

Climate scenario analysis and application guide: Food, Agriculture and Forest Products



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About this guide

In its October 2021 [Status Report](#), the Task Force on Climate-related Financial Disclosures (TCFD) reported significant momentum around the adoption of and support for its recommendations. However, the report found relatively low levels of disclosure in response to the recommendation that companies should assess their strategic resilience, taking into consideration different climate-related scenarios. This recommendation is consistent with the priorities of the [COP26 Private Finance Hub](#), which includes assessing companies' resilience to climate risk based on the use of scenario analysis in the real economy and through sector-specific scenarios and guidance.

In response, the TCFD requested WBCSD to work with leading companies in the energy system to develop a business-relevant climate scenario analysis reference approach designed to support corporate scenario analysis practice and inform disclosures about strategic resilience. In March 2022, WBCSD launched a [Climate Scenario Analysis Reference Approach for the Energy System](#).

This work was built on WBCSD's [TCFD Preparer Forum series](#) with key sector groups across: Oil and Gas; Electric Utilities; Construction and Building Materials; Chemicals; Autos; and Food, Agriculture and Forest Products. The [Food, Agriculture and Forest Products TCFD Preparer Forum](#), like the TCFD Status Report and COP26 Private Finance priorities, also identified scenario challenges and needs, in this instance in the availability and use of robust, credible scenarios in the Food, Agriculture and Forest Products sectors.

To address these challenges and support responses to wider developments from standards setters and regulators (e.g., the inclusion of scenarios in US SEC [Rules to Enhance and Standardize Climate-Related Disclosures for Investors](#), EU [ESRS E1 Climate change](#) and ISSB [IFRS S2 Climate-related Disclosures](#)), WBCSD convened 13 leading companies from across the Food, Agriculture and Forest Products value chain to form a Corporate Forum on Reference Scenarios for Food, Agriculture and Forest Products.

This guide has been prepared by WBCSD based on advice and inputs provided by Forum members. It reflects their input on the use of sector-relevant climate transition scenarios for the purpose of assessing strategic resilience to climate risk and informing disclosures in response to the TCFD's recommendations.

This guide is not intended as a definitive resource for the optimal approach to climate scenario analysis by companies. Given limited time, and in some cases a more limited scientific basis for certain aspects of climate modeling relevant to Food, Agriculture and Forest Products, the scenarios could not include all possible drivers and outputs. The scenarios and this guide should be viewed as a next step in the continuing development of business-relevant scenario analysis for these sectors.

The Food, Agriculture and Forest Products Forum anticipates that the uptake and maturity of climate scenario analysis will continue to advance over time. A forthcoming companion guide will address how scenarios can support transition plans in response to the TCFD's [Guidance on Metrics, Targets, and Transition Plans](#) and [Glasgow Financial Alliance for Net Zero \(GFANZ\) Expectations for Real-economy Transition Plans](#). The last section of this guide includes recommendations for future work.

Executive summary

The Agriculture, Forestry and Other Land Use (AFOLU) sector is responsible for just under a quarter of anthropogenic greenhouse gas (GHG) emissions, mainly from deforestation and agricultural emissions from livestock, soil and nutrient management.

AFOLU emissions could change substantially under distinct transformation pathways with significant mitigation potential from agriculture, forestry and bioenergy mitigation measures.

The TCFD recommends scenario analysis for companies reporting on and preparing for risks and opportunities due to climate change. A review of 50 AFOLU corporate climate disclosures found that TCFD disclosure in the AFOLU sector is steadily maturing, with companies trending toward increasing quantitative scenario analysis. But reporting remains inconsistent and not comparable due to varying scenario applications and there has been an absence of established reference scenarios for these sectors. Companies need new tools and support to effectively use scenario analysis to assess the risks and opportunities, build transition plans and disclose meaningful information.

This guide describes a set of new climate scenarios developed specifically for Food, Agriculture and Forest Product companies. Climate scenarios explore uncertainties about the future by modeling what different emissions pathways suggest about ways of achieving climate outcomes. They help companies to understand dependencies and potential actions, decisions, strategies and investments. The scenarios focus on transition risk – exploring the technological, political, legal, market and economic changes required to reach a particular temperature outcome – and the associated risks and opportunities. The scenarios are designed to apply to companies engaged in various activities across Food, Agriculture and Forests Products sectors – including inputs, production, trading, manufacturing, consumer products and retail.

The scenarios are not intended to be prescriptive about what should happen, nor are they target-setting scenarios. Instead, they can help companies understand the plausible pathways the world could take to meet end-of-century temperature targets. We believe that a 1.5°C scenario is required to align to a net zero outcome and is a requirement for a nature positive and more equitable future.

Variables in the model provide a view of what may need to happen in various situations to reach a specific temperature goal, such as shifts in diet and food waste which would be needed to limit warming to 1.5°C. The Climate Scenario Tool allows you to visualize climate scenario data and download full datasets for use in climate scenario analysis. Underlying the scenarios are a set of key drivers: GDP and population; trade; protected areas; GHG prices; bioenergy; diet shifts; food waste reductions; input efficiency; yield-enhancing technologies; timber demand; and other climate policies. A companion [Technical Guide](#) provides a detailed description of the assumptions and modeling methodology.

The Climate Scenario Tool provides outputs in three categories: land use variables (e.g., land use change); business variables (e.g., production, price); and environmental variables (e.g., GHG emissions, forest carbon stocks). Outputs are included for 23 commodities and 18 regions covering the globe and are reported between 2020-2050 in five-year intervals. Scenario analysis builds an understanding of how different external trends, such as raw material sourcing, could change over the course of decades, extending beyond the five years typically used in financial forecasting.

Five key business applications for the scenarios were identified based on the greatest need or business value derived from the use of scenario analysis: engagement and education; public and policy engagement; strategic adaptation and resilience; assessing financial impact; and reporting and disclosure.

A core step for organizations to integrate scenario analysis into day-to-day business processes is to identify and manage the range of stakeholders that are required to understand climate scenarios and to leverage insight from the analysis. Scenario analysis can benefit a range of functions in the business including sustainability, strategy and business planning, risk management, investor relations, finance, procurement and human resources, extending up to executive management and the board of directors.

Assessing how best to respond to the challenges posed by climate change and testing the resilience of a strategy require organizations to apply a range of scenarios to explore how the future could unfold. These insights can critically inform and help to shape an organization's long-term strategic planning and the evolution of its operational and/or business models.

Decisions on transition approaches, targets and pathways must be made with an awareness of current and emerging policy and an understanding of public attitudes toward risk and environmental issues, as well as the priorities and socio-economic capacities of different sections of society.

Public and policy engagement by organizations are critical to develop transition solutions that address societal needs and concerns and that reflect and inform climate policy.

Scenario analysis can help companies understand how climate change and climate action might impact financial performance, and how to integrate climate risk into financial risk management frameworks. This requires organizations to build pathways that represent their evolving business and operational models and to reflect emerging financial and non-financial audit and reporting requirements.

The scenarios are also designed to support companies in undertaking disclosure in response to the TCFD recommendations, including that companies should describe the resilience of their strategies considering different climate-related scenarios. Effective reporting and disclosure should include a coherent overarching summary and rationale for all the activities that have taken place as a result of using scenario outputs.

The primary objective of this guide is to build an understanding of the features and value of the Climate Scenario Tool and the outputs of scenario analysis. The target audience is primarily business functions and stakeholders looking to build their capabilities with scenario analysis to inform business decisions, strategies and activities related to climate transition risks. The guide provides important background as both an introduction for those new to climate scenarios and context for more experienced climate analysts that may use the tool to improve their analysis. The Appendix provides an introduction to climate scenarios and scenario analysis. More details on the technical aspects of the scenario modeling and underlying methodology is available in the [Technical Guide](#).

Users of the Climate Scenario Tool should note that the results are the modeled impacts under a set of plausible but not predictive climate scenarios. The results in the tool are country or region aggregated averages that could be materially different when comparing the results to a specific company or local geography. The tool provides an understanding of the trends that point to the most significant impacts on the business under a set of different climate scenarios, allowing companies to scope out more detailed analysis.

1 The need for scenario analysis in the Food, Agriculture and Forest Products sectors

This section presents findings from a review of literature and existing scenarios and highlights requirements for the development of scenarios tailored to Agriculture, Forestry and Other Land Use (AFOLU) sectors.

- Builds awareness of the challenges and importance of performing scenario analysis in the AFOLU sectors
- Explores gaps in existing scenarios and reasons for the limited adoption of scenario analysis amongst AFOLU companies

Agriculture and forestry represent two of the most important sectors for society, as they provide most of the world's food and fiber.

The Agriculture, Forestry and Other Land Use (AFOLU) sector is responsible for just under a quarter of anthropogenic GHG emissions, mainly from deforestation and agricultural emissions from livestock, soil and nutrient management. AFOLU is unique since the mitigation potential is derived from both enhancement of removals of GHGs and reduction of emissions through management of land and livestock.

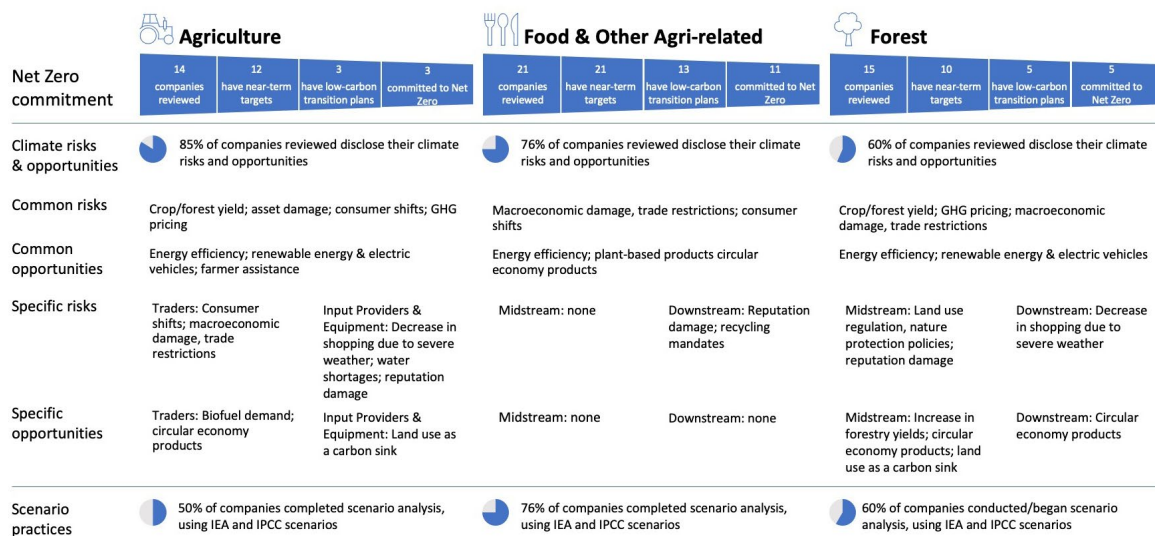
AFOLU emissions could change substantially along transformation pathways, with significant mitigation potential from agriculture, forestry and bioenergy mitigation measures.¹ The AFOLU sector must play a leading role in the transition to a global low-carbon economy.

The TCFD recommends scenario analysis for companies reporting on and preparing for transition risks and opportunities.

A review of 50 AFOLU corporate climate disclosures found that TCFD disclosure in the AFOLU sector is steadily maturing, with companies trending towards increasing quantitative scenario analysis. But reporting remains inconsistent and not yet comparable due to varying scenario applications. Two-thirds of reviewed companies conduct scenario analysis with most using IPCC and IEA scenarios, which are not specifically focused on the AFOLU sector.

New tools and support are needed for companies to effectively use scenario analysis to assess risks and opportunities, build transition plans and disclose meaningful information.

Figure 1: Review of AFOLU corporate climate disclosures



Source: WBCSD with supporting analysis by Vivid Economics

Limited adoption of scenario analysis among AFOLU companies is partially explained by a lack of reference scenarios meeting company requirements.²

1. Comprehensive data outputs

are difficult to develop due to three main challenges:

- Lack of data availability, with the majority of publicly available scenarios not currently including agriculture or forest products. Certain commodities (e.g., oil palm, coffee) have particularly insufficient data.
 - Lack of data granularity, with data not being sufficiently regional (and as local as possible).
 - Data discrepancies and inconsistencies can be found between observable evidence and scenario forecasts (e.g., for extreme weather). The timescales for analysis can also differ across variables and geographies.
- 2. Consistent approaches** are needed to identify key assumptions and inputs and the resulting implications of scenario analysis across the value chain – including impacts, dependencies, trade offs and decisions. Current scenarios are not always explicit in listing their assumptions. This makes it challenging for a company to understand if scenarios are consistent.
- 3. Alignment with TCFD recommendations** expressed primarily around scenario design, such as the requirement that at least one utilized scenario should be below 2°C, or the recommendation to incorporate “disorderly” assumptions.

A deeper study of more than 30 publicly available scenarios that include AFOLU pathways revealed significant variation in terms of outputs, assumptions and underlying models. Refer to the [Technical Guide](#) for a full list of the scenarios that were reviewed.

Based on the [TCFD Guidance on Scenario Analysis for Non-Financial Companies](#), several gaps were identified among the existing scenarios used as AFOLU reference scenarios:

- **No scenario provides data for all relevant output variables.**
- **No scenario covers all relevant commodities.** Missing commodities tend to include alternative proteins, forest commodities and key secondary products.
- **Many scenarios present data for land use variables at the regional level, but for a limited set of variables.** For some scenarios, more granular data exists but it usually covers a limited number of variables.
- **Providers with multiple scenarios tend to distinguish them primarily by temperature outcome and rarely cover all key assumptions.** Best practice providers create scenarios by varying driving forces to create a comprehensive array of futures.
- **Most scenarios do not include “disorderly” assumptions, although best practice scenarios do.** For those that do, data may not be provided or associated with temperature outcomes. Only NGFS provides disorderly scenarios across multiple temperatures, both of which are below 2°C.

- **Scenarios focus on narratives and data without discussing ways to determine whether a scenario remains plausible over time.** Some scenarios provide an assessment of the current plausibility of each scenario but do not provide “signposts” to enable future assessments.
- **Scenarios rarely list all of their assumptions explicitly, which makes them difficult to replicate independently.** Although this is not an issue for best practice scenarios, their transparency is diminished for energy system variables which are typically modeled using non-open source models.
- **Many scenarios are not user-friendly and no scenario provides examples of how it can be applied in a TCFD context.** As a best practice set of scenarios, NGFS refers to scenario analysis but TCFD is not mentioned explicitly.

Recognizing that companies often combine several scenarios to meet their specific needs, the intent in developing these scenarios is not to create a one-size-fits-all set of scenarios. The purpose of these scenarios is to provide a set of reference scenarios aligned with TCFD recommendations, while hopefully reducing some of the complexity of using multiple scenarios not necessarily geared toward AFOLU.

② Food, Agriculture and Forest Products scenarios

This section describes the design and development of five scenarios tailored to the AFOLU sector, the principles applied and the characteristics and structure of the scenarios. It also provides an overview of the modeling approach and key scenario drivers and outputs, including the commodities and business, land use and environmental variables in the scenarios.

How the approach was developed

The literature review and existing scenarios described in the previous section highlighted the need to build a new set of scenarios for the AFOLU sector. This Food, Agriculture and Forest Products scenario analysis approach

was developed based on a comprehensive research and consultation process.

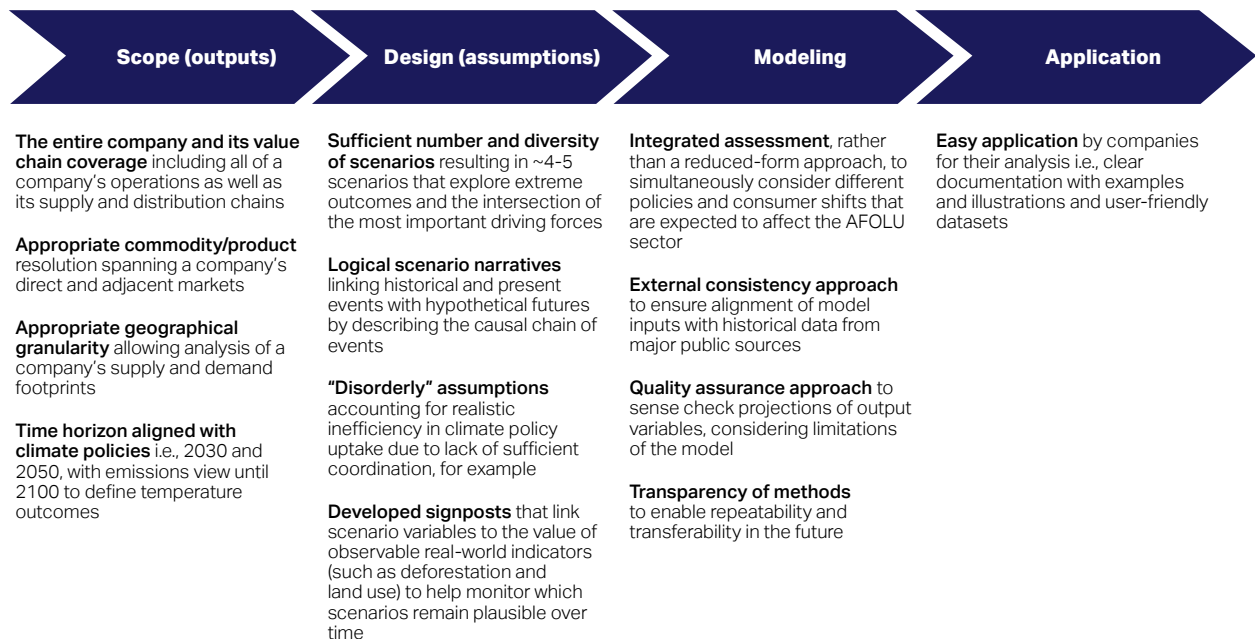
Scenario design

From a review of existing public scenarios, key characteristics and gaps were identified. These led to the establishment of 13 design principles aligned with the four TCFD reference scenario principles for Scope, Design, Modeling and Application.

These principles informed the design of five exploratory scenario narratives describing future pathways at the intersection of the key driving forces identified. The narratives illustrate the relationship between drivers and resulting outcomes, including the causal assumptions underlying the relationships.

For each driver, we relied on available literature for initial estimates, which were then tested with technical and business experts to identify plausible upper and lower boundaries. Scenario drivers were mapped against model outputs to understand the interactions of the outputs. Finally, "signposts" were identified for each scenario, offering criteria to assess whether reality is approaching any of the scenarios. For example, if a scenario assumes a significant increase in the amount of protected land by 2025, but real-world data in that year shows only a minimal shift in that direction, then the scenario may not be that applicable for scenario analysis in 2025.

