario analysis (with or without sectoral scenarios to call on) is available on our website.

6.3 Continuous improvement

No first iteration will be perfect, so sectors should monitor what CREs are disclosing, checking for additional areas that subsequent iterations of sectoral scenarios may need to address, or major discrepancies between CRE disclosures and sectoral scenario outputs.

Even after a few iterations, scenarios should be reviewed and revised from time-to-time to reflect changing circumstances, at the very least to integrate new information and data available from climate science and sector supply chain.[29]

The TCFD also anticipate that the quantification of financial impacts of climate-related risks and opportunities at entity level will become more robust as tools, methods and internal capacities mature.[30]

Sectors should aim to facilitate analyses of greater detail and sophistication at CRE level over time through work undertaken at sectoral level, by taking such steps as commissioning advice, modelling or procuring data.

6.4 Build on momentum

The development of scenarios and identification of key risks and opportunities for the sector is a significant milestone toward a low-emission and climate resilient future.

However, this is just the beginning of a transition, and it is likely that sectoral engagement would be beneficial for development and implementation of transition plans, including sector- level transition plans.

If the next steps are unclear at this point, agreeing on a formal statement or memorandum of understanding between participants should facilitate future engagements.

Consistency and comparability: Publish the scenarios in a final report

We recommend sectors complete a final report detailing the steps taken in the development of the scenarios, and the scenarios themselves. The report should be made publicly available because:

- CREs will need to have a clear line of sight over the development of the scenarios to be able to use them and (where necessary) amend them for disclosure purposes.
- Making the scenarios public will maximise their inter-sectoral reach, enhance transparency and alleviate any criticism of anticompetitive conduct.

Publicly released scenarios are accessible on the XRB's website. Please inform the XRB of new sector scenario work and updates.

Key outputs to document: Final report, including reiteration and review plan

A final published report which captures the outputs of prior scenario development process steps should be compiled for publication.

The report should outline any quality assurance steps taken, and provide details of the reiteration and review plan.

Conditions for success

1	Engage external peer reviewers to help bolster the rigor and robustness of quality checking and review processes. External perspectives will offer a useful counterpoint to any 'group think' that might have inadvertently set in.
2	Agree on an interim monitoring processes to determine the role sectoral scenarios are playing in CRE disclosure. Assume some review work would be needed after the first iteration of individual entities scenario analysis and disclosures.
3	Check for consistency in the handling of drivers, pathways, outcomes, narratives and quantification across different sector scenarios as and when they become available.
4	Build on momentum and maintain sectoral engagement for the next steps of the sector transition.

Appendix 1: Scenario quality check factors

Factors to assess in checking scenario quality

The TCFD sets out 12 factors through which to assess the quality of scenarios (Table 2).[29] This checklist offers a means of monitoring the integrity of the scenario development process as it unfolds (or is subsequently reiterated).

Table 2: ***Scenario quality checklist*** *(adapted from [29]).*

Factor	Check the scenario has
Time horizon	Appropriate short, medium and long term time horizons for the decisions that must be made.
Focal question	A focal question targeting the climate-related decisions the entity must make.
Driving forces	A clearly articulated set of underlying causes of change in relation to the focal question, derived from STEEP categories of external drivers (see table 3).
Scenario logic	Clearly defined relationships between core scenario assumptions and the drivers of change, and between drivers of change the entity's business model and strategy, and that these are coherently reflected in the scenario storyline.
Pathways	A clear and coherent trajectory between present and future temperature outcomes, illustrating the cause-effect relationships described by the scenario logic.
Uncertainty	Explicitly described key sources of uncertainties via the interaction of critical uncertainties (significant but uncertain drivers).
Storyline	A seamless, integrated narrative describing the causal train of events, their drivers, assumptions and affected systems.
Plausability	Events unfold in a manner that is possible and credible in the eyes of decisions makers.
Distinctive and diverse	Differing assumptions about the interplay of driving forces under each scenario, with a sufficient number of scenarios produced to appropriately explore a range of outcomes.
Consistency	Application of the scenario logic is consistent between scenarios.
Relevance	Insights into the future evolution of climate-related risks and opportunities that directly relate to the strategic decisions an entity must take.
Challenging	Sufficiently challenged conventional wisdom, and avoided falling into simplistic extrapolation of present conditions into the future. The scenarios need to help to evaluate the performance of business model and strategy under difficult circumstances to be of greatest value.