Figure 2: TCFD scenario design principles



Source: TCFD

Stakeholder consultation and the Food, Agriculture and Forest Products Corporate Forum

The scenarios are designed to apply to companies engaged in various activities across Food, Agriculture and Forest Products sectors, including:

- Inputs: production of seeds, fertilizers, irrigation equipment and other crop management products and technologies.
- Production: planting, irrigation, growing, harvesting, storing and transporting agricultural and timber commodities.
- Trading: buying, quality grading, pricing and storing raw agricultural and forest materials.
- Manufacturing: refining and processing raw materials into specialized food ingredients and inputs into secondary products (e.g., pulp paper).
- Consumer products: manufacturing finished consumer food and forest-based products.
- Retail: consumer-facing sales of finished food and forest-based products.

This is a simplified list of activities conducted by Food, Agriculture and Forests Products companies and does not capture all facets of the AFOLU sector, or reflect the dynamic nature of the system.

Consumers, for example, are an important stakeholder in the system and their behavior has potentially significant impacts, but this approach focuses on use of the scenarios by companies.

WBCSD surveyed its Food, Agriculture and Forest Products members to gather insights on requirements for the scenarios, including:

1. Companies' use of scenario analysis and associated challenges.
2. Assumptions and priority commodities, business variables, and environmental and social variables for the scenario models.
3. Features and desired uses of the Climate Scenario Tool.

The Food, Agriculture and Forest Products Corporate Forum was convened to guide development of the scenarios. The Forum is made up of a subset of WBCSD member companies that are TCFD supporters and are committed to using scenario analysis. Members are Bayer, Cargill, CMPC, Corteva, Danone, DSM, International Paper, Mondi, OFI, Rabobank, Tyson Foods, Viterra and Weyerhaeuser. These companies represent perspectives from across the Food, Agriculture and Forest Products value chain.

Forum members provided input and feedback on the scenarios throughout their design and development.

Along with the Forum input, the scenario design benefited greatly from input from an Advisory Group made up of leading nonprofits, development organizations, scientific institutions and other experts from the AFOLU sector. This input aimed to ensure the comparability, consistency and usefulness of outputs. Members of the Advisory Group included BSR, Climate Bonds Initiative, Orbitas, Tropical Forest Alliance, United Nations Environment Programme Finance Initiative (UNEPFI) and World Wildlife Fund.

Scenario modeling

Development of the modeling underlying the scenarios followed best practice to guarantee the quality of resulting models. Model assumptions and methods were tested with a group of technical advisors from leading institutions, including Cornell College of Agriculture and Life Sciences, Food Systems Economics Commission, PBL Netherlands Environmental Assessment Agency and Potsdam Institute for Climate Impact Research (PIK). The underlying model used for this analysis was the Model of Agricultural Production and its Impact on the Environment (MAGPIE), an open-source model from the PIK.

Refer to the [Technical Guide](#) for more information about the scenario modeling approach.

Members of the Food, Agriculture and Forest Products Corporate Forum

Bayer, Cargill, Corteva, CMPC, Danone, DSM, International Paper, Mondi, OFI, Tyson Foods, Rabobank, Viterra, Weyerhaeuser.

Scenario narratives

This scenario analysis approach allows you to visualize climate scenario data and download full datasets for use in climate scenario analysis. See the [Technical Guide](#) for a detailed description of the assumptions and modeling methodology.

The Climate Scenario Tool includes five scenarios that provide a wide array of potential hypothetical futures for the AFOLU sector with a diversity of physical and transition impacts. In general, avoiding the worst physical impacts requires action that implies some level of transition risk. While both are important to consider, this analysis can be done separately.

The emphasis of these scenarios is on transition risks. Physical risks can vary drastically by location (e.g., local elevation in the case of floods), whereas transition impacts tend to apply broadly in scenario analysis.

Therefore, the five scenarios span the full range of transition risk: the >3°C Historic Trends Scenario has low levels of transition risk; the <2°C scenarios have moderate levels of transition risk; and the 1.5°C scenarios have high levels of transition risk.






Scenario drivers

Underlying the scenarios are a set of ten key drivers. Eight of these drivers vary by scenario while two (GDP and Population, and Trade) remain constant across all scenarios. These drivers represent the scenario narratives and create the variation in scenario outputs. The ten drivers are fed as assumptions into the model. Given these assumptions, the model estimates the least-cost way for the Land Use sector to feed the world. Based on this calculation, the model then outputs the variables described in the Scenario outputs section that follows.

For example, the Protected Area driver varies by scenario: under the 1.5°C Societal Transformation Scenario, this driver is 50% terrestrial area protected by 2050; while under the >3°C Historic Trends Scenario, the assumption for this driver is the current terrestrial area protection of 13% of the land’s surface. Due to this difference, the model will consider the 1.5°C Societal Transformation Scenario to have more carbon sequestration but less land on which to grow crops as compared to the >3°C Historic Trends Scenario. This difference will impact food production locations and then cascade to other variables, such as food prices or diet shifts, creating variation in the outputs between different scenarios.

Refer to the [Technical Guide](#) for more information on the drivers used across the five scenarios.

Figure 3: Scenario narrative descriptions

Scenario	Scenario description
 >3°C Historic Trends Scenario	>3°C Historic Trends represents a scenario in which climate action remains stable at current levels creating limited transition risks, but the world fails to limit global warming to manageable levels, resulting in substantial future physical risks. This scenario has low levels of transition risk.
 <2°C Forecast Policy Scenario (IPR)	Under <2°C Forecast Policy Scenario (IPR) , Climate action starts abruptly and late, around 2030, resulting in limited transition risk in early years. After 2030, transition risks ramp up significantly due to the sudden implementation of greenhouse gas (GHG) prices, area protection regulation, and a scale-up of bioenergy with carbon capture and storage (BECCS) capacity. This scenario has varying levels of transition risk over time.
 <2°C Coordinated Policy Scenario	<2°C Coordinated Policy Scenario is a scenario where timely policy and regulation work to curb emissions in an orderly fashion, decreasing the physical risk of climate change but increasing the transition risk. This scenario has moderate levels of transition risk.
 1.5°C Societal Transformation Scenario	1.5°C Societal Transformation Scenario represents strong, coordinated and prompt global policy action , as well as market responses (e.g. diet shifts and lower food waste) that result in widespread carbon pricing and land protection to enable decarbonization and limited physical impacts of climate change. This scenario has high levels of transition risk.
 1.5°C Innovation Scenario	Under 1.5°C Innovation Scenario , large demands from the energy system for BECCS, coupled with greater-than-historic yield growth in agriculture and government support for R&D, enables early decarbonization and limited physical impacts of climate change. This scenario has high levels of transition risk, but may be muted by technological progress.

Scenario outputs

The tool provides scenario outputs in three categories: land use variables; business variables; and environmental variables. Outputs are included for 23 commodities and 18 regions (including 6 large individual countries) and are reported at five-year intervals between 2020-2050.

The 23 commodities included for the output variables are:

Crop commodities:

- Cotton Seed
- Fruits Vegetables Nuts
- Groundnuts
- Maize
- Oil Palms
- Other Oil Crops, including Rapeseed
- Potatoes
- Pulses
- Rice
- Soybean
- Sugar Beet
- Sugar Cane
- Sunflower
- Temperate Cereals
- Tropical Cereals
- Tropical Roots

Animal products:

- Beef, Sheep and Goat
- Dairy
- Eggs
- Pork
- Poultry

Forest products:

- Timber
- Pulpwood

The 18 regions included in the output variables are outlined in the table below:

Table 1: Regions included in scenario output variables

Australia & New Zealand	Middle East & Northern Africa
Brazil	Other Europe, excluding EU & UK
Canada	Russia
European Union & United Kingdom	Southern Africa
Former Soviet Union (excluding Russia)	South Asia
Greater China	South East Asia
India	Tropical Africa
Japan & Korea	Tropical Latin America
Latin America's Southern Cone	United States

Outputs from the tool are variables with numerical values. These outputs are divided into three categories: environmental variables; land use change variables; and business variables.

Environmental variables are not directly linked to commodities but instead to the AFOLU sector in general. Such variables include the GHG emissions related to AFOLU sources, such as the total methane emissions from enteric (intestinal) fermentation. The model is connected to a Dynamic Global Vegetation Model that provides information on water yields and land suitability. In turn, these factors are reflected in the output variables related to the cultivation of different crops. Environmental variables include:

- **GHG emissions:** The GHG emissions related to the AFOLU sector, by region. Specific GHG emissions variables include CO₂, CH₄ and N₂O.

Negative emissions do not currently include soil carbon sequestration^a but they do include land use changes.

- **Forest-based mitigation:** The gross amount of CO₂ abatement in the forest sector.

Land use variables are linked to the environmental variables to show how the environmental variables will affect the land use sector. Land use variables include:

- **Land use change:** The total land use change in a region from one type of land use to another. Specific variables for land use include the extent of cropland, forest, pastures and rangeland, and urban areas for a region.

Business variables are directly linked to the 23 modeled commodities and help companies to understand the impact of the environmental and land use variables on

AFOLU markets and production. Business variables include:

- **Production:** The potential amount of a commodity produced under a specific scenario.
- **Price:** The change in price of a specific commodity by scenario.
- **Market size:** The production per commodity times price of the respective commodity.
- **Yield growth:** The increase in crop or forest yields per area as a result of technical innovation, such as investment in better seeds.

A company can use these output variables to examine how the production cost or market size for AFOLU products may shift under different climate scenarios. For example, a maize producer could look at yield and production shifts for maize across different regions to identify key areas for potential future investment.

^a Soil carbon has been noted as a strong area of interest for companies. However, it presents challenges related to local variation, lacking a sufficiently granular enough research base to include it in the scenario model.

③ Business application of scenario analysis

In this section, we discuss considerations of scenario analysis and the application of the Climate Scenario Tool to inform and enhance business planning, decision-making, performance and disclosure. It highlights how use of the tool can provide a common foundation and starting point upon which organizations can build their own organization-specific analysis.

We have learned from our Corporate Forum that there is a spectrum of potential users of the tool based on where they sit in their organization and their level of experience with scenario analysis - ranging from Climate Analysts to Chief Sustainability Officers. The tool, and this guide, have been designed to provide an entry point for those new to scenario analysis, with more technical information available for those looking for it (see the [Technical Guide](#)). The step-by-step examples that follow in this chapter are intended to help you understand the broad categories of use and how to begin using the tool, but the potential applications of the tool are countless so you are encouraged to get started with the tool to discover how it can be most useful for you.

The guidance is focused on helping companies directly involved in the Food, Agriculture and Forest Products sectors, however these principles can also be applied to companies indirectly involved with the system such as e.g., the seafood sector and its use of feed. The aim is to help companies identify the principles they can apply when conducting scenario analysis to:

1. Help companies when they are challenged internally or externally about how climate change may impact their strategy.
2. Enable and support others to think differently about potential future risks and opportunities from climate change and how it could impact the company.

The Climate Scenario Tool provides you with capabilities to explore climate scenarios and scenario drivers and pathways and to review business-relevant scenario outputs and variables. Scenario analysis is useful for identifying climate-related risks and opportunities, as well as sectoral decarbonization pathways, and matching these with stress testing scenarios.

Interpreting and applying the scenarios

The value of conducting scenario analysis

By performing climate scenario analysis, businesses can more robustly identify and plan for climate impacts and dependencies and deliver necessary transformational change. Scenario analysis builds understanding of how different external trends – such as raw material sourcing – could change over the short, medium and long-term, extending beyond the five years typically used in financial forecasting. This, in turn, helps a business become more resilient to climate change by understanding plausible pathways the world could take to meet end-of-century temperature targets.

Against this backdrop, it is important to clearly understand the role of scenario analysis as a core business tool, including:

- how to interpret scenarios;
- how scenario analysis is performed; and
- how the outputs of scenario analysis should be interpreted and utilized by the business, management and broader stakeholders.

Scenario analysis as a business tool

Scenario analysis helps businesses:

- **Establish an ongoing iterative process for analysis**, supplementing risk management and sustainability assessment processes – for example, to identify new pockets of risk and opportunity, and key sensitivities of the scenario that were not initially included or identified.
- **Look beyond short-term forecasting** to enable boards and management to consider potential business vulnerabilities, opportunities and operational

responsiveness to a range of potential future states – for example, developing strategies to address the “what if” and “how to” questions of the impacts of climate change.

- **Identify how risks and vulnerabilities will be sufficiently mitigated** – for example, scenario-based stress testing may leverage more detailed information on climate risks to help identify new risks and to re-prioritize risks that build strategic resilience.

Capabilities of organizations to effectively apply scenario analysis and to integrate results into business processes depend on the organization’s maturity and understanding of the role and application of climate scenarios. Scenario analysis can help link potential future impacts to different parts of the company’s value chain.

First, an understanding of climate scenarios must be reached, then it must be communicated to various parts of the organization, including senior management, enterprise risk management (ERM) and procurement, before being fully integrated into business planning.

Figure 4: Levels of company maturity using scenario analysis

Least mature	Most mature	
<p>Understanding what climate scenario analysis is</p> <ul style="list-style-type: none"> • Understanding what climate scenarios are • Understanding of the assumptions, drivers, outputs, variables, commodities • Understanding the models that underpin climate scenarios 	<p>Selling climate scenario analysis as a meaningful project to senior management</p> <ul style="list-style-type: none"> • Enable upskilling of senior management in climate scenarios to be able to sell as a worthwhile exercise • Connecting together how outputs of climate scenarios can fit into business planning processes • Understanding what climate scenario uncertainty ranges are and how they can be applied to business processes. • Applicability of climate scenarios to your specific company 	<p>Integration of company specific climate scenario analysis into business planning</p> <ul style="list-style-type: none"> • Identifying connections between output and business processes • Creating links between outputs and cash flow models • Linking climate scenarios to business planning and strategy • Transition planning • Financial impact assessment • Reporting and disclosure

Users of scenario analysis

To facilitate the integration of climate risk management solutions, organizations must have a clear understanding of which business and management functions utilize scenario analysis to inform decision-making and planning.

Applying climate scenarios and using scenario analysis outputs is not restricted to a single internal function; a range of business stakeholders rely on insight from scenario analysis to deliver business strategies and management responses to climate change and transition risk and opportunity (see Table 2).

These stakeholders must be upskilled and engaged with scenario analysis outputs to deliver business strategies and management responses to climate change and transition risk and opportunity.

Table 2: Business functions benefiting from scenario analysis

ROLE / FUNCTION	USE OF SCENARIO ANALYSIS
Board	Provide understanding and awareness of how climate change and transition pathways will reshape risk and opportunity landscapes and be assured that these are reflected in corporate strategy as foundations for long-term stability and business resiliency.
Executive management	Inform management actions, business objectives and operational approaches necessary to future-proof the business model to address the evolution of the corporate environment and deliver viable corporate performance in response to climate transitions and net zero pathways.
Sustainability	Provide additional context to inform and extend materiality assessment processes, horizon scanning, stakeholder engagement and climate action.
Strategy and business planning	Anticipate the evolution and impact of climate transition and business challenges and contribute to the development of adaptation (or transformation) strategies and business resiliency plans based on a range of potential outcomes and pathways. Also, testing a proposed strategy under a range of climate scenarios and market developments to determine what outcomes could be achieved.
Risk Management	Identify, assess and prioritize climate-related risks and mitigants, and integrate them into enterprise risk management frameworks, to inform and support design and delivery of business performance and strategic objectives over varying time horizons and transition pathways.
Investor relations	Describe to external stakeholders the scenario analysis process implemented by the company to assess the resilience of its business model to energy/climate mitigation and adaptation measures. Additionally, represent to investors and raters the climate narrative and transition plans founded on scenario analysis and transition pathways.
Finance	Estimate climate-related financial impacts and performance of detailed financial and economic modeling to inform investment, funding, capital management, capital expenditure, operational expenditure and asset management. The outputs of scenario analysis will also form the basis of internal management reporting and target setting, and TCFD-aligned external disclosures.
Human Resources	Inform cultural and behavioral change and resourcing needs to deliver climate transition strategies and performance. Inform reward, development and recruitment strategies necessary to build key talent pools, skill sets and infrastructure to support business transition.
Procurement	Inform procurement strategy through a regional and supply lens. Identify policy effects on traditional sourcing regions to help strategize how to adapt to a shifting climate. Typical sourcing locations could become unviable and others more attractive over the period of decades and this needs to be accounted for when planning procurement strategy.

Business applications

Based on the feedback from the Forum, key areas of business use of scenario analysis were identified. These business applications comprise areas of consensus where there is the greatest need for, or business value derived from, the integration of scenario analysis. The business applications and user requirements to conduct them have critically informed the design and specification of the Climate Scenario Tool's features, scenario data and outputs.

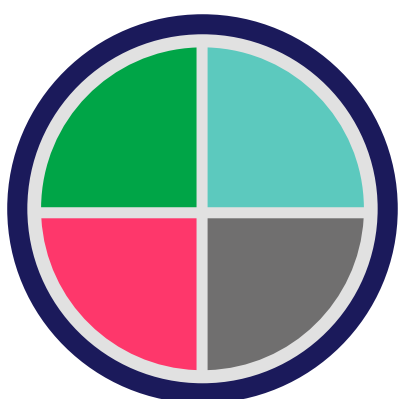
While business applications will vary across organizations and are dependent on an organization's maturity in conducting scenario analysis, key business applications for the Climate Scenario Tool were identified:

- Engagement and education
- Public and policy engagement

- Strategic adaptation and resilience
- Assessing financial impact
- Reporting and disclosure

These business applications are summarized in Figure 5 and described in the following sections.

Figure 5: Business applications for Food, Agriculture and Forests Products scenarios



Engagement & education

The primary use case of the tool is to help drive conversations with senior management, ERM, procurement and strategy teams, this will be the starting point for many on their scenario analysis journey.

Public & policy engagement

Using the scenario outputs, variables and trends out to 2050 as an opportunity to engage with policy makers and a tool for engaging with industry bodies based on scientific data.

Strategic adaptation & resilience

The collation of scenarios and ranges of scenario outputs can inform assessments of business model resilience and help companies understand how transition risks and opportunities could materialize - forming the basis of a transition plan to address these risks and opportunities

Financial impact

The output variables can be the starting point for describing how transition risks and opportunities can link to financial impacts, using climate scenarios as a tool for understanding potential changes to cash flow, impacts on the balance sheet and market opportunities.

Reporting & disclosure

The tool dashboards can provide a set of trends and variables per sub-sector that can be used as a basis for TCFD reporting, investor conversations and alignment with certain temperature targets.

Business application 1: Engagement and education

Using the Climate Scenario Tool to educate stakeholders in the business about climate scenarios and how these impacts can be used as part of business planning.

Target audience: Procurement, Executive Management, Risk Management, Strategy and Business Planning, Board

Discussions with Forum members underscored the importance of Engagement and Education across internal and external stakeholders for scenario analysis to be embedded in business practice and of particular importance to the maturing of strategic business use of climate scenarios.

The Climate Scenario Tool can help a business educate stakeholders from different departments and functions and develop their understanding of the use of scenario analysis outputs.

This foundational business application is important to build senior stakeholder support for conducting scenario analysis and as a precursor to integrating scenario analysis into business processes.

- Business leaders can develop understanding of the views of scientific, academic, political and economic communities about future climate pathways.

- Management can explore differences and commonalities in these pathways and drivers of the impacts of climate change and economic development over extended time horizons.
- Stakeholders can be informed on what climate scenarios are, how they relate to a specific sector, and how scenario analysis can be used to shape business decision making.
- Management can be supported to understand how outputs of climate scenarios fit into business planning processes, such as integration into ERM, procurement strategies, product and market strategies and, eventually, financial impact assessment.

CHALLENGES	HOW THE CLIMATE SCENARIO TOOL CAN HELP
<ul style="list-style-type: none"> • Levels of knowledge of climate scenarios and scenario analysis vary widely across stakeholders. This can make it challenging for management teams to understand the business value of conducting scenario analysis and reduce the priority for investment in core capabilities and solutions. • Conducting scenario analysis at the correct level of detail to ensure understanding by users with varying levels of background knowledge. For example, senior or board level stakeholders may have little understanding of scenario analysis compared with stakeholders who sit within a company's sustainability team. 	<ul style="list-style-type: none"> • Accessibility: The Data Explorer's dashboard is accessible for different levels of scenario analysis knowledge and allows you to share visualizations of scenario impacts with key stakeholders. This primary business application is the first step to accessing more mature business applications of scenario analysis. • Education and Upskilling: The Climate Scenario Tool offers an Overview section within the Data Explorer as well as the Portal for those newer to scenario analysis, which can be used to explain: <ul style="list-style-type: none"> • What a climate scenario is, what it is based on and what an "end-of-century temperature target" means • Comparison between scenarios and variables • What is meant by a climate assumption under the different scenarios and how these translate into the model • How assumptions and drivers can be linked to the company strategy. • Dashboard filters: The Data Explorer allows you to filter by commodity, region and environmental variables that are most relevant to a company.

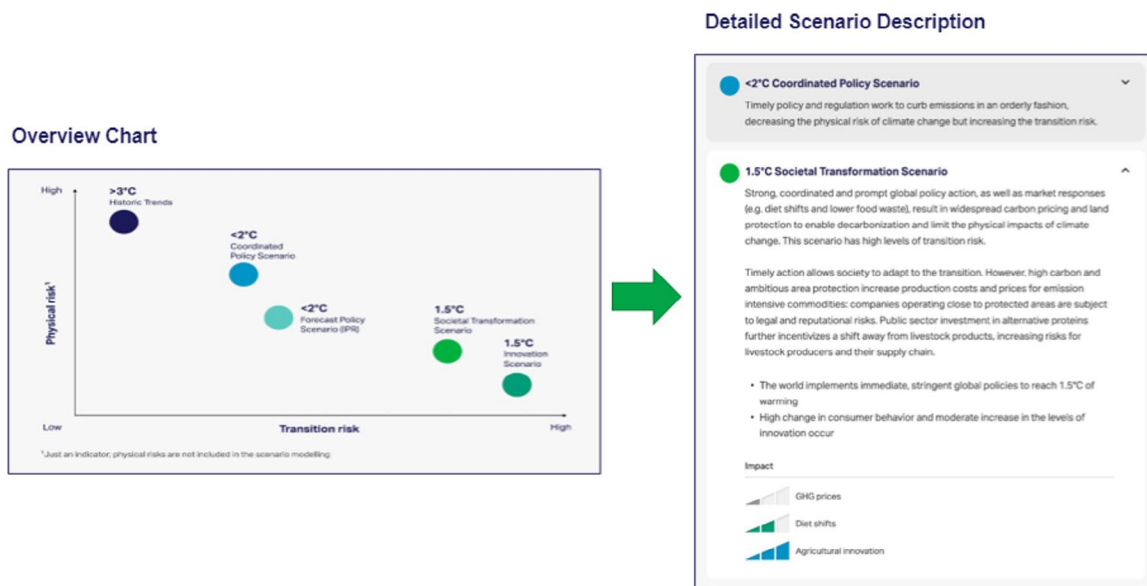
How to use the Climate Scenario Tool

Step 1a - Inform stakeholders on what climate scenarios are, how they relate to the Food, Agriculture and Forest Products sectors and the key characteristics

On the Food, Agriculture and Forests page of the Portal, you can click on the Scenarios subpage to learn more about each scenario. Each one is defined by a set of drivers with varying impacts on GHG prices, diet shifts and agricultural innovation.

You can explore the scenarios to understand what is driving end-of-century warming.

Figure 6: Scenarios overview in "The Scenarios" subpage of the Climate Scenario Tool portal



Source: WBCSD Climate Scenario Tool, with supporting analysis by Vivid Economics

Under “Explore the data”, you can access the Data Explorer. On the Overview page of the Data Explorer, you can select the “Key Insights” tab to familiarize yourself with the main findings across the different scenarios. Next, to explore specific inputs,

you can click on the “Drivers” tab and visualize the drivers at a global level – for instance GHG prices, diet shifts or bioenergy production. These visualizations allow you to compare how much the trajectories of the drivers

vary by scenario over time to understand what is driving the output results. For example, the greatest GHG prices are highest under the two 1.5°C scenarios, with prices reaching USD \$153 by 2050 (see Figure 7).

Figure 7: Scenario drivers



Source: WBCSD Climate Scenario Tool, with supporting analysis by Vivid Economics

Step 1b - Explore how scenarios relate to the business and the effects of scenario pathways and drivers on business-relevant variables over time

You can choose the commodities and business variables relevant to your business. A forest products business sourcing and

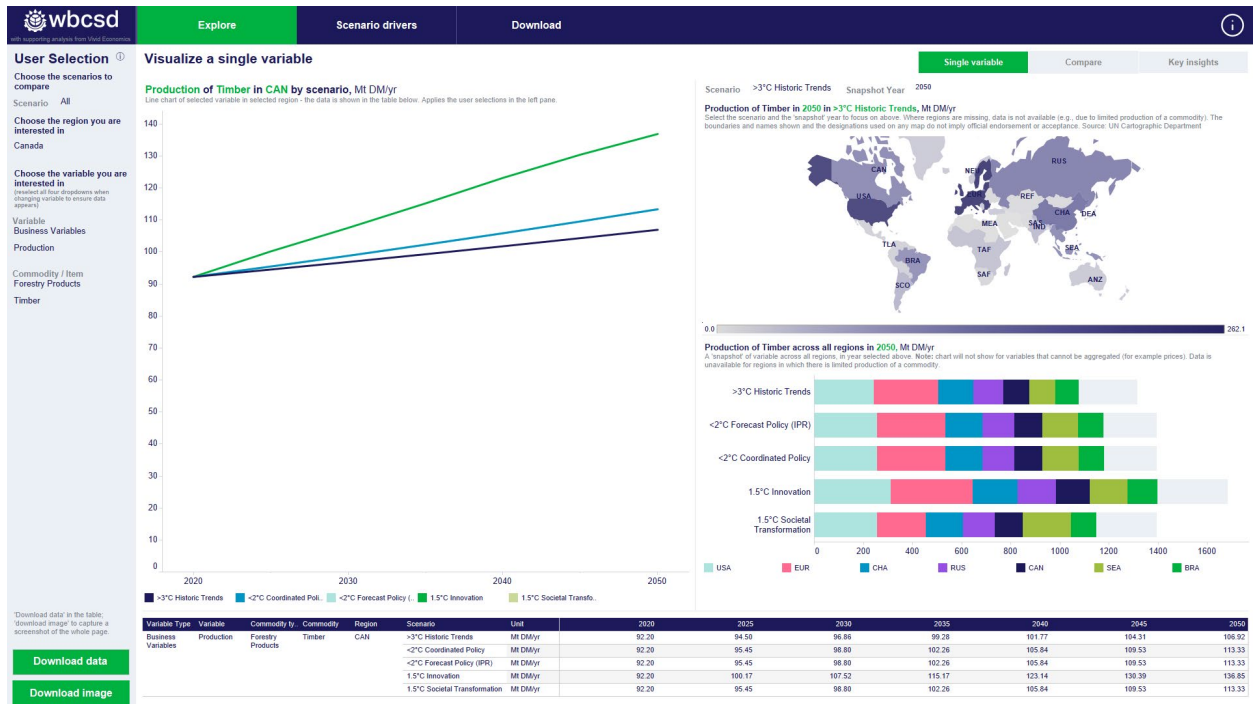
processing timber from Canada, for example, can explore how the production of timber can vary over the climate scenarios over time.

In the Data Explorer, select the Explore page and select Single Variable, "Canada" as the region, then sequentially "Business Variables", "Production", "Forest Products" and "Timber".

You can now see projected timber production by scenario from 2020 to 2050 and a visualization of how much different regions of the world contribute to that production in 2050 (see Figure 8).

A more complex business could apply these principles across many crop and region combinations to understand, at a macro level, how their sourcing and market could change over time.

Figure 8: Exploring a single variable in the Explore tab



Source: WBCSD Climate Scenario Tool, with supporting analysis by Vivid Economics

Step 1c - Help management understand how scenario outputs fit into business planning processes and operational processes

Once you are proficient in understanding how the different Data Explorer inputs affect the results, you can extract the required information to brief management on:

- What a climate scenario is, **using the easy-to-understand explanation and examples on the Portal.**
- How the Climate Scenario Tool can help show possible impacts of climate change on the business **using the Explore and Scenario drivers sections of the Data explorer.**
- What management can do with the outputs by **analyzing the results shown.**

The outputs from the Climate Scenario Tool can help inform the long-term strategy of a business from a climate perspective, addressing questions such as:

- How are my key sourcing regions expected to change in yield from a climate transition perspective?
- What region has the greatest yield increase as a result of technological improvements?
- Where is the greatest increase in price for my products? Is this driven by an increased cost of goods due to the embodied carbon?

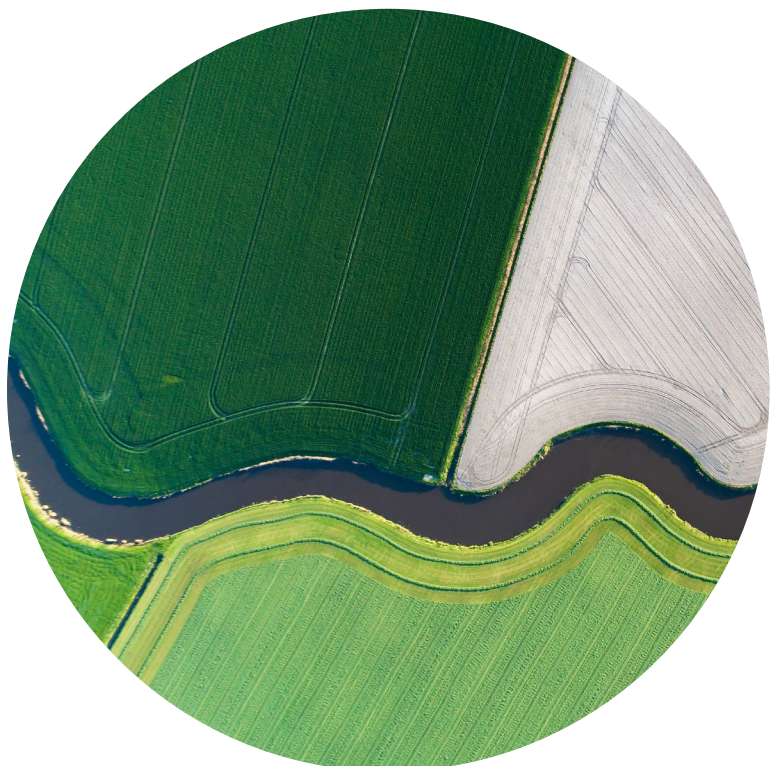
Step 1d - Engage diverse stakeholder groups on climate change pathways to provide a base for developing and interpreting transition strategies and adoption plans

Based on discussion with management, the exercise can be repeated and enhanced with a diverse stakeholder group. Out of each discussion should come several questions and responses. As a more diverse stakeholder group is engaged, more clarity can appear around business-relevant processes,

and a greater understanding of the climate scenarios will lead to more climate-specific questions being answered.

Businesses can use the base understanding of where their greatest climate risk and opportunities lie and how they could evolve to form part of their initial assessment of transition and adaptation plans.

Climate change itself is uncertain, meaning that climate scenarios are used to **explore this range of uncertainty.** Businesses should look across all plausible climate scenarios to understand the range of impacts that could affect the business. This range gives a set of guardrails to form an adaptation strategy or transition plan against.



Example engagement 1 - Procurement

The greatest value of the Climate Scenario Tool from a procurement perspective is **understanding how prices and production of key raw materials could change** over time under different climate scenarios. For example, if the company procures sunflower from Europe, they can use the Climate Scenario Tool to explore the range of uncertainty of production volumes of sunflower in Europe under the scenarios (see Figure 9).

First, the engagement with procurement should be to educate about what climate scenarios are and how they can be useful for business planning. This can be done using the Portal as described in step 1.

Second, you can show the Explore a single variable page to describe how prices and production of the specific raw materials could change over time.

You can see that, in all scenarios, sunflower production in Europe is expected to decrease over time with the biggest decrease in a 1.5°C Societal Transformation scenario from 8.5 MT DM/yr in 2020 in 1.9 MT DM/yr in 2050. This is offset by the increase in price of sunflower in a 1.5°C Societal Transformation scenario of 7% from 2020 to 2050. This is likely due to the phaseout of first-generation bioenergy which causes a drop in production but an increase in price. Procurement can use this information to drive how they are sourcing sunflower in Europe and how it is used.

Initially, procurement could fully understand their exact sourcing locations and engage with suppliers to communicate the possibilities. Under a 1.5°C Societal Transformation scenario, demand for bioenergy increases but, due to the transition to second-generation bioenergy, demand for sunflower decreases. If the company is to be resilient in 2050, it may want to consider altering its procurement strategy to decrease reliance on sunflower or to move sourcing to another region.

While the tool identifies trends in sourcing production and prices, companies should validate their specific supply chain circumstances before taking remedial actions such as altering sourcing regions.

Figure 9: Compare by variable subsection of the Explore tab, exploring outputs for Sunflower in Europe



Source: WBCSD Climate Scenario Tool, with supporting analysis by Vivid Economics

**Business application 2:
Public and policy engagement**

Using the tool to engage with wider policy and public discourse about climate scenarios and how they can be a useful tool to engage with industry based on a set of scientifically backed, open-source data

Target audience: Reporting functions, Strategy and Business Planning, Sustainability

Meeting net zero and climate targets involves deep-seated transitions in economies, institutions, politics, governance processes and public behavior. Decisions on transition approaches, targets and pathways must be made with awareness of current and emerging policy and an understanding of public attitudes towards risk and the priorities and socio-economic capacities of different sections of society.

Public and policy engagement by organizations are critical components of the development

of transition solutions that address societal needs and concerns and reflect and inform climate policy. A key piece here is around business alignment with governmental Nationally Determined Contributions (NDCs) and overall alignment to the Paris Agreement, to keep global warming less than 2°C and ideally within 1.5°C. Companies can use the outputs from the Climate Scenario Tool to understand their required contribution to the carbon reduction of the Food, Agriculture and Forest Products sectors.

CHALLENGES	HOW THE CLIMATE SCENARIO TOOL CAN HELP
<ul style="list-style-type: none"> Developing awareness of the rationale and focus of business strategy and performance that mitigate public or reputational concerns. Lack of clear and consistent political leadership and articulation of a consistent Food, Agriculture and Forest Products-focused approach to climate change transition. Increasing sector-wide action to incentivize and strengthen the focus on long-term performance, such as climate impacts, diversification of products, scale of production and measuring and capturing true value in pricing. Need for more sustained and coordinated ways of engaging the public, regulators and policymakers on climate change, allowing for improved learning and adapting as the context and societal needs and priorities evolve. 	<ul style="list-style-type: none"> Prompt stakeholder dialogue: Using the scenario outputs, variables and trends to 2050 as an opportunity to engage with policymakers and a tool for engaging with industry bodies based on scientific data. Impact on the value chain: Use the Data Explorer features to consider impacts of potential risks and investigate downside effects on other parts of the value chain that require public or policy engagement. Promote innovation: The scenarios provide a foundation level of Food, Agriculture and Forest Products-focused outputs that can help incentivize, accelerate and drive innovations to balance environmental, social and economic outcomes and meet the expectations and needs of society.

How to use the Climate Scenario Tool

Step 2a – Understand the scenario inputs, drivers and assumptions

See step 1a of the Engagement and education business application. When undertaking this step for public and policy engagement, it is important to note the elements that will be most relevant to the external landscape. For example, you may identify a trend in dietary or GHG pricing shifts occurring under a specific scenario and note what types of regulations are driving these changes (or may drive them in the future). Further details on how the drivers differ between scenarios can be found in the [Technical Guide](#).

Step 2b – Understand how an example company in the sector will be impacted by climate transition

This step can be undertaken in three ways: 1) A high-level look at an example use case; 2) A look into a specific commodity in more detail using the Key Insights page on the Explore tab; or 3) A deep dive into specific commodities and regional dependencies using the Explore tab.

On the Portal, you can explore three use case examples for a meat processor, a wheat producer, and a forest products company.

The example use cases guide you through the most relevant areas of the Data Explorer and give context around the implications of what is expected based on the example company's specific characteristics. From this, you can draw out key transitions that may occur under different scenarios and begin to consider how policies may enable these transitions.

Figure 10: Example use case - US meat processor

US meat processor

Context: A U.S. headquartered, multinational meat processor was asked by one of its investors to assess how climate transitions might impact the company's revenues and costs. Meanwhile, the processor's Chief Risk Officer (CRO) has begun to assemble an internal taskforce to prepare for potential emerging mandatory climate disclosure regulations from the EU and United States.

The CRO asks her team to investigate how they might undertake climate scenario analysis. The CRO taskforce team identifies several institutional sources for scenarios, but all of them focus on energy-related variables rather than information on agriculture-related business metrics. Fortunately, her colleague alerts her to the WBCSD website, where she dives into the [WBCSD Climate Scenario Tool](#).



Selecting scenarios

Following the Taskforce for Climate-related Financial Disclosures (TCFD) guidance, she selects three scenarios that represent a wide range of societal pathways, to assess related business impacts:

- >3°C Historic Trends Scenario**
A scenario that mirrors historic trends.
- <2° Forecast Policy Scenario (IPR)**
A high conviction scenario that captures meaningful action towards curbing global warming, including through moderate greenhouse gas (GHG) prices, land protections, and scale up of bioenergy with capture and storage (BECCS).
- 1.5°C Innovation Scenario**
A high ambition scenario that reflects greater-than-historic yield growth and public investment in innovation on top of greenhouse gas prices, land protections and significant scale up of bioenergy with capture and storage (BECCS).