Appendix 2: Driving forces detail

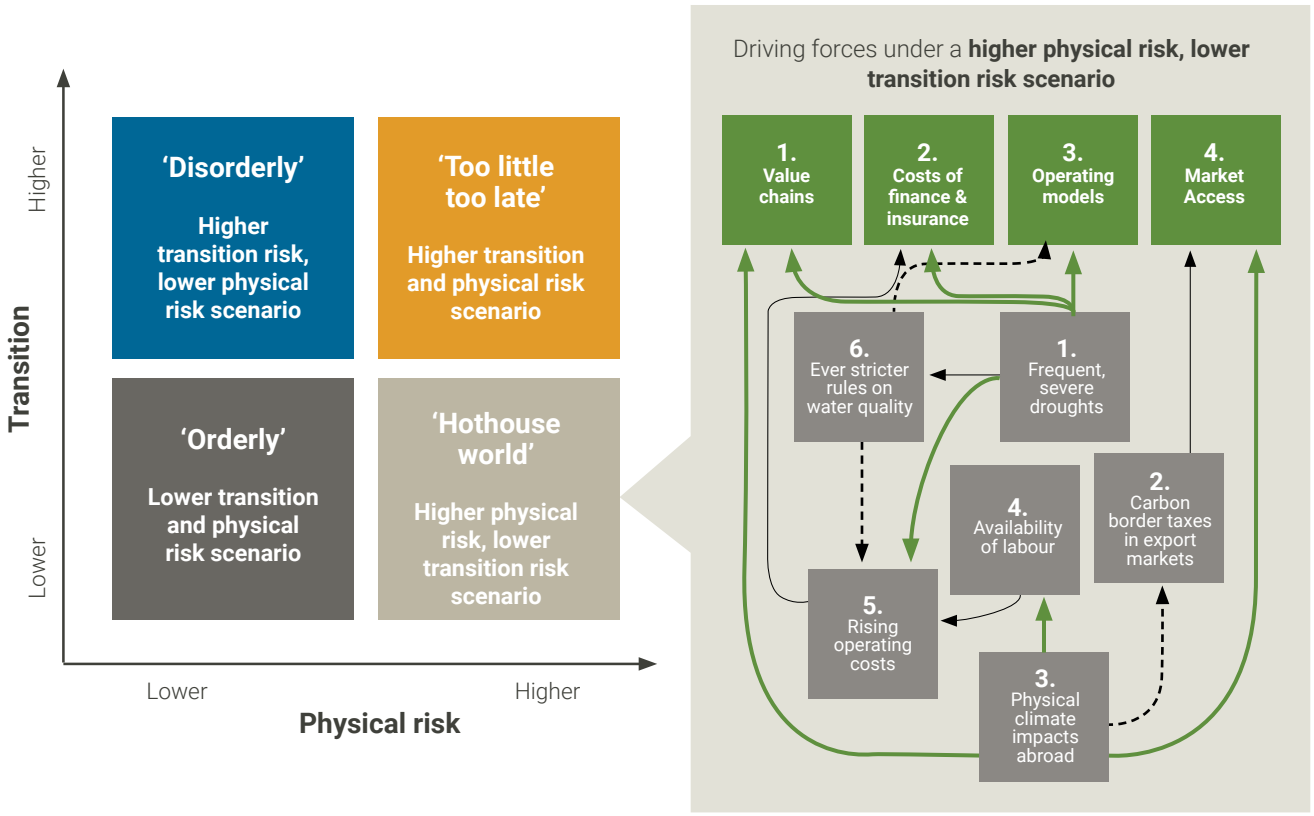
Additional considerations for identifying driving forces

A framework commonly employed to facilitate the identification of driving forces is a workshop-based 'STEEP' analysis. This calls on stakeholders to interrogate Social, Technological, Economic, Environmental and Political categories for driving forces of relevance to the focal question. The boundaries of each category are intentionally fluid rather than restrictive. In the context of climate-related scenario analysis, important driving forces are the risks and opportunities that may result in material financial impacts on the company or affect the resiliency of the company's strategy. To be considered a driver, a factor needs to (1) be continuous over a period of time and (2) influence the outcomes of the focal question durably and consistently. Strategy practitioners can help to consider the convergence across STEEP categories, such as business model and product innovation combining to cause disruption.