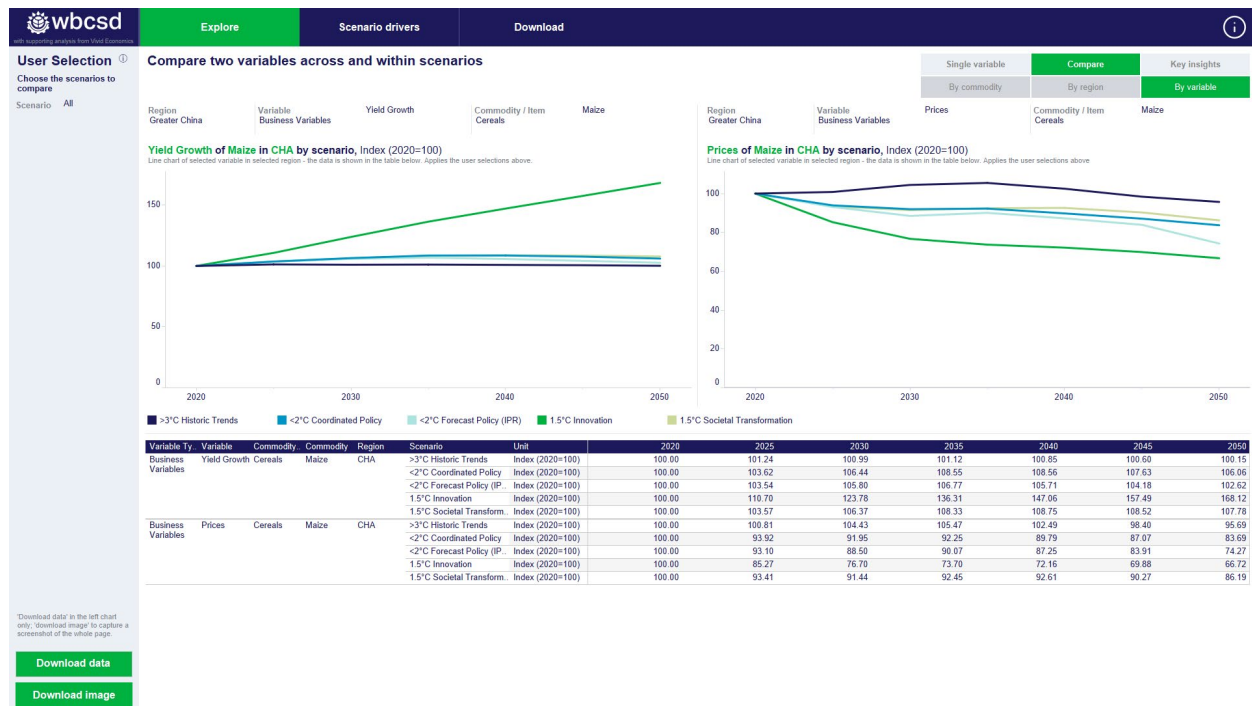
Source: WBCSD Climate Scenario Tool, with supporting analysis by Vivid Economics

Alternatively, you could go directly into the Data Explorer and select a key commodity and region that you are interested in understanding more about the transition risk. For example, a company concerned with Maize in Greater China can use the

Explore tab and Compare by variable to quickly understand some key impacts on the crop in that specific region (see Figure 11). In the “Explore” tab, you can go into more detail on specific variables – for example, if a

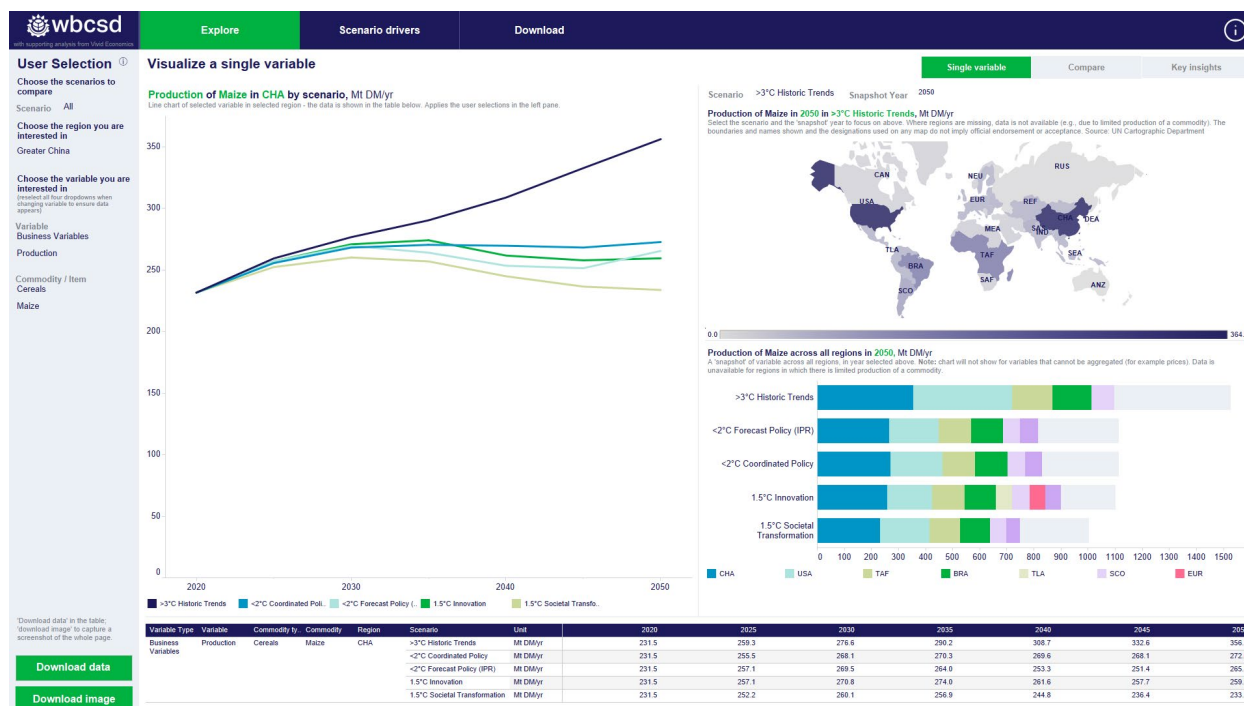
company wanted to specifically see the change in production for Maize in Greater China over time and under different scenario pathways (see Figure 12).

Figure 11: Compare by variable subsection of the Explore tab, exploring outputs for Maize in the Greater China region



Source: WBCSD Climate Scenario Tool, with supporting analysis by Vivid Economics

Figure 12: Explore tab – production of Maize in China



Source: WBCSD Climate Scenario Tool, with supporting analysis by Vivid Economics

Step 2c – Discussion with policymakers on how to use scenarios to inform policy activities and where the need for new or reformed policies are required across the Food, Agriculture and Forest Products sectors

A company can use information from steps 2a and 2b, as well as additional detail from in-house scenario analysis, to engage with policymakers. You can identify areas that may face specific transition risks and need new policies to mitigate some of the risks faced by that specific part of the system – for example, if soybean production is expected to decrease over time due to diet shifts causing decreased demand for animal feed.

Companies can use this information to engage with policymakers and educate them about the plausible decreased demand for soybean, while considering the increased demand of plant-based products sourced from other oils. Companies and policymakers can then work together to enable the repurposing of land historically used for soybean production for alternative and regenerative forms of agriculture or for rewilding projects.

Examples may include:

- Identifying cross-industry alignment opportunities and sector-level initiatives that can be leveraged to manage or mitigate individual or interconnected risks – e.g., land use, deforestation, regulatory engagement, more sustainable production techniques, etc.
- Illustrating how outputs from policy- or technology-focused scenarios may be leveraged to inform a case for policy change or development.
- Highlighting areas of adaptation that critically require governmental or policy leadership to drive change.

**Business application 3:
Strategic adaptation and resilience**

Overlaying company-level information onto the outputs from the tool to understand how company risk and opportunities could evolve over time under a set of climate scenarios. The outputs can help identify opportunities to stress-test the company strategy and challenge business as usual processes.

Target audience: Strategy and Business Planning, Risk Management, Procurement, Executive Management, Board

One of the goals of the risk management pillar of the TCFD strategy is for organizations to conduct and report an assessment of their resilience to climate risk.

Climate scenarios enable companies to explore uncertainties about the future through modeling different emissions pathways, timelines, mitigation options, feedback loops and technology trajectories.

Climate scenario analysis helps companies develop strategic plans – including understanding risks and opportunities – under a range of plausible future states that vary by what extent society manages to limit temperature rise.

The scenarios in the Climate Scenario Tool are designed specifically for this purpose: to help companies better understand the range of potential pathways society may move through, whether towards a business as usual or a net zero future.

Alternatively, “net zero” scenarios guide companies that would like to set or update emissions reductions targets for how quickly, and by how much, they should aim to reduce emissions to adequately contribute to society’s overall net zero transition. A useful source for understanding net zero is the Science-Based Target initiative (SBTi). For the Food, Agriculture and Forest Products sectors,

specific guidance is provided by SBTi FLAG (Forests, Land and Agriculture) guidance, which specifically focuses on the required GHG emission reductions of companies in land-intensive sectors.

Scenario analysis is also a core part of the ISSB guidelines on climate-related disclosures, specifically as part of the IFRS standards on assessing climate resilience. The guidelines suggest conducting sensitivity or stress test approaches to identify how material climate risks and opportunities can evolve over time for a relevant climate scenario variable.

Assessing how best to respond to the challenges posed by climate change and testing the resilience of a strategy requires organizations to explore how the future could unfold by applying a range of scenarios. These insights can critically inform and help shape an organization’s long-term strategic planning and the evolution of its operational and/or business models.

CHALLENGES	HOW THE CLIMATE SCENARIO TOOL CAN HELP
<ul style="list-style-type: none"> To collate relevant, forward-looking information to challenge a company’s operating model. To readily apply, compare and contrast the impact of scenarios across a range of drivers and outcomes. To link scenario outputs to business variables, commodities, geographies etc. that are most relevant to the organization. To provide transparency on how scenario analysis has been conducted and is linked to business planning and transformation. To identify which parts of the company would be most affected by climate change outcomes and test the credibility of transition pathways and performance targets. To define metrics, agree on targets and link to executive remuneration. 	<ul style="list-style-type: none"> Collation of relevant climate scenarios: The Climate Scenario Tool contains a range of scenarios, drivers and variables that have been identified as most relevant to Food, Agriculture and Forest Products companies and allows for a range of potential outcomes to be consistently assessed. Examination and summary of key data: The Data Explorer allows you to extract, filter and summarize the variables considered most relevant to the organization’s business and operational performance. Visualization and comparison: The scenario and variable explorer features in the Data Explorer enable you to visualize the profile and performance of key business variables and explore variations across multiple scenarios at desired levels of granularity. Facilitating business dialogue: The Climate Scenario Tool can be used to facilitate conversations between different business functions – such as ERM, Corporate Reporting, Strategy and Procurement – to assess and visualize how different trends of variables under scenarios can lead to different levels of risk and outcomes. Foundation for impact analysis: The output variables offer a starting point for describing how transition risks and opportunities can link to financial impacts, using climate scenarios as a tool for understanding potential changes to cash flow, impacts on the balance sheet and market opportunities. Inform risk and resilience management: You can explore ranges of uncertainty of key variables that can confirm climate-related metrics and set risk tolerances, risk appetites and risk thresholds to inform resilience and the degree of risk that the organization may face, is prepared to manage and its development of risk responses.

Examples may include:

- Comparing ranges of uncertainty across commodity price/demand/ supply against a market shift or operational challenge.
- Highlighting how the commercial viability of a product is impacted by commodity shifts or geographically specific outcomes under different scenarios.
- Illustrating how the customized dashboard may be populated with different business relevant variables dependent on the sub-sector of operations and how these can link into business continuity planning or strategic planning (e.g., sourcing of commodities shifts geography).
- Illustrating how tracking specific variables helps organizations develop an impact pathway, linking risk and opportunities to an impact on the balance sheet.

Climate scenarios should be informative but not prescriptive: they can inform and help shape, for example, the enterprise risk management approach, but companies should do their own more granular risk modeling (including consideration of potential physical risks) and layer that onto the transition risk from these scenarios.

Companies can consider how these scenarios fit into their ERM process and what would drive financial assessment and decisions to act.

How to use the Climate Scenario Tool

Step 3a – Build understanding of the scenarios, their context and key features of scenario inputs, drivers and assumptions

Engagement and education business application guidance can be found earlier in this chapter. For strategic adaptation and resilience, it is most important to gain an understanding of the key assumptions that sit behind the different scenarios (see [Technical Guide](#)).

Step 3b – Identify key, business-relevant scenarios and outputs and assess their volatility across a range of scenarios

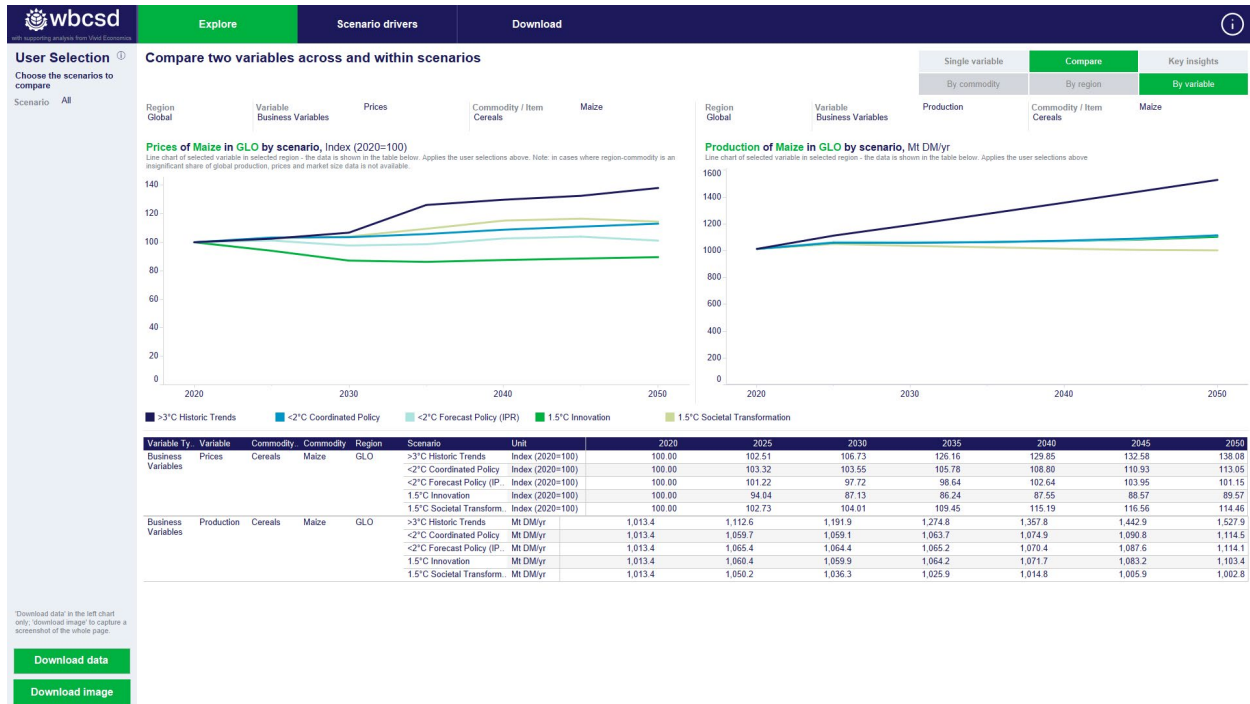
Aided by the foundational understanding built in step 3a, you can further explore specific drivers in the Data Explorer. The [Technical Guide](#) contains a list of the core drivers from a policy, GHG pricing, diet shift and land use change perspective. You should make sure you have a clear understanding of the key drivers for each scenario as these will help with describing the associated impacts.

Once identified, risks and opportunities can be mapped to specific variables for each scenario – for example, the opportunity of technological advances increasing yields for crops like rice. This links directly with step 4b of the Financial Impacts business application (see p.32).

Step 3c – Prioritize and scope the main analytical activities needed to understand the impacts to the business

For a more high-level view, the Scenario Drivers tab in the Data Explorer can be used to explore the impacts of scenarios on business-critical drivers. The key insights section of the "Explore" tab shows a high-level summary of the key insights that can be taken from the scenario results. The "Explore" section displays changes in a few key variables over time under different scenarios for specific commodities and regions of interest. You can utilize the outputs of this tab to understand where further data analysis may be needed.

Figure 13: Compare by Variable section of the Explore tab showing the Global Price and Production of Maize by scenario



Source: WBCSD Climate Scenario Tool, with supporting analysis by Vivid Economics

For a more detailed view, the Explore tab allows you to customize the specific variables and compare regions and commodities.

Figure 14: Data Explorer Explore tab - comparison by commodity for production of Maize, Tropical Cereals and Poultry at a Global level



Source: WBCSD Climate Scenario Tool, with supporting analysis by Vivid Economics

Step 3d – Outline how risks and opportunities will evolve and how the business or operational model may be impacted

Using both the Scenario Drivers and Explore tabs in the Data Explorer, you can view how variables are expected to change over time and begin to interpret what this will mean for the change in impact on the business over time under different scenarios. For example, you may be concerned about how your sourcing of oil palm in Brazil will be affected by future transition risk impacts (see Figure 15).

You can see that in all scenarios except the “>3°C Historic Trends” scenario, production of oil palm decreases out to 2050, meaning that a business reliant on oil palm sourcing from Brazil may want to investigate other regions they can source the crop from over the next years and decades. This form of analysis illustrates the interplay between physical

climate change and climate transition. Companies and policy makers also need to factor in physical climate and nature scenarios along with climate transition scenarios.

Step 3e – Develop strategic response and transition plans to adapt operational and business models

This will involve additional in-house analysis using the outputs and understanding gained from the previous steps. The organization can use the Climate Scenario Tool to inform a view of the gross risk associated with climate change, which does not account for any planned adaptation or mitigation steps.

The business can use this view of gross risk over the climate scenarios to identify where the most material areas are in order to develop mitigation or adaptation steps. An organization’s view of the potential future is typically qualitative when initially carried out, but using quantitative climate

scenario analysis can help to more fully understand where this risk or opportunity lies through a regional and commodity lens.

Organizations can assess how potential mitigation steps could impact the gross risk that has been quantified. For example, what could a 60% decrease in ruminant meat production from intensive farming by 2030 mean for the impact of reduced demand for meat-based products? The types of activities identified and tested through the Climate Scenario Tool can ultimately help inform the guardrails for transition plans.

Climate scenario analysis focuses on the climate impacts manifesting through the different scenarios, but does not consider wider financial, social, political or environmental factors. When developing strategic responses, organizations should carry out a qualitative assessment of these factors to ensure the overall strategy captures a holistic assessment of risks and opportunities.

Figure 15: Data Explorer Explore tab - oil palm production in Brazil



Source: WBCSD Climate Scenario Tool, with supporting analysis by Vivid Economics

**Business application 4:
Financial impact**

The output variables can be the starting point for describing how transition risks and opportunities can link to financial impacts, using climate scenarios as a tool for understanding potential changes to cash flow, impacts on the balance sheet and market opportunities.

Target audience: Finance, Risk Management, Executive Management, Board

Traditional planning approaches make it difficult to predict how climate change will affect the business models of Food, Agriculture and Forest Products companies in the future.

Scenario analysis can help companies understand how climate change and climate action might impact financial performance, and how to integrate climate risk into financial risk management frameworks.