Table 3: ***STEEP categories with examples of driving forces in New Zealand*** *(adapted from [31]).*

Catagory	Description	Examples in a New Zealand context
Social	Demographics, social norms, lifestyle trends, health, education, rural-urban divide	Migration, attitudes to lifestyle and consumption, distribution of wealth and opportunity, attitudes to science and the role of business in society
Technological	Research trends, emerging and/or disruptive technologies, technology uptake and market penetration	Biological methane inhibiting technologies, battery storage and electricity distribution, development of alternative or synthetic proteins, digitalisation
Economic	Macro and microeconomic policy, trade settings, finance, capital allocation	Interest rates and capital costs, public and private sector debt, trade settings and deals, value of exports
Environmental	Climate change, biodiversity loss, water, pollution, land use change, waste management, energy	Physical climate impacts, freshwater regulation and land use regulations, waste disposal options, energy systems
Political	Climate policy, law, regulation, legal liabilities, political attitudes and trends	Net-zero emissions targets, emissions regulations, border settings and freedom of movement, legal challenges

***Figure 7:* Evaluating the implications of each quadrant**. *The interaction of driving forces under a higher physical risk, lower transition risk scenario are explored using the conceptual model of Figure 5. Carbon taxes may play a much lesser role (if any) in market access, but severe droughts and physical impacts domestically and abroad are amplified in their influence on outcomes relative to other scenarios. The different weights and styles of the arrows between concepts illustrate differences brought on by this quadrant.*



Appendix 3: Scenario architectures

Employing shared architectures will help sectors to produce broadly aligned scenarios

Origins of the architectures

The 'Orderly', 'Disorderly', 'Hothouse World', and 'Too Little Too Late' architectures illustrated below are loosely based on the structure of the NGFS climate scenarios. As described in section 3.4, this approach to envisioning futures which are differentiated via the scale of physical and transition risk they embody is gaining traction globally. Adopting it as the structure for sectoral scenarios in New Zealand will help to align sectors with global financial climate-related risk analysis practices.

Using the architectures: Key points and caveats to bear in mind

Employing shared building block assumptions across all sectors will provide important coherence between the scenarios they develop. However, there are several key points to bear in mind when employing this architecture.

Firstly, bringing together work undertaken by different groups for different purposes is a necessarily imprecise undertaking. Several of the global level projections and pathways included in the architectures above cover similar ground, with NGFS and IEA scenarios both addressing energy and transport at global scale, while He Pou a Rangi do so for New Zealand. These have not been designed to be integrated, and will not neatly align. While a perfect reconciliation of the outputs of these various different projections, pathways and global scenarios is therefore unrealistic, neither is it necessary where the aim at sectoral level is simply a broad-brush framing of plausible future outcomes in a few key factors of interest.

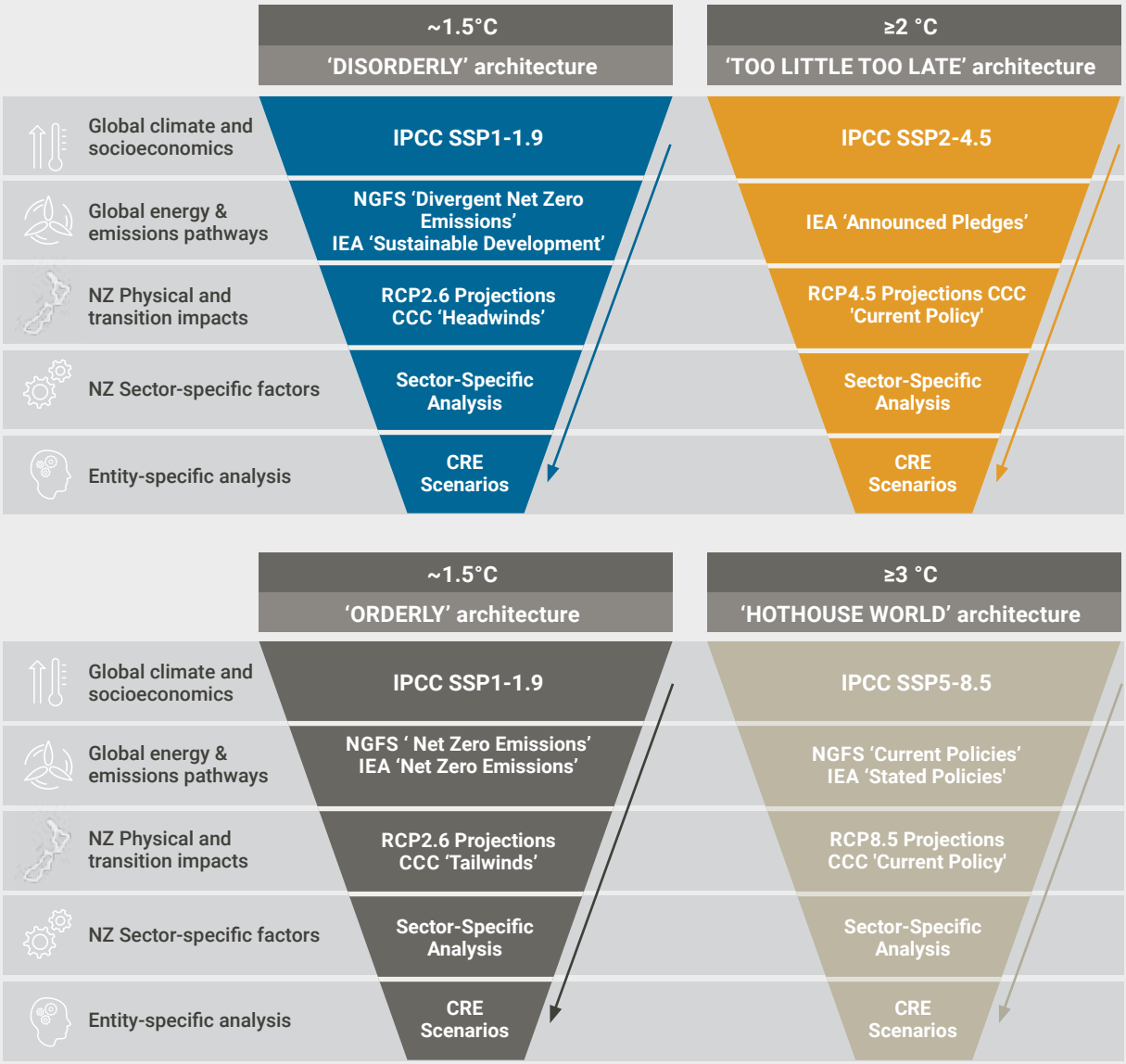
Secondly, the practicalities of working with available data mean that several of the design rules of higher-level scenarios and projections may need to be broken. For instance, NGFS scenario outputs are currently all based on the use of IPCC SSP 2, in combination with the previous generation of IPCC RCPs. The new generation of IPCC scenarios supersedes these, but there will of necessity be a time lag between their release and their uptake in the next generation of NGFS scenarios.