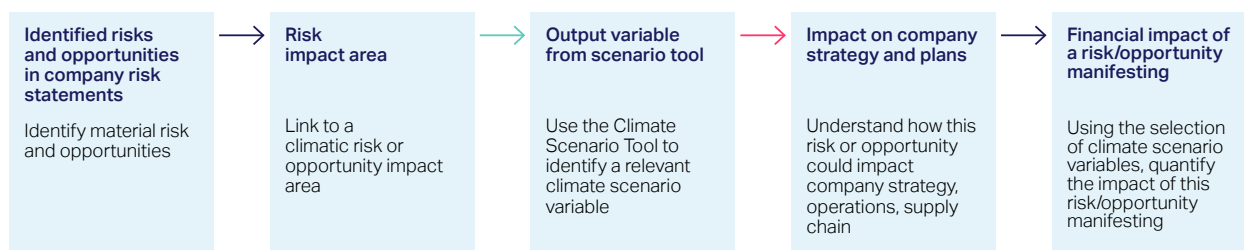
This requires organizations to build impact pathways that represent their current and evolving business and operational models, and to reflect emerging financial and non-financial audit and reporting requirements.

CHALLENGES	HOW THE CLIMATE SCENARIO TOOL CAN HELP
<ul style="list-style-type: none"> The approach for connecting the impact of climate transition risks to financial performance is still developing. Organizations are challenged to understand which financial metrics are impacted, how these will be assessed or audited and how to build approaches to quantify the interactions between climate risks and opportunities, drivers of business and operational performance and financial metrics. Developing climate risk assessment from a largely qualitative to more quantified approach. Ensuring the quality and coverage of data and identifying sources of appropriate proxy data to address data gaps. Limited maturity or awareness of assumptions, data and assessment methodologies across ERM, strategy and finance teams challenge the development of a coherent impact pathway analysis. Lack of consistency in the models, methodologies and datasets used by agency ratings make it challenging to assess the potential impact of climate change transition risks on ESG ratings and potential changes in cost of capital. 	<ul style="list-style-type: none"> Metric assessment: The Climate Scenario Tool provides sector-specific data for Food, Agriculture and Forest Products companies that simplifies the data collation and presentation process and enables the selection of scenarios and variables to identify and assess metrics most relevant to an organization. Development of financial impact pathways: The Data Explorer can be filtered to show output variables that comprise a clear and consistent starting point for describing how transition risks and opportunities can link to financial impacts. Inform transformation requirements: By using the Data Explorer to explore a range of variables and scenarios, you can develop a view of key impact areas and materiality of future scenarios on their business, in turn identifying areas for transformation. This view can inform the scope of more sophisticated quantification of financial impacts and cost-benefits of adaptation initiatives. Stakeholder transparency: By using the Data Explorer to identify and assess the movement of business-relevant variables, a consistent and transparent presentation of the drivers of financial impact can be provided to stakeholders. Enhance dialogues between the real economy and investors: This improves the quality of exchange between the real economy and the finance community. It can facilitate the interpretation of external reporting and drive more accurate assessment by ratings agencies, investors, banks and auditors of the impact on credit ratings, potential levels of impairment/provision, capital requirements and the costs of investment.

Examples may include:

- Demonstrating how the availability and pricing of resources vary across scenarios and influence the cost and structure of production processes.
- Using the Variable Explorer to support an illustrative assessment of how new technologies may support cost efficiency and reduction of CO₂ emissions.
- Illustration of a heatmap that shows how variable uncertainty across scenarios could inform adaptations of the product portfolio and associated revenues.
- Using the Variable Explorer features to identify a specific impact area – for example, supply or price of a commodity or geographic concentration – and demonstrate how an organization can develop an impact pathway and connect it to the balance sheet.

Figure 16: Steps for assessing financial impact



The steps for financial impact assessment are:

- Develop an impact pathway linking risk and opportunities to an impact on the balance sheet.
- Use scenarios to assess material risks and set climate related targets.
- Analyze how variations in demand, supply, revenue, costs of production, etc. under different scenarios might affect key parts of the business and its performance.
- Perform sensitivity analysis on drivers of transition risk – for example, policy and legal (compliance costs, stranded assets, asset depreciation) or market and economic (company valuation, asset impairment, credit rating) – to assess impacts on revenue, costs and profitability.

How to use the Climate Scenario Tool

Step 4a – Identify company-specific transition risks and opportunities that are captured by the Climate Scenario Tool

Conduct an internal assessment to identify the company-specific transition risks and opportunities using TCFD best practice. First, the organization should map out possible climate-related risks under the TCFD categories: Policy, Legal, Reputation, Market and Technology. Then a materiality exercise should be conducted to qualitatively assess which of these could be material to the business over the next 10-30 years.

Step 4b – Identify key, business-relevant scenarios and outputs and assess their volatility within and across a range of scenarios

First, you should understand the climate scenarios and their drivers. This can be carried out using the Portal (see Figure 17). Each scenario is defined by a set of drivers with varying impacts on GHG prices, diet shifts and agricultural innovation. You can explore the scenarios to understand what is driving the end-of-century warming.

The drivers of each scenario are key to understanding why a result is showing the way it is.

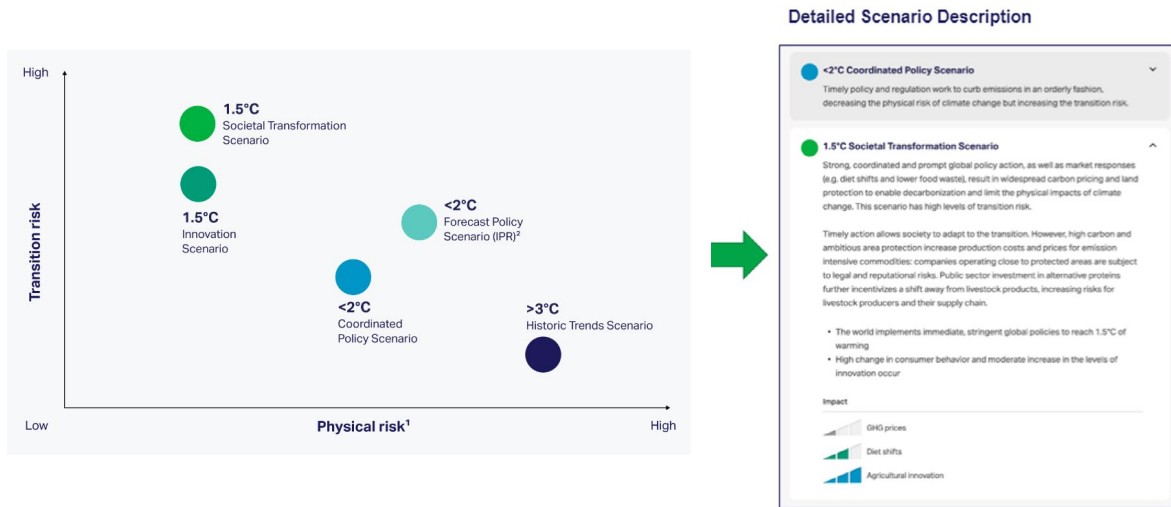
The [Technical Guide](#) contains a list of the core drivers for each scenario from a policy, GHG pricing, diet shift and land use change perspective. You should understand the key drivers for each scenario as these will help describe the impact.

Once identified, you can map these risks and opportunities to the variables in the Climate Scenario Tool. For example, if there is an opportunity where technology increases yields e.g., for cotton seed, then you could map this opportunity to the variable “Yield growth of Cotton Seed” in the Climate Scenario Tool.

Step 4c – Build impact pathways relating to the material risk and opportunities to understand how the external environment could have a financial implication internally

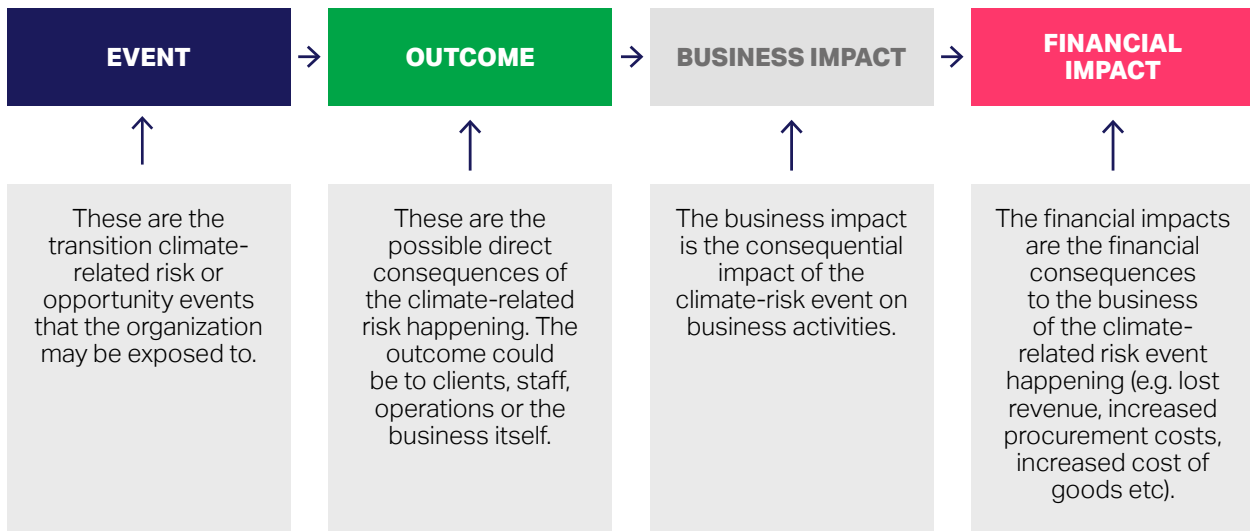
After identifying the material climate risk and opportunities and linking these to a variable that describes this trend in the Climate Scenario Tool, the organization can start to develop impact pathways that describe how the external climate driver impacts the business (see Figure 18). Impact pathway mapping establishes the causal links between changes in climate policy, related national and global policies, and impacts on business in terms of costs, revenue and asset values.

Figure 17: Scenarios overview in the Climate Scenario Tool portal



Source: WBCSD Climate Scenario Tool, with supporting analysis by Vivid Economics

Figure 18: Developing impact pathways



Source: PwC

An example could be the impact of an event on reduced demand for meat-based products from a ruminant meat producer.

- The outcome would be reduced production of meat-based products and reduced land used for pasture.
- The business impact would be a need to shift operations away from meat-based products to arable farming and reduced ability to sell meat-based products in affected markets alongside an increase in demand for “higher quality” free-roaming animals.
- The financial impact would be reduced revenues, increased CAPEX to shift operations to other products, increased CAPEX to farm “higher quality” free-roaming animals, and potential write-offs of intensive farming units.

Step 4d – Identify the required internal data related to the impact pathways. Source this internally by engaging with procurement, product and finance teams

Impact pathways are useful methods to link climate impacts to impacts on the business. While it is a qualitative assessment, it can help organizations understand what internal data is required to conduct a financial impact assessment. Organizations should use the “business impact” part of the impact pathway (detailed above) to understand what data is required.

For example, the ruminant meat producing company would need to source:

- Quantities of ruminant meat produced by country, categorized into type of farming (e.g., intensive, pasture fed, wild).
- Cost and revenue associated with ruminant meat production by country and category.
- Yearly operating costs for ruminant meat per country and category.
- Total land use associated with ruminant-meat production, categorized by type of production.

These should be sourced by engaging different members of the business to understand where this data is housed. Procurement, market/product and finance teams should be engaged and upskilled to show the benefit of the assessment.

Step 4e – Build a climate scenario analysis model using the data download feature relating the transition risk data to the internal metrics to understand the financial impact of a changing external environment

The bulkiest step is bringing all this information together into a climate scenario analysis model. First, you could create a calculation pathway that links each item of the impact pathway to a specific variable or step. Building a calculation pathway for each step of the impact pathway ensures that each element of the business impact and financial impact is captured and calculated. You should match each of the business and financial impacts to the internal input data as well as the climate scenario data from the Data Explorer. See Figure 19 for an example for reduced revenue from decreased production of ruminant meat.

Figure 19: Example – quantifying reduced revenue from decreased production of ruminant meat



You can go into the Data Explorer to download the required data for the relevant variables in the Download section of the Climate Scenario Tool (see Figure 20). Depending on the climate scenarios and timeframe of interest, you can download the set of data and manipulate it offline using your own system.

You could build a climate transition scenario model to assess the financial impact of a given scenario occurring. Typically, this would involve several assumptions, such as the “assumed percentage of ruminant meat production exposed to a reduction in production”. In this instance, the assumption relates to the percentage of meat production that is delivered through intensive farming, which will be most exposed to a reduction in production.

More generally, scenario analysis enables you to conduct assessment of climate-related risks and opportunities, which could have a material financial impact across the organization’s portfolio (segmented by asset type/country/region/business line as appropriate). For example, increased operating costs from higher compliance costs or insurance premiums; write-off and early retirement of existing assets; reduced revenue from negative impacts on workforce management, retention and planning, etc.

Step 4f – Test and iterate assumptions, data inputs and results with senior stakeholders, finance, risk and relevant business teams until internal teams are comfortable with the results and what they mean

You should get comfortable with the results generated by the model and be able to explain what is driving the impact. Is the result driven by the scenario variables or are the assumptions having the greatest impact on results? This is typically called conducting a sensitivity assessment, where the assumptions are tweaked to show how potential future impacts could change based on a change in the business.

Figure 20: Data Explorer - Download tab

Variable Type	Variable	Commodity N	Commodity	Region	Scenario	Unit	2020	2025	2030	2035	2040	2045	2050
Business Variables	Production	Cereals	Maize	GLO	->3°C Historic Trends	Mt DM/yr	1,013	1,113	1,192	1,275	1,358	1,443	1,528
					-2°C Coordinated Policy	Mt DM/yr	1,013	1,060	1,059	1,064	1,075	1,091	1,114
					-2°C Forecast Policy (IPR)	Mt DM/yr	1,013	1,065	1,064	1,065	1,070	1,088	1,114
					1.5°C Innovation	Mt DM/yr	1,013	1,069	1,060	1,064	1,072	1,083	1,103
					1.5°C Societal Transformation	Mt DM/yr	1,013	1,050	1,036	1,038	1,015	1,006	1,003
All	All	All	All	ANZ	->3°C Historic Trends	Mt DM/yr	0	0	1	1	1	1	1
					-2°C Coordinated Policy	Mt DM/yr	0	0	0	0	1	1	1
					-2°C Forecast Policy (IPR)	Mt DM/yr	0	0	0	0	0	0	1
					1.5°C Innovation	Mt DM/yr	0	0	0	0	1	1	1
					1.5°C Societal Transformation	Mt DM/yr	0	0	0	0	0	1	1
All	All	All	All	BRA	->3°C Historic Trends	Mt DM/yr	91	106	118	129	135	141	145
					-2°C Coordinated Policy	Mt DM/yr	91	98	101	106	113	118	121
					-2°C Forecast Policy (IPR)	Mt DM/yr	91	99	101	105	110	115	119
					1.5°C Innovation	Mt DM/yr	91	97	99	104	110	113	115
					1.5°C Societal Transformation	Mt DM/yr	91	97	98	101	105	107	109
All	All	All	All	CAN	->3°C Historic Trends	Mt DM/yr	12	13	12	12	12	12	14
					-2°C Coordinated Policy	Mt DM/yr	12	11	9	8	7	7	7
					-2°C Forecast Policy (IPR)	Mt DM/yr	12	12	10	10	9	7	6
					1.5°C Innovation	Mt DM/yr	12	12	11	11	10	9	8
					1.5°C Societal Transformation	Mt DM/yr	12	12	11	10	9	8	7
All	All	All	All	CHA	->3°C Historic Trends	Mt DM/yr	232	259	277	290	309	333	356
					-2°C Coordinated Policy	Mt DM/yr	232	256	268	279	279	268	273
					-2°C Forecast Policy (IPR)	Mt DM/yr	232	257	270	264	253	251	265
					1.5°C Innovation	Mt DM/yr	232	257	271	274	262	258	259
					1.5°C Societal Transformation	Mt DM/yr	232	252	260	257	245	236	234
All	All	All	All	DEA	->3°C Historic Trends	Mt DM/yr	0	0	0	0	0	0	0
					-2°C Coordinated Policy	Mt DM/yr	0	0	0	0	0	0	0
					-2°C Forecast Policy (IPR)	Mt DM/yr	0	0	0	0	0	0	0
					1.5°C Innovation	Mt DM/yr	0	0	0	0	0	0	0
					1.5°C Societal Transformation	Mt DM/yr	0	0	0	0	0	0	0
All	All	All	All	EUR	->3°C Historic Trends	Mt DM/yr	60	59	58	58	58	58	57
					-2°C Coordinated Policy	Mt DM/yr	60	57	51	46	43	42	41
					-2°C Forecast Policy (IPR)	Mt DM/yr	60	58	53	53	54	56	53
					1.5°C Innovation	Mt DM/yr	60	64	64	65	62	61	59
					1.5°C Societal Transformation	Mt DM/yr	60	56	49	44	41	39	38
All	All	All	All	IND	->3°C Historic Trends	Mt DM/yr	27	31	35	39	44	48	51
					-2°C Coordinated Policy	Mt DM/yr	27	30	34	37	39	40	41
					-2°C Forecast Policy (IPR)	Mt DM/yr	27	31	34	37	39	40	41
					1.5°C Innovation	Mt DM/yr	27	30	34	37	41	45	50
					1.5°C Societal Transformation	Mt DM/yr	27	30	33	35	37	37	37
All	All	All	All	MEA	->3°C Historic Trends	Mt DM/yr	9	10	12	14	16	18	20
					-2°C Coordinated Policy	Mt DM/yr	9	10	11	12	13	14	14
					-2°C Forecast Policy (IPR)	Mt DM/yr	9	10	11	12	13	14	15
					1.5°C Innovation	Mt DM/yr	9	10	11	12	13	14	14
					1.5°C Societal Transformation	Mt DM/yr	9	10	11	12	12	12	13
All	All	All	All	NEU	->3°C Historic Trends	Mt DM/yr	15	16	17	17	17	17	17
					-2°C Coordinated Policy	Mt DM/yr	15	16	17	17	17	17	17
					-2°C Forecast Policy (IPR)	Mt DM/yr	15	16	17	17	17	17	17
					1.5°C Innovation	Mt DM/yr	15	16	17	17	17	17	17
					1.5°C Societal Transformation	Mt DM/yr	15	16	17	17	17	17	17

Source: WBCSD Climate Scenario Tool, with supporting analysis by Vivid Economics

You should engage with senior stakeholders and data holders from finance, risk and procurement to socialize the results. This is an iterative process: each step of the socialization will result in a set of questions from the stakeholders that are directed at:

- The assumptions chosen for the analysis; and
- The climate scenario model drivers.

You should engage different groups of stakeholders to fine-tune the assumptions, based on the best knowledge in the company about how the business operates now and how it could change up until 2050. The [Technical Guide](#) accompanying the Climate Scenario Tool will help bring understanding to how each of the scenario drivers forms the particular pathway and result.

This preliminary assessment typically captures the gross, unmitigated climate risk that an organization is exposed to in financial terms. During the socialization process, the business can start to understand and develop potential mitigation and adaptation steps to capture the net risk of climate change.

Step 4g – Engage with corporate reporting and finance to understand how these long-term impacts can be integrated into financial statements

Finally, you should engage with corporate reporting and finance to socialize the gross risk and net risk with mitigation steps applied to corporate reporting. Integrating results into financial statements is still in its infancy in the majority of companies, including those in the Food, Agriculture and Forest Products sectors.

Financial statement integration should seek to capture the risk the business is exposed to, or the opportunity it could capture, under the set of climate scenarios. An example could be adjusting the cash-flow model to include an element of climate change, such as accounting for input of CAPEX to shift intensive ruminant meat production to more arable farming or pasture-fed production of meat.

Business application 5: Reporting and disclosure

Reporting should highlight and summarize the previous use cases to describe how the organization has been using climate scenario analysis in its business planning. Organizations can extract relevant statistics, figures and graphs from the tool to describe how it is acknowledging and managing the climate-related risks and opportunities it is exposed to.

Target audience: Reporting functions, Sustainability, Human Resources, Risk Management, Executive Management, Board

Reporting and disclosure is ultimately the final-stage business application of the Climate Scenario Tool—all other business applications feed into and result in disclosure. In 2017, the TCFD released its final report including the recommendation

that companies should describe the resilience of their strategies taking into consideration different climate-related scenarios. The Climate Scenario Tool is designed to support organizations in the Food, Agriculture and Forest Products sectors to undertake disclosure in response to the TCFD recommendations.

Effective reporting and disclosure should include a coherent narrative that provides an overarching summary and rationale for all the activities that have taken place as a result of using scenario analysis. This should align with the TCFD framework and additional activities to form a story of how a business is preparing itself for the decades ahead, under different climate scenarios.

Conducting and reporting around scenario analysis is increasingly becoming a core requirement of reporting standards and mandatory initiatives.

TCFD-aligned reporting is mandatory in New Zealand and for public and large private companies in the UK.

Similar initiatives in the EU require disclosure of climate-related impacts as part of the EU taxonomy and recent proposed rules by the Securities and Exchange Commission (SEC) in the U.S. are showing moves in a similar direction, as well as other reporting bodies such as ISSB and EFRAG. TCFD has released a helpful [webinar on the convergence of climate disclosure frameworks](#).³

Reporting on the impacts of climate change is not just useful from a regulatory perspective, but it is important that an organization discloses to shareholders and stakeholders how it is enabling the climate transition and demonstrating itself to be a resilient business that is mitigating risks and capitalizing on opportunities posed by the climate transition.

CHALLENGES	HOW THE CLIMATE SCENARIO TOOL CAN HELP
<p>There has so far been a low level of disclosure within the Food, Agriculture and Forest Products sectors, on scenario analysis.</p>	<ul style="list-style-type: none"> Consistency: The Climate Scenario Tool provides a common set of sector-relevant scenarios at enhanced levels of granularity to be used across the Food, Agriculture and Forest Products sectors. The Climate Scenario Tool also supports and enables: <ul style="list-style-type: none"> Comparison and connections between scenario approaches developed for different audiences (e.g., the real economy, financial institutions and supervisors) exploring a range of uncertainty across different scenarios. Assessment and interpretation of disclosure through the use of a common set of scenarios and inputs that increase comparability across companies. Filtered data views: The Data Explorer supports navigation and comparison of scenarios and extraction of specific business-relevant outputs (e.g., prices/support for selected commodities, specific geographies etc.). The Data Explorer also provides: <ul style="list-style-type: none"> Access to granular, sector-specific and business-relevant variables. Dashboard options that support the extraction of scenario data and that enable and enhance climate risk reporting. Reliability: As the scenarios and variables have been developed collectively and specifically for the Food, Agriculture and Forest Products sectors, the Climate Scenario Tool provides greater reliability and relevance on which climate risk assessment and reporting can be performed. Less burden on internal teams: The Climate Scenario Tool and the scenarios it contains reduces the resources required by preparers to develop scenarios in-house.

Examples may include:

- Collation of scenarios specific to the Food, Agriculture and Forest Products sectors.
- Utilizing the Data Explorer's customizable features in the more detailed views to tailor scenarios to best fit a company's business. This ensures the Data Explorer's outputs are as relevant as possible and can be used for disclosure of transition risks and opportunities.
- Using the Data Explorer to identify the core drivers of climate change specific to Food, Agriculture and Forest Products, e.g., from a set of variables, identifying those that are most volatile or negatively impacted in future scenarios and linking these to core TCFD reporting requirements.
- Using the Data Explorer to demonstrate how a core set of variables and targets has been established.
- Using the Data Explorer to illustrate characteristics of an analysis of expected emission pathways for a specific product.

Using scenario analysis to inform transition planning

Step 5a – Upskill senior leadership with engagement and education as part of a governance framework

See the Engagement and education business application. From this business application, you should be able to describe how you have engaged with key stakeholders across different levels of seniority. This feeds into the governance pillar of TCFD reporting.

Step 5b – Create a defined methodology for scenario analysis and identify sector/company relevant scenarios

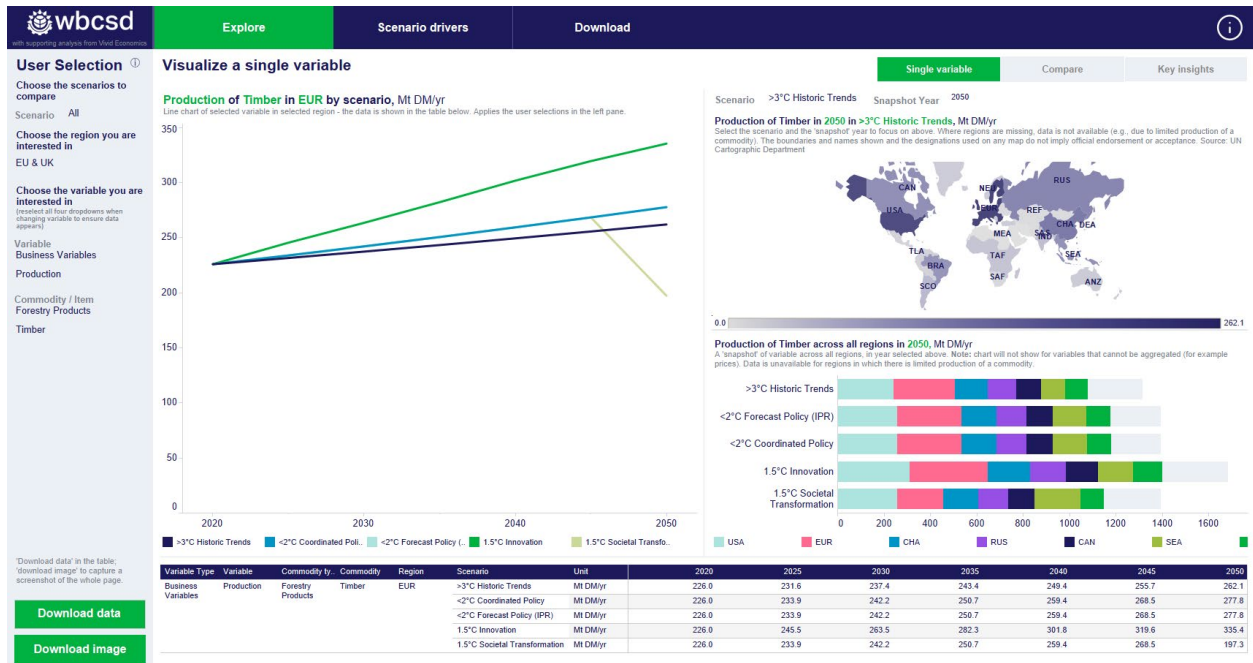
As identified in other business applications, you can gain a good understanding of the key assumptions and drivers behind each of the scenarios from the Portal, alongside the supporting [Technical Guide](#). On the Portal, you can explore the five scenarios and the assumptions and drivers that sit behind them.

Step 5c – Identify company-specific risks and opportunities

Using the Explore tab and the data download features in the Data Explorer can help a company identify specific transition risks that may affect their commodities and regions of concern.

Using the Explore tab, a company can explore how a specific variable changes over time for a given commodity. For example, a forest products company mainly sourcing from Europe can view the production change over time for Timber in Europe (see Figure 21).

Figure 21: Exploring production change over time for Timber in Europe



Source: WBCSD Climate Scenario Tool, with supporting analysis by Vivid Economics

Companies can utilize data from the Download tab to export the data for their own use and deeper analysis.

Figure 22: Download tab



Source: WBCSD Climate Scenario Tool, with supporting analysis by Vivid Economics

Step 5d – Assess strategic resilience response from material transition risks and opportunities (more advanced)

See Strategic adaptation and resilience business application. From this business application, you can identify the key transition risks and opportunities applying to the company and assess the volatility of different outputs across scenarios. This supports disclosure against the strategy pillar of TCFD.

Step 5e – Identify financial impacts (more advanced)

See Financial impacts business application. Similar to step 5d, advanced users can identify company-relevant transition risks and opportunities that feed into TCFD reporting. The financial impact business application forms a foundation for understanding the potential impacts of different climate scenarios on the financials of the company.

Step 5f – Establish core KPIs and targets related to scenario variables

To establish KPIs and targets, you need to assess the transition risk to your specific commodities and sourcing regions. Using the Explore tab of the Data Explorer, a company can look in more detail at how its relevant commodities and sourcing regions may be impacted by transition risks. This supports disclosure against the TCFD pillar of metrics and targets.

Step 5g – Summarize scenario analysis activities relevant to TCFD, forming a story of how a company is looking out to the future to assess its strategic resilience

The outputs of the Climate Scenario Tool can be used to support an in-house assessment of risks and opportunities that can feed into a company's TCFD disclosure.

A company early in its scenario analysis journey can use the Explore tab in the Data Explorer to investigate what variables and drivers should be the focus of their in-house scenario analysis. Based on this, it can disclose how it plans to further investigate these key variables and drivers as part of a wider assessment of strategic resilience.

Examples of disclosure

See Figure 23 for Nestlé's TCFD disclosure, which contains details of the scenarios used and key assumptions sitting behind its scenario analysis.

The disclosure details the impact level of various transition risks and how these vary by scenario. The company identifies how its strategy aims to mitigate the impact of each of these risks.

Figure 23: Example TCFD disclosure - Nestlé

OUR METHODOLOGY TO ASSESS THE IMPACTS OF CLIMATE-RELATED RISKS ON NESTLÉ (CONTINUED)

Transition risk					Physical risk	
Time horizon	• 2030				Time horizon	• 2040
Scenarios*	Emissions trajectory	High	Intermediate	Low	Warming scenario	• Projected 2040 climate assuming likely temperature rise > +1.5°C by 2040 ¹
	Temperature rise by 2100 ⁵	+4.0°C to +5.0°C	+2.0°C to +3.0°C	+1.5°C		
	Global action against climate change	Few or no steps taken to limit emissions	Reliance on existing/planned policies (not commitments)	Immediate and coordinated action to curb emissions		
Business scope	• Upstream, direct operations and downstream				Footprint scope	• Critical raw materials ⁶ – cocoa, coffee, dairy, palm oil • Direct operations (facilities)
Modeling simulations	• Net zero – Nestlé’s absolute emissions decrease by 20% by 2025 and by 50% by 2030				Modeling simulations	• Assumed current footprint remains static until 2040
Modeling metric	• Directional cumulative 10-year discounted cash flow (DCF) impacts on net zero business model under the three different scenarios				Modeling metric	• Projected percentage change in crop yields in 2040 versus 2020 for selected raw materials • Projected change in annual impacts in 2040 versus 2020 due to operational disruption and asset damage to facilities

SCENARIO ANALYSIS – POTENTIAL TRANSITION IMPACTS

Financial impacts are cumulative up until 2030:
 ● Low ≤ CHF1bn
 ● CHF1bn < Medium ≤ CHF4bn
 ● CHF4bn < High ≤ CHF7bn

Transition risks	Estimated directional cumulative discounted cash flow impacts until 2030		
	High emissions +4.0°C – +5.0°C	Intermediate emissions +2.0°C – +3.0°C	Low emissions +1.5°C
POLICY Action to constrain emission-intensive activities	● Low impact • Carbon tax of USD40 per ton by 2030 with negligible financial impacts	● Medium impact • Carbon tax of USD75 per ton by 2030 with moderate increase in costs of production, distribution and raw materials	● High impact • Carbon tax of USD140 per ton by 2030 with significant increase in costs of production, distribution and raw materials
TECHNOLOGY Development of emerging technology to support a lower-carbon economy	● Low impact • Minimal uptake of lower-carbon technology • No immediate or near-term material investments required	● Low impact • Varying levels of uptake of lower-carbon technology, low investment levels required to maintain competitiveness	● Medium impact • Widespread adoption of lower-carbon technology with moderate investments to meet market pressure and regulation • Input costs increase as suppliers pass on their own investment cost impacts
MARKET Shifts in supply and demand as consumers prefer sustainable alternatives	● Low impact • Very low proportion of consumers adopting more sustainable choices with limited supply and demand shifts	● Medium impact • Lower proportion of consumers adopting more sustainable choices with minimal supply and demand shifts	● High impact • Higher proportion of consumers adopting more sustainable choices with wide-ranging supply and demand shifts

Source: Nestlé

Using scenario analysis to inform transition planning

Scenario analysis can support companies in developing transition plans. These form the basis for how they will transform activities to align with a low-carbon future, particularly actions at the strategic and operational level to realize climate transition commitments aligned to a decarbonized future.

TCFD guidance states that transition plans should be aligned with a company’s overall strategy, anchored in quantitative metrics and targets, actionable, credible and subject to corporate governance processes. While no single scenario can provide a basis for a transition plan, scenario analysis can inform transition planning, providing guardrails to planning goals and be used to challenge or support a transition strategy.

A transition plan should reflect the company’s assessment against a range of potential outcomes and consider a combination of mitigative and adaptive measures to facilitate its transition.

The companion guide on [Transition Planning and Climate Scenario Analysis](#) addresses how scenarios can support transition planning.

4 Conclusion

The AFOLU sector has a critical role to play in realizing a 1.5-degree world. Food, Agriculture and Forest Products companies face unprecedented transition risks and opportunities. Tools are needed to better understand uncertainties about the future, explore what different emissions pathways suggest about ways of achieving climate outcomes, and consider what decisions, actions and investments to make.

The set of new climate scenarios and recommendations described in this guide are designed to help companies apply effective scenario analysis to enable TCFD-aligned reporting and disclosure, shape long-term strategic planning and improve the resilience of operational and business models in response to the challenges posed by climate change. Companies should use scenario analysis to support the development of transition plans that reflect an assessment of a range of potential outcomes, are aligned with their overall strategy and anchored in measurable targets and actions.

Opportunities for future work

Through the development of the scenarios, companies and advisors provided valuable input on the design – model drivers, outputs and functionality – with the greatest benefit for organizations looking to understand their transition risks and opportunities. While we strove to include as much as possible for a robust model, naturally there are limitations to any model and what it can include.

It was a rich learning process and the opportunities for future additions and improvements to the scenarios and the Climate Scenario Tool are many. They include: additional commodities like cocoa, coffee, rubber, and alternative fibers; environmental and social variables including water, food security, nutrition, biodiversity, employment and human development; drivers related to nature-based solutions such as regenerative agriculture, avoided grassland conversion and intact forest conservation; and other variable of interest including more nuance on trade, regulatory drivers and consumer preferences. Continuing to drive for more specific geographic granularity will also be beneficial.

These additions and improvements will always depend on the credibility of the science underpinning the models and the ability of the models to handle the inherent level of computational complexity. As one example, we recognized companies' strong interest in soil carbon. However, challenges related to local variation and the lack of a sufficiently granular research base means it is not yet possible to include this in the scenario model. WBCSD is exploring opportunities for further development of the Climate Scenario Tool and we will prioritize assessment of soil carbon and other areas of strong interest. We welcome ideas for how to build on and expand this work.

Given the nature of scenario analysis, the scenarios and the Climate Scenario Tool were built with the future in mind. The model data will be revisited and updated on a regular basis to remain relevant and business-useful and to reflect pathways as they unfold.

WBCSD and the partners involved in building these tools are eager to receive your feedback so that we can continue improving the tools.

Appendix: Climate scenarios explained

What are climate scenarios?

Many parts of society are responding to widespread consensus that the climate is changing and scientific evidence of the potential impacts of climate change. Governments are acting to mitigate and adapt to those impacts. Central Banks and financial institutions have introduced measures to assess climate risks to financial systems. Companies that produce goods and services in the real economy are changing their business models, setting climate targets and driving investment in net zero transformations to respond to the challenges and opportunities posed by climate change.

Assessing how best to respond and testing the resilience of any strategy depends on exploring how the future could unfold. Climate scenarios explore uncertainties about the future by modeling what different emissions pathways, timelines, mitigation options, feedbacks and technology trajectories suggest about ways of achieving stated climate outcomes. In this way, climate scenarios help companies and others explore different pathways, dependencies and uncertainties.

A climate scenario can be seen as a narrative that describes a potential pathway the future could take toward a certain climate outcome. For example, Figure 24 shows the differing temperature pathways across the Intergovernmental Panel on Climate Change (IPCC)'s broad climate scenarios.

TCFD defines a climate scenario as "a plausible description of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces (e.g., rate of technological change, prices) and relationships."⁴

This allows you to analyze a diverse range of possibilities to assess potential actions, decisions, strategies and investments. Climate scenarios assess the consequences of different levels of climate policy, technological and societal action at varying speeds, and consider impacts along short- and long-term time horizons.

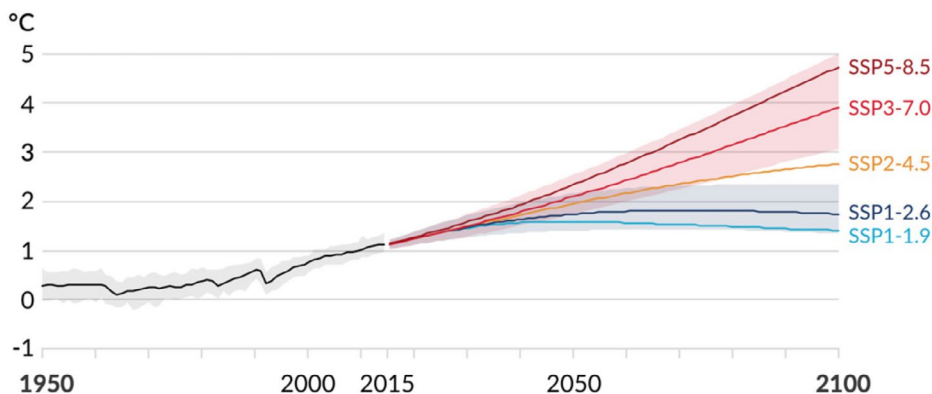
There are many factors incorporated into climate scenario development and many to consider when analyzing their outputs.

Users of climate scenarios may include businesses, investors, researchers, policymakers, regulators and others, each of whom will have different goals for what they are hoping to gain from the scenario analysis process.