Similarly, the previous IPCC RCPs form the foundation of New Zealand's currently available physical impact projections. Over the timescales and spatial resolutions of interest to CREs these differences may prove to be negligible, but they are nevertheless important to acknowledge.

These caveats aside, the broad groupings of high level data presented here can and should be used to structure thinking on the development of scenario narratives, or provide a stepping off point for more in-depth analyses at sector or entity scale. Waiting for all providers of higher-level scenarios, pathways and projections to align on methods, inputs and assumptions would require sectors to wait many years, or draw on a much narrower range of inputs.

Ultimately, the responsibility for sourcing, validating or generating data appropriate to the analysis of climate-related risk and opportunity lies with those persons tasked with developing scenarios and disclosing their findings.

Figure 11: ***Scenario architectures.*** *Broadly aligned sets of scenarios, pathways and projections can form a shared architecture for sectoral scenarios. These provide high-level assumptions and building blocks which are plausible and broadly coherent, and can be used to paint a picture of the world an entity might find itself in. It should be noted that the NGFS use three different IAMs to generate the* ***data associated with the scenarios*** *they have developed. Modellers have used a prescribed set of assumptions and inputs in generating these data. Of necessity, the assumptions and inputs set out above differ from those of the NGFS. However, the NGFS provide* ***technical documentation*** *describing these inputs and assumptions if sectors wish to evaluate the utility of employing NGFS IAM data in quantifying their scenarios.*



Appendix 4: Financial sector considerations

Additional considerations for financial entities

Climate-related scenario analysis for financial institutions is a relatively new field, within which significant work is currently underway. Current practice differs within and between sectors and jurisdictions and is evolving quickly. Therefore, practically trying to ensure the use of similar approaches and assumptions in the financial sector is significantly more challenging.

The TCFD has largely focused on scenario analysis guidance for non-financial institutions since 2017. The guidance that has been produced (for instance by the United Nations Environment Program-Finance Initiative, or the Climate Financial Risk Forum), tends to focus on the needs and contexts of financial institutions which are much larger in scale than those reporting in Aotearoa New Zealand under NZ CS 1. It is also less focused than the TCFD's guidance on testing strategy resilience, which should be borne in mind.

The mandatory disclosure regime has a relatively narrow legislative mandate for managers of Registered Investment Schemes (MIS Managers). MIS Managers must disclose their climate-related risks and opportunities in respect of the funds they manage, involving a more targeted scenario analysis approach than other CREs.

Additional considerations for banks and insurers to account for are the Reserve Bank's climate-related stress testing and prudential requirements.

We recommend financial entities draw on the 'transmission channels' approach as an organizing framework for how to think through the potential ways in which a given financial institution and/or fund or scheme could be impacted by climate change.