Climate scenarios can provide a range of storylines, each with distinct characteristics

The most commonly referenced scenarios represent only a fraction of the universe of scenarios that have been developed in recent years. Scenarios are developed by many institutions (including businesses, academic institutions, think tanks, and many more) for a wide variety of reasons. However, the majority of scenarios follow broadly similar storylines. A summary of common storylines used by scenario developers is shown in Table 3. Each of these scenarios will have a different emphasis, assumptions and outcomes representing a range of possible futures.

Figure 24: IPCC temperature pathways



Source: IPCC

What are the different purposes of climate scenarios?

There are many climate scenarios available, each with a different purpose. For some climate scenarios, the purpose is to inform policy decisions at a global level. These scenarios are often developed by academics to provide potential outcomes and pathways for policymakers and other academics.

Climate scenarios have improved with time to include more sector-specific and regional granularity. However, one scenario cannot answer all the questions that different users may have.

Through scenario analysis, companies can assess their business models and strategies against different possible futures and better judge where efforts might be needed to improve business resilience. Scenario

analysis is also important to meet disclosure requirements, such as recommendations of the TCFD. With climate disclosures becoming mandatory in some jurisdictions and financial market regulators introducing stress tests, scenarios are being more widely adopted. It is therefore important users understand how scenarios are developed and how to interpret their outputs based on the assumptions made by scenario developers.

Table 3: Summary of common scenario storylines

STORY SUMMARY	PARIS AMBITIOUS ACTION	DELAYED ACTION	CURRENT NATIONAL COMMITMENTS	BUSINESS AS USUAL
Transition Story Emphasis	Paris Agreement aligned, with steep, sustained annual emissions reductions	Limited climate action for a decade and a half then steep decarbonization trajectory following crisis	Decarbonization trends based on pledged national commitments and international policies	Follows existing trends & activities, current policies type
Socio-economic assumptions	International effort to align to Paris Agreement	Social turmoil, late action in society	Some societal shift toward decarbonization	No significant societal or economic changes to activity
Temperature Outcome by 2100	1.5°C	Can hit 2°C but often including high use of negative emissions tech	Approximately 2-3°C	Often 3°C rise or above

Table 4: TCFD recommendations for disclosures

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			
A. Describe the board's oversight of climate-related risks and opportunities.	A. Describe the climate-related risks and opportunities the organization has identified over the short, medium and long term.	A. Describe the organization's processes for identifying and assessing climate-related risks.	A. Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process.
B. Describe management's role in assessing and managing climate-related risks and opportunities.	B. Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy and financial planning.	B. Describe the organization's processes for managing climate-related risks.	B. Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 GHG emissions, and the related risks.
	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: TCFD

External uses of climate scenarios

- To meet disclosure requirements such as TCFD and International Sustainability Standards Board (ISSB).
- To meet current and proposed regulatory requirements such those of the Financial Conduct Authority, Prudential Regulation Authority, European Central Bank, European Union Sustainability Reporting Standards (ESRS), U.S. Securities and Exchange Commission, and other jurisdictions.
- To meet investor needs and conversations regarding strategy and portfolio resiliency.
- To enable engagement and communication to stakeholders of how the business can evolve over time.

Internal uses of climate scenarios

- To understand strategic business resilience.
- To understand how the business could align itself to a certain goal such as to a 1.5°C pathway, informing business decisions.
- To understand the business case for certain strategic decisions.
- To conduct sensitivity analysis to changing conditions over time.
- To manage risks and opportunities, feeding into Enterprise Risk Management (ERM) frameworks.

Real and financial economy scenario analysis

Scenario analysis is a valuable tool for financial institutions and for financial regulators to understand climate-related risks and opportunities for businesses in the real economy. Although climate mitigation, adaptation and resilience measures depend on complementary action by real and financial economy actors, there are clear distinctions between their practices, business applications and perspectives when applying climate scenarios.

The [Network for Greening the Financial System](#) (NGFS), for example, has developed climate scenarios for central banks, supervisors and financial institutions (banks, investors and insurers) to use in stress testing and scenario analysis exercises. While not specifically designed for non-financial companies, NGFS' scenarios are broadly aligned around objectives and outcomes that can be used to inform companies' strategic resilience assessments.

Different types of scenarios

When analyzing climate scenarios, transition risks and opportunities are usually considered separately from physical risks. **Physical-risk scenarios** are focused on the physical impacts of climate change such as extreme weather events. **Transition-focused scenarios** look at the risks and opportunities associated with technological, political, legal, market and economic changes required to reach a certain temperature outcome. These scenarios can inform the analysis of impacts that may arise from a transition, such as one to a low-carbon economy.

Some scenarios, including those from NGFS, consider both physical and transition risks.

Different types of scenarios allow us to focus on different elements of scenario analysis.

- **Predictive** scenarios aim to predict the most likely outcome using modeling and trend analysis to make assumptions about the future. An example of this would be a climate scenario that forecasts policy decisions or those based on current or pledged policies.
- **Normative** scenarios work around how a specific objective could be achieved, such as scenarios looking at how we can limit warming to 1.5°C or achieve net zero by a certain date.
- **Explorative** scenarios look at how external factors may impact the future, such as limiting the use of certain technologies and seeing what would happen as a result.

TCFD recommends using explorative scenarios, i.e., a range of scenarios spanning several plausible futures. **The reference scenarios developed for the Food, Agriculture and Forest Products sector are explorative in nature with an explicit focus on transition risk.** They serve as a tool to compare hypothetical, plausible futures, rather than a forecast of the most probable future. The aim is to help companies answer the question: "What would be the potential implications for our strategy if the future described in a scenario came to pass?"

How are climate models applied to scenarios?

Climate scenarios are the detailed narratives of assumptions, key factors, developments and pathways that define a plausible future. Climate scenario models are the quantification of these pathways. They are developed using computer models that are able to analyze multiple factors, and the interactions between them, that might affect the future according to the objective of, or rationale behind, the model and scenario. Within this development process, macroeconomic assumptions – such as population growth and GDP – combined with climate limits – such as the need to hit a 1.5°C target – are described by the climate scenario. The climate model then quantifies these assumptions and pathways (and other assumptions introduced by the modelers) to produce a modeled set of outputs. An example of a set of macroeconomic assumptions often used are the IPCC's Shared Socioeconomic Pathways (SSPs). The IPCC's Representative Concentration Pathways (RCPs) can serve as climate limits in models if the aim of the model is to quantify a scenario along an RCP's GHG emissions pathway.

The majority of these models will be an Integrated Assessment Model (IAM). These are detailed models calculating energy and economic system transformation pathways. They usually provide the least-cost pathway to reaching a certain level of warming, known as cost-effectiveness IAMs. In the case of the Food, Agriculture and Forest Products scenarios, the model estimates the least cost way for the Land Use sector to feed the world.

Models will differ in their level of complexity depending on the focus of the scenarios being used. Balancing the complexity of models is often necessary, with trade-offs between the level of detail required and the amount of computing power needed to process the model.

Outputs from IAM climate scenario models are time-dependent variables that can be compared, adapted and calibrated according to the needs of the user.

IAMs are made up of multiple modules, each modeling an aspect of the overall system. An IAM runs through the interlinkages between the modules, producing outputs in the form of time-dependent variables. These variables provide a view of what may need to happen in various situations to hit a certain temperature goal, such as what shifts in diet and food waste would be needed to limit warming to 1.5°C.

The variables can then be used as inputs in your own analysis, or adapted and calibrated as necessary for specific analyses. For example, one may adapt a global variable to apply to a particular region.

Scenario models are a useful tool to support strategic resilience assessments. However, it is important to understand their limitations and the factors that influence outputs.

Climate scenario models are complex processes that are a product of assumptions, methodological choices and compromise between complexity and computation time. As a result, climate scenario model outputs are not meant to be taken “out of the box” and lifted into internal models or disclosures.

You should understand what drives the outputs of a quantified scenario before applying it yourself. For the scenarios set out in this guide, you should consult the [Technical Guide](#) to understand the details behind the modeling methodology and variables.

The dynamic context for corporate scenario analysis

Corporate scenario analysis practice is influenced by various factors and takes place in the context of other developments, including those listed in Figure 25. In the current volatile global context with several emerging risks, the speed of change can make it more challenging to conduct scenario analysis. By the time the process is completed, things may have already shifted. However, this complexity should not keep companies from starting.

For further explanation of the use of climate transition scenario analysis, please refer to the

[Demystifying Climate Transition Scenarios](#) report,⁵ which provides:

- An overview of the process through which climate scenarios are quantified using models.
- Tools for interpreting the assumptions and modeling methods that form standard climate scenarios.
- Foundational knowledge of climate transition scenarios which readers can build on with further reading and research.
- An understanding of the underlying assumptions of the climate scenarios that characterize pathways to a temperature target.

- The core modeling methodologies used to quantify climate scenarios.

This work builds on the recommendations of the TCFD. For more information about these processes, please see:

- [Task Force on Climate-related Financial Disclosures](#)
- [TCFD: The Use of Scenario Analysis in Disclosure of Climate-related Risks and Opportunities](#)
- [TCFD: Guidance on Scenario Analysis for Non-Financial Companies](#)

Figure 25: Factors influencing corporate scenario analysis practice

Macro socioeconomic developments	National and international climate targets over different time horizons & with regional characteristics	Policy instruments, regulations and reporting frameworks including TCFD and others	Financial institution climate initiatives and investor information expectations
Development of public and proprietary climate scenarios	Market developments	Transition planning	Strategic development
Peer activity and standardization	Societal pressure and NGO activity	Technological developments including scalability, costs, performance, & competitiveness across energy drivers	Risk assessment

Endnotes

¹ [IPCC, Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Chapter 11, 2014](#)

² [WBCSD, Food, Agriculture and Forest Products TCFD Preparer Forum, April 2020](#)

³ [TCFD, Climate Disclosure Convergence, TCFD, SEC, ISSB, May 2022](#)

⁴ [TCFD, Technical Supplement, The Use of Scenario Analysis in Disclosure of climate-Related Risk and Opportunities, June 2017](#)

⁵ [WBCSD, Demystifying Climate Transition Scenarios, July 2022](#)

DISCLAIMER

This report is the outcome of the collective work of the WBCSD team and the Food, Agriculture and Forest Products Forum. The views in this report represent a broad consensus of the Forum. It does not necessarily, in all details, represent the individual views of each Forum member or their company. Unless otherwise stated, the positions expressed in this report do not represent the views of any of the external organizations that are acknowledged for their help and input.

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GORDON AND BETTY
MOORE
FOUNDATION

 **NICFI**
Norway's International Climate and Forest Initiative

ABOUT WBCSD

WBCSD is the premier global, CEO-led community of over 200 of the world's leading sustainable businesses working collectively to accelerate the system transformations needed for a net zero, nature positive and more equitable future.

We do this by engaging executives and sustainability leaders from business and elsewhere to share practical insights on the obstacles and opportunities we face in tackling the integrated climate, nature and inequality sustainability challenge; by co-developing "how-to" CEO-guides from these insights; by providing science-based target guidance including standards and protocols; and by developing tools and platforms to help leading businesses in sustainability drive integrated actions to tackle climate, nature and inequality challenges across sectors and geographical regions.

Our member companies come from all business sectors and all major economies, representing a combined revenue of more than USD \$8.5 trillion and 19 million employees. Our global network of almost 70 national business councils gives our members unparalleled reach across the globe. Since 1995, WBCSD has been uniquely positioned to work with member companies along and across value chains to deliver impactful business solutions to the most challenging sustainability issues.

Together, we are the leading voice of business for sustainability, united by our vision of a world where 9+ billion people are living well, within planetary boundaries, by mid-century.

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5 Using scenario analysis to inform transition planning

A transition plan is a disclosure containing details of how a company intends to decarbonize and align to a future low-carbon economy and society. Although there is a lack of transition plan examples across all sectors at the current time, guidance is being published, providing a framework for the components that a transition plan should include. It is important to note that companies may wish to go above and beyond these frameworks, for example by placing greater emphasis on nature or social issues such as biodiversity conservation and the "[Just Transition](#)".⁶

Equally, some companies may not be at the point of reporting a full transition plan, recognizing that it can be a challenge to create measurable and quantifiable reports. For these companies, directional movement with their transition planning is important. Companies should be equipped to articulate a coherent and clear narrative around the transition plans they do publish and, if using qualitative analysis, should reflect how they have used this in their strategic planning. It is crucial that companies regularly iterate and update their transition plan over time, showing progress and being transparent as to how transition planning has been conducted. For example, clearly disclosing methodologies for measuring and updating GHG footprints as well as how scenario analysis has been carried out.

Regulatory context for transition planning

There is increasing pressure globally to make transition plans mandatory and guidelines are being developed to define requirements. For example, the UK government has created a [Transition Plan Taskforce](#)⁷ to define guidelines for mandatory disclosure. In the U.S., the Securities and Exchange Commission released proposed [Rules to Enhance and Standardize Climate-Related Disclosures for Investors](#)⁸ which include disclosure of details on companies' use of scenario analysis. Other guidance either developed or under development includes [TCFD](#),⁹ [CDP](#),¹⁰ [GFANZ](#)¹¹ and [IGCC](#).¹² The emerging guidance provides perspectives on what components should be included in transition plans, although these can vary by organization.

The emergence of guidance and potential regulation underscores the importance of scenario analysis as a key component of transition planning. Much of the existing guidance follows a similar structure to the TCFD recommendations, reflecting four key pillars: governance; strategy; risk management; and metrics and targets. In general, there is some overlap between guidance from different organizations, including requirements around scenario analysis. However, there are discrepancies in the recommended elements of a transition plan between different guidance documents.

Adoption of a transition plan

While close to 70% of the highest emitting companies have made net zero commitments, less than 20% of these companies have presented detailed and credible transition plans to decarbonize.¹³ As firms are required to adopt more rigorous approaches to respond to climate change and report on their actions, effective transition planning has become an important strategic capability relying on scenario analysis as a core element to inform planning and decision-making.

There is general agreement over the definition and primary objectives of a transition plan – that it should:

- **Outline how an organization will pivot its existing business model** toward one that is aligned with a 1.5°C scenario based on the latest climate science recommendations (such as the SBTi [Net-Zero standard](#),¹⁴ [FLAG framework](#)¹⁵ etc.).
- **Act as an accountability mechanism** for companies and their external stakeholders.
- Provide **evidence that the company is aligning relevant aspects of its business with its climate-related goals** and emissions reduction targets.
- **Be a clear and critical input to business strategy and risk and opportunity management** over the short-term and long-term.
- **Be anchored in quantitative metrics and targets** that are actionable, credible and subject to corporate governance processes.

It is important to make the distinction that a **climate transition plan is not a net zero roadmap**. The SBTi Net-Zero Standard, for instance, sets rules on how to build a net zero roadmap. While there are some overlaps between a transition plan and a net zero roadmap, the net zero roadmap sets out

targets and related activities around decarbonization whereas the transition plan sets out how the organization is preparing to transform to deliver these, along with transformational activities to address risks and opportunities from climate change.

Below is an example of additional elements that might be needed for a good transition plan in addition to those needed for a net zero roadmap.

Table 6: Elements needed for a transition plan in addition to those needed for a net zero roadmap

FEATURES OF A NET ZERO ROADMAP	FEATURES OF A GOOD TRANSITION PLAN		
Actions needed to meet Net Zero target	Actions needed to meet Net Zero target	Board oversight	Scope 1, 2 & 3 Footprint
How actions contribute to meeting targets	How actions contribute to meeting targets	Mechanisms in place to ensure targets are met	Other carbon metrics e.g. carbon price, investments in R&D
Timeline of when actions need to start/end	Timeline of when actions need to start/end	Description of reporting framework and review process	Carbon offsetting strategy
Interim targets to be met	Interim targets to be met	Considerations around wider influence e.g. suppliers/customers	Policy engagement to date and future plans
	Considerations around the just transition	Integration of physical and transition risks and opportunities	How risks and opportunities will be addressed

Transition planning challenges

Transition planning capabilities are still maturing^{e16,17,18} with the Transition Plan Taskforce highlighting in early 2022 that only 43 companies of the UK's 100 largest publicly listed companies declared having a transition plan in place.¹⁹ Of those presenting plans, there are inconsistencies in the content and scope of transition plans as well as variation in the coherency and level of detail presented.²⁰

For organizations operating in the Food, Agriculture and Forest Products sectors, transition plans are largely still underdeveloped and the practice is still emerging. As of January 2022, only 21 of the 50 highest GHG-emitting North American food companies tracked by Ceres' Food Emissions 50 initiative have set any short-term emissions reduction targets inclusive of scope 3 emissions, which is the largest source of emissions in this sector. None have published a climate transition plan.²¹

The limited number and extent of variation across transition plans appears to be consistent with the low level of company disclosure of the resilience of strategies under different climate-related scenarios. This continues to have the lowest level of disclosure across the 11 recommended TCFD disclosures. In the latest [TCFD 2022 status report](#),²² only 17% of companies in the AFOLU sector reported on the resilience of strategy. This highlights the need for companies to conduct climate scenario analysis to build resiliency assessment capabilities as a fundamental input to the production and delivery of actionable and credible transition plans.

This lack of development of transition plans may be explained by some common challenges:

- **Difficulties aligning business strategy and business planning time horizons.** The time horizons for assumptions relating to a climate transition plan will extend further into the future than a company's core business plans. This presents a challenge both in terms of accuracy and also in clearly defining the assumptions within the climate transition plan report and broader alignment with TCFD reporting.
 - **The maturity of companies' external impact assessments.** Firms are starting to specify which accounting standards or benchmarks they use, but work is required to identify and incorporate environmental and social KPIs that consider the external impacts of an organization's decarbonization pathway. As the approach to providing assurance is still emerging, demonstrating to key stakeholders that transition plans are sufficiently transparent, credible and robust is a challenge.
 - **Challenges around data availability.** A lack of adequate coverage and the availability and quality of data across business operations, supply chains and value chains make it challenging to measure, report and compare climate risks and performance (e.g., Scope 3 emissions).
- **Elements that are not commonly reflected in current transition plan, including:**
 - > Details that outline short-term emissions reduction initiatives and approaches to increasing the portfolio of low-carbon products and services.
 - > Commitments to develop and disclose internal policies on controversial issues (e.g., fossil fuels (e.g., oil sands), offsets, etc.).
 - > Future emission reduction initiatives, where management of low-carbon products and commitments to controversial issues – such as the reliance on the scale of impact of future carbon capture and storage technologies – are not commonly addressed in transition plans.
 - **Lack of guidance on measuring and reporting around emerging issues,** such as biodiversity, and social issues, such as the just transition. While there is little emphasis on these issues in current reporting frameworks, they could become more key to transition planning in the future.

^e Only ~40% of companies disclosing under the Task Force on Climate-related Financial Disclosures (TCFD) reported impact on business strategy and financial planning (TCFD. 2021 Status Report, October 14, 2021). Only ~30% of companies disclosing to CDP are developing a low-carbon transition plan (CDP, March 2, 2022).

- **Lack of specific guidance around adaptation vs. mitigation.** Companies may struggle to understand where adaptation should be used vs. where mitigation should be used to progress towards key targets due to a lack of guidance in existing recommendations. For example, where should risk be managed by adapting to align with a plausible future world and where is a long-term mitigation strategy required?
- **Regulations are still developing and the approach to providing assurance is still emerging.** Regulations around transition plan disclosure are not universally applied. For example, while the SEC is proposing regulations around climate-related disclosures in the US, there is a lack of global alignment of regulations around transition plans. This presents challenges for companies trying to disclose their approach.