Existing models may struggle with climate risk

There may be a natural tendency to approach the handling of climate-related risk among financial institutions in the same way that other, less diffuse and uncertain risks are handled. This may see financial entities leap directly to Step 5 in the scenario method, attempting to quantify climate-related impacts using their existing financial models and tools with the simple addition of parameters to represent physical or transition risk factors sourced from publicly available data. However, this approach may struggle to adequately reflect the complexity, uncertainty and non-linearity of the impacts of climate-related risks and opportunities and **should be treated with caution.**

In the interim period before the arrival of much richer data and sophisticated machine learning techniques improve the predictive power of climate-financial models, experimentation with approaches to systematically incorporate qualitative analyses may be more fruitful. **NGFS note** that the nature of climate risk means that many of the initial climate scenario analyses exercises 'could underestimate real impacts of transition and physical risks' and therefore they 'stand out primarily as learning opportunities.'

References

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3. TCFD (2020) *Guidance on Scenario Analysis for Non-Financial Companies*, p.74-75
4. TCFD (2020) *Guidance on Scenario Analysis for Non-Financial Companies*, p.17-18
5. Adapted from TCFD (2020) *Guidance on Scenario Analysis for Non-Financial Companies*, p.23
6. TCFD (2020) *Guidance on Scenario Analysis for Non-Financial Companies*, p.76
7. See also TCFD (2020) *Guidance on Scenario Analysis for Non-Financial Companies*, p.78 and p.81
8. TCFD (2020) *Guidance on Scenario Analysis for Non-Financial Companies*, p.7, 36, and 55
9. ISO14090 (2019) *Adaptation to climate change* – Annex A: Using systems thinking to set boundaries for climate change adaptation, p.21
10. See for example: Voinov, A. & Bousquet, F. (2010) Modelling with stakeholders, *Environmental Modelling and Software*, 25(11) p.1268-1281, and Gray, S., Paolisso, M., Jordan, R. & Gray, S. (2017) *Environmental Modeling with Stakeholders: Theory, Methods and Applications,* Springer International Publishing, Zurich, Switzerland
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16. TCFD (2020) *Guidance on Scenario Analysis for Non-Financial Companies*, p.26-28
17. TCFD (2020) *Guidance on Scenario Analysis for Non-Financial Companies*, p.80-82
18. The Aotearoa Circle (2020) *Climate-related risk scenarios for the 2050s*, p.22-26 and p.28-31
19. TCFD (2020) *Guidance on Scenario Analysis for Non-Financial Companies*, p.30-31; p.82-83
20. See for example NIWA's 'Our Future Climate New Zealand' site for physical impact projection data covering different IPCC Representative Concentration Pathways, over a range of temporal and spatial scales, or He Pou a Rangi (Climate Change Commission) for data and modelling illustrating projections of GHG emissions, energy, transport, land use, industry, agriculture and a range of other factors to 2050.
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29. TCFD (2020) *Guidance on Scenario Analysis for Non-Financial Companies*, p.31
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31. TCFD (2020) Guidance on Scenario Analysis for Non-Financial Companies, p.25

Table of Amendments

Date	Version	Description of change
June 2022	2022.C.1	Working draft
July 2023	V2-Jul23-NZCSJuly23	General update

Summary of changes:

- Addition of an overview of where scenario analysis sits in the process of making an entity's strategy more resilient, and the corresponding XRB guidance documents.
- Streamlining of executive summary for decision makers, with increased focus on why it would be valuable for their entity.
- Addition of a "guidance on a page" summary.
- Addition of the purpose of the guidance and a description of the intended audience and use cases.
- Addition of suggested objectives for a sectoral scenario development process. (1.7).
- Addition of a description of the different roles and responsibilities in the process, and guidance about outsourcing (1.8).
- Clarification that quality control needs to be addressed and agreed upfront in the first step (1.9).
- Reframing 2.1 specifically on sectors.
- Addition of a step to make explicit the need to map the sector (2.4).
- Clarifications related to the selection of scenarios, their definition and their number, (4.3) and how they align with temperature outcomes and pathways (4.1).
- Clarification of expectation in term of continuous improvement (6.3) and addition of guidance on potential next steps (6.4).
- Summary recommendations replaced by 'Conditions for success'.
- Readability: Streamlining of the core guidance by increasing use of appendixes. Change of parts title to better reflect the content. Suppression of repetitive explanations.
- Accessibility: Simplification of the language. Consistent use of technical terms. Addition of glossary for technical terms. Additional box explaining interactions between risks and driving forces.
- Suppressions: Background and context (out of date).