Developing a transition plan

The following elements can be considered as common high-level principles for a credible transition plan upon which core elements may be built.

1. **Aligns with an economy-wide net zero transition.** Targets, expected emissions trajectories and plans should be compatible with meeting a defined global temperature target by a specific time, ideally a 1.5°C scenario with low or no-overshoot. The plan should cover the whole organization and any exclusions must not be material to the company and/or to the natural environment.
2. **Focuses on concrete actions that emphasize the near term and are backed up by clear governance mechanisms.** The plan should set out actions to be taken in the next three to five years along with interim milestones that can be used to assess progress and explain how actions are in line with the transition to a net zero economy. The plan should be integrated into, and coherent with, the overall business and investment strategy and backed up by clear governance processes.
3. **Enables periodic reporting and verification in a transparent manner.** Verification should be enabled, for example, through an annual report on progress with adoption of quantifiable and timebound key performance indicators and a defined stakeholder feedback mechanism.

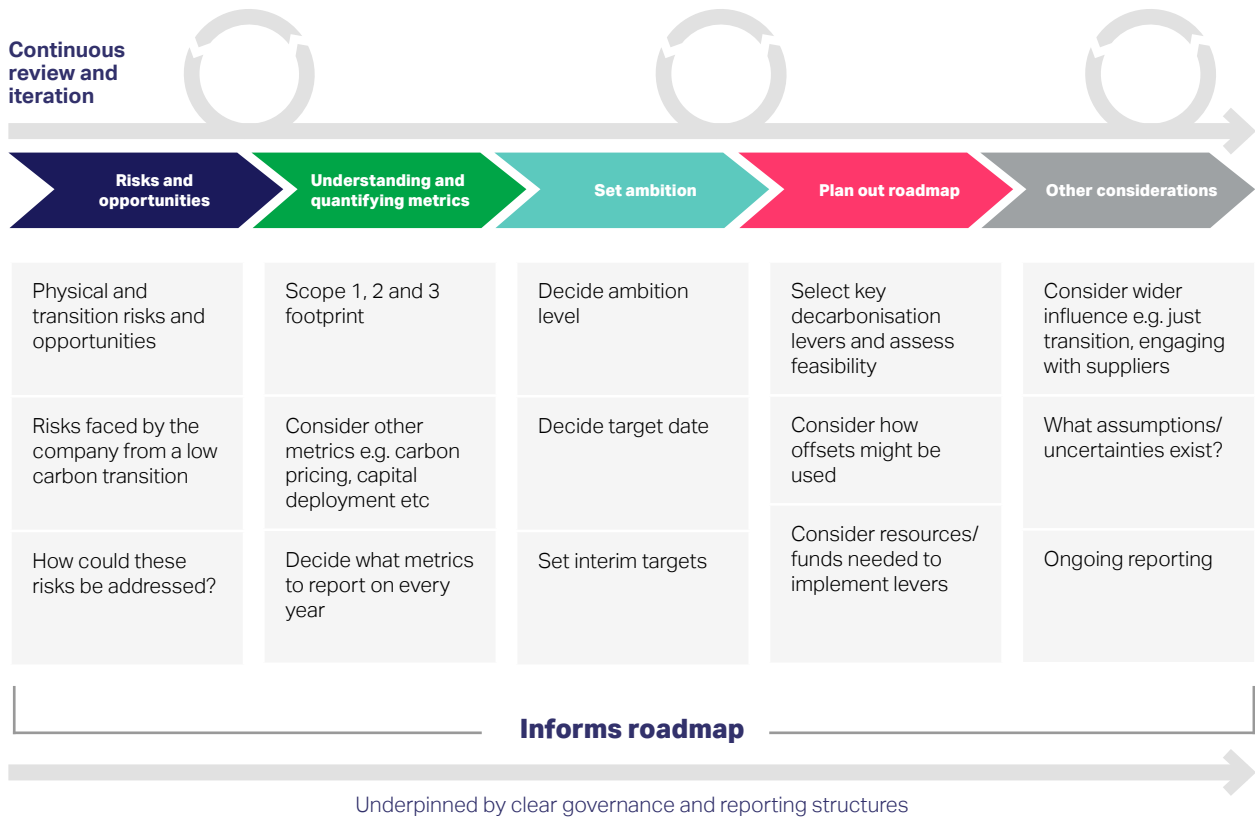
Elements of an effective transition plan

Organizations will initiate transition planning from a range of starting points depending on their experience and the maturity of activities related to transition planning. Regardless of the starting point, they will need to conduct a series of key development steps, including:

- Establishing a governance structure
- Conducting a baseline review of risks, opportunities and key metrics
- Setting ambition levels, timelines and targets
- Planning a transition roadmap
- Incorporating considerations such as a just transition, ongoing reporting and stakeholder management.

Figure 27 provides perspectives on key steps for developing a transition plan.

Figure 27: Key steps for developing a transition plan



Source: PwC

Transform to Net Zero offers a set of key elements of Climate Transition Action Plans (CTAP)^{f, 23} as a useful reference based on their experience of developing transition plans.

Table 7: Eleven Key Elements of Model Climate Transition Action Plans - extracted from "Climate Transition Action Plans", Transform to Net Zero, September 2022

<p>1. Near- and long- term science-based targets to reach 1.5°C-aligned value chains, including a target year for net zero GHG emissions, and in line with Race to Zero criteria. Targets should be verified by a third party to be consistent with the latest climate science and should also be consistent with relevant sector-specific guidance, as available.</p>
<p>2. Robust governance structures that establish ownership and accountability to deliver targets, including: a. Board-level oversight; b. Roles and responsibilities of management, with representation across all relevant business functions; and c. Elements to drive employee engagement through skill development, training and change management to align the business culture with a net zero transformation.</p>
<p>3. Information about how climate considerations are integrated into financial planning to demonstrate alignment between the CTAP and business strategy. This should include information on how climate considerations are integrated into capital allocation and financing decisions, expected changes in capital allocation and financing decisions, and high-level information on the impact of capital allocation and financing decisions on climate objectives.</p>
<p>4. GHG emissions accounting of complete and consistent scope 1, 2, and 3 emissions inventories that have been verified by a third-party, enabling measurement of progress towards targets. The CTAP should be underpinned by the emissions inventories but does not necessarily have to include the full inventory itself.</p>
<p>5. Low carbon and other climate-related initiatives to decarbonize business operations and value chains and implement the near- and long- term science-based targets. This could include the following types of initiatives: a. Innovation of low-carbon products and services; b. Actions to address the portfolio of high emissions products and services; c. Integration of emissions considerations into decision making (e.g., use of internal carbon pricing); and d. Evolving business models to pivot towards lower carbon areas.</p>
<p>6. Net zero-aligned carbon removal plans with time bound KPIs. CTAPs should include information on companies' general approach to emissions reductions within the value chain enroute to net zero, and how removals will address residual emissions in the target year.</p>
<p>7. Value chain engagement strategy that articulates how the organization will encourage suppliers, peers, and customers to transition to a low-carbon economy. This can include education and incentives offered to suppliers to reduce scope 3 emissions, and to customers to promote low-carbon products and services. These strategies should be guided by time bound KPIs.</p>
<p>8. Policy engagement strategy to create an environment that enables 1.5°C-aligned GHG reductions in the real economy. The strategy should highlight collaboration with industry peers intended to send joint market signals to policymakers. An organization's policy engagement should be aligned with its CTAP.</p>
<p>9. Cross-issue evaluation of impact that adopts a systems approach to consider interlinkages between climate, nature, and society. Planned decarbonization activities should address concerns related to nature and biodiversity and social impacts on communities.</p>
<p>10. Strategy to promote a just and inclusive transition that addresses the disproportionate distribution of climate impacts and climate transition costs on under-resourced communities. CTAPs can include opportunities for co-creation with affected communities that seek to counter injustices and build resilience.</p>
<p>11. Transparency and reporting covering all aspects of the CTAP. Organizations should disclose key assumptions including transition pathway uncertainties, possible implementation challenges, and respective contingency plans. Annual reporting should show progress against goals and targets. The CTAP's activities, metrics, and targets should be periodically reviewed and updated, and organizations should be open about what is not currently included in the CTAP but will be addressed in the future.</p>

Source: Transform to Net Zero

^f In support supporting companies in meeting targets backed up by transformation plans to achieve net zero no later than 2050, Transform to Net Zero is publishing a series Transformation Guides, including one published in September 2022 that focuses on how companies shape climate transition action plans (CTAPs) to guide their net zero transformations. See Climate Transition Action Plans, Transform to Net Zero, September 2022.

Growing expectation from the finance community for real economy transition planning

Glasgow Financial Alliance for Net Zero (GFANZ)

The increasing significance of transition plans and the importance of the finance community understanding them has been underscored by GFANZ, which has established a Real Economy Transition Plans workstream to support businesses in accelerating the development and implementation of credible transition plans and to enable financial sector support of these efforts.

The GFANZ report, [Expectations for Real-economy Transition Plans](#),²⁴ outlines components of transition plans that financial institutions will be looking for from real economy companies to inform their allocation of capital and services, and how financial institutions can engage. The report aims to help companies understand and navigate the growing expectations of financial institutions that are aligning

their investment and finance strategies with net zero.

GFANZ highlights transition plans as the most effective way for companies to provide financial institutions with information regarding their net zero transition strategy and level of ambition to accelerate the transition. In their view, real-economy transition plan should:

- Articulate the company’s overall approach to the net zero transition.
- Include information about climate objectives, targets, action, progress and accountability mechanisms.
- Help define the overall role and ambition in the transition.
- Enable financial institutions to assess the credibility of climate objectives and make comparison across sectors, regions and peers.
- Facilitate transparency to stakeholders as a reporting mechanism.

“Companies with credible transition plans may increasingly be able to access products and services tailored to low-carbon business models. In contrast, companies that do not have credible transition plans may face higher costs and/or restricted access to financial products and services (e.g., higher costs of capital) depending on the decision-making process of their financial institutions.”

Expectations for Real-economy Transition Plans, GFANZ

Accordingly, GFANZ has identified five core transition plan components from existing practice guidance, standards and regulatory frameworks, with associated sub-components regarded as most relevant for evaluating an organization’s transition plan and tracking its implementation (Figure 28 and Table 8).

Figure 28: Components of real-economy transition plans relevant for financial institutions – extracted from “Expectations for Real-economy Transition Plans”



Source: GFANZ, June 2022

Table 8: Mapping of components of real-economy transition plans against existing initiatives – extracted from “Expectations for Real-economy Transition Plans”

THEME	COMPONENT	SUB-COMPONENT	DISCLOSURE AND DATA COLLECTION			TARGET-SETTING & VALIDATION		ASSESSMENT TOOLS		
			TCFD	ISSB	CDP	SBTi	TPI-CP	ACT	CA 100+	TPI-MQ
Foundations	Objectives and priorities	• Objectives and over-arching strategy								
		• Governing principles ^{16,17}								
Implementation Strategy	Activities and decision-making	• Business planning and operations								
		• Financial planning								
		• Sensitivity analysis								
	Policies and conditions	• Transition-related policies								
		• Nature-based impact								
	Products and services	• Products and services								
Engagement Strategy	Value chain	• Clients/portfolio companies and suppliers								
	Industry	• Industry peers								
	Government and public sector	• Government and public sector								
Metrics and Targets	Metrics and targets	• GHG emissions metrics								
		• Sectoral pathways								
		• Carbon credits ¹⁸								
		• Business and operational metrics								
		• Financial metrics								
		• Nature-based metrics								
		• Governance metrics								
Governance	Roles, responsibilities, and remuneration	• Board oversight and reporting								
		• Roles and responsibilities								
		• Incentives and remuneration								
	Skills and culture	• Skills and trainings								
		• Change management and culture								

Source: GFANZ, June 2022

This framework provides a bridge between the real economy and financial sectors that can serve as a common basis to facilitate real economy and financial institution engagement.

Table 9 provides some illustrations from the AFOLU sector of how scenario analysis can link to real economy transition planning components.

Table 9: How scenario analysis can link to real-economy transition planning components in the AFOLU sector

Industry and value chain	Climate-related risk/opportunity	Example scenario variables	Transition plan elements	GFANZ theme	Related examples
Agriculture – input providers	Technological advances	Yield growth; production costs; land use change; emissions	Product and service - efficiency gains, increase yield, prevent land use change, precision agriculture, soil management	Implementation Strategy	Bayer - Sustainability Report 2021. Transformation toward sustainable agriculture. pp7-9 Corteva - 2021 Sustainability & ESG Report. Sustainable Innovation... pp14-19
	Impacts of carbon pricing mechanisms	Raw material costs, GHG emissions; Shifts in product demand; Technology pathways	Current and emerging GHG regulation - changes in taxation, production costs and practices	Implementation Strategy Metrics and targets	Nutrien, ESG report 2022 - Strategic Implications. Identified Climate-Related Risks and Opportunities
Food – processor and manufacturers	Market changes – consumer preferences	Crop and livestock commodity demand; market size; diet shift	Product and service – plant-protein	Implementation Strategy	Danone - Integrated Annual Report. pp45-52
	Demand to transition to more sustainable agriculture practices	Regional level commodity supply; commodity demand analysis; production costs; yield-enhancing technology pathways	Stakeholder engagement; Supply chain engagement;	Objectives and priorities Engagement strategies	Kellogg. Example 10. Expectations for Real-economy transition plans
	Change to product portfolio	Product mix; commodity mix; production costs; product price; diet shift pathways	Activities and decision-making/ products and services	Implementation Strategy	Nestlé, Example 8, Expectations for Real-economy transition plans

Farmers	Increased input costs make production methods expensive for farmers	Production costs, commodity yield growth; input efficiency; land cover; land use change	Product and service - price sensitivity; market growth analysis; commodity transition; revenue sensitivity	Implementation Strategy Engagement strategies	Food, Agriculture and Forest Products TCFD Preparer Forum, pp46-58 Corteva - 2021 Sustainability & ESG Report, p33
Investors	Clarity of investment cases to realize carbon drawdown by scaling up climate-smart, soil-centric agriculture practices.	Production yield; commodity price variation; market size; technology and policy pathway analysis	Transition funding; technology and innovation pathway; Supply chain incentivization	Engagement strategies Metrics and targets	Transformative investment in climate smart agriculture, Climate-Smart Soil Tech Landscape Analysis, pp36-41
Forest management	Climate positive land use	Land cover; Land use change; Timber/pulpwood/food production; Yield improvement; CO2 mitigation potential; avoided deforestation; forest restoration	Zero deforestation commitments and regular reporting of progress across key commodities Investment in reforestation, afforestation or restoration of degraded land	Engagement strategies Metrics and targets	Food, Agriculture and Forest Products TCFD Preparer Forum, pp46-58 Forest Sector Net-Zero Roadmap
	Protected areas increase risk for supply chains relying on deforestation	Commodity prices; emissions and composition across supply chains; Land cover; Land use change	Transition-related policies Clients/portfolio companies and suppliers Government and public sector	Implementation strategy Engagement strategies	Transition Scenarios for Tropical Agriculture, Section 3- Industry transition risks and opportunities
Retailers	Targeted value creation through creating transparency around current GHG emissions along the entire value chain	Production of meat, dairy and alternative products/ commodities; GHG emissions; CO2 abatement potential	Activities and decision-making	Implementation Strategy Metrics and targets	M&S Plan A: Our Planet M&S Annual Report 2022, pp72-77
Cross-sector	Transparency about the key issues and potential challenges	Use scenario analysis to be clear on ranges of performance and uncertainty; build clarity on what can and cannot be achieved and to identify key enabling requirements	Stakeholder engagement	Foundations	Climate Transition Action Plans – Transformation Guide (various case studies)

Climate Bonds Initiative

As the sustainable finance market expands to include high emitters and high emitting activities at greater scale, Climate Bonds Initiative (CBI) has identified one key challenge as the need to demonstrate the credibility of an organizations future transition and avoiding greenwashing.

In its discussion paper, Transition Finance for Transforming Companies: Tools to address companies transitions and their SLBs,²⁵ CBI proposes

a framework for identifying credible, Paris-aligned transitions and a set of hallmarks and principles to support the growth of the climate transition bond market and to build confidence for investors, clarity for bankers and credibility for issuers.

CBI recognizes that with forward-looking targets, Sustainability Linked Bonds (SLBs) are key to financing the transition and provide an opportunity for companies' net zero targets to be linked to access to sustainable finance. However, CBI highlights concerns about

the relevance, reliability and ambition of transition pathways and the difficulty in assessing and comparing targets across companies and against wider goals such as the Paris Agreement targets.

CBI proposes five principles²⁶ (Figure 29) and Five Hallmarks of a Credibly Transitioning Company (Figure 30) for use by a range of stakeholders to set or assess the credibility of transitions and to drive ambition in key company targets and willingness and capability to deliver on the targets.

Figure 29: Five transition principles - extracted from "Financing Credible Transitions", 2020

A starting point - 5 principles to protect from greenwash

To achieve ambition, we need transition pathways that have end-goals for environmental factors that are consistent with planetary boundaries and have sufficiently ambitious trajectories to get there. A prerequisite is developing transition pathways to move from today's high GHG emissions to levels commensurate with meeting the goals of the Paris Agreement. That is our 'climate mitigation transition'.

To drive this ambition, we propose the following 5 principles for a transition with impact.

Importantly, any entity, activity or project meeting these principles is substantially contributing to meeting the goals of the Paris Agreement and should therefore be eligible for capital that has a climate or environmental mandate. This provides wide scope to support the growth of a large, liquid market for both already net-zero and transition-related activities.

- 1. In line with 1.5 degree trajectory**
All goals and pathways need to align with zero carbon by 2050 and nearly halving emissions by 2030.
- 2. Established by science**
All goals and pathways must be led by scientific experts and be harmonised across countries.
- 3. Offsets don't count**
Credible transition goals and pathways don't count offsets, but should count upstream scope 3 emissions.
- 4. Technological viability trumps economic competitiveness**
Pathways must include an assessment of current and expected technologies. Where a viable technology exists, even if relatively expensive, it should be used to determine the decarbonisation pathway for that economic activity.
- 5. Action not pledges**
A credible transition is backed by operating metrics rather than a commitment/pledge to follow a transition pathway at some point in the future. In other words, this is NOT a transition to a transition.

Source: Climate Bonds Initiative

Figure 30: The Hallmarks of a credibly transitioning company – extracted from “Transition finance for transforming companies – 2022 Climate Bonds Initiative”, Climate Bonds Initiative, September 2022



Source: Climate Bonds Initiative

CBI’s view of the strategic importance of the Hallmarks is underscored by their market offerings for assessing credible transitions—expanding certification to include credible transition entities and expanding market screening to include all SLBs and transition-labeled Use of Proceed bonds.

Highlighting examples of good practice

To help bring to life the principles and practices for building robust and credible transition plans, the following examples provide an overview of how some leading companies are approaching transition planning.

Bayer – using scenario analysis to respond to climate change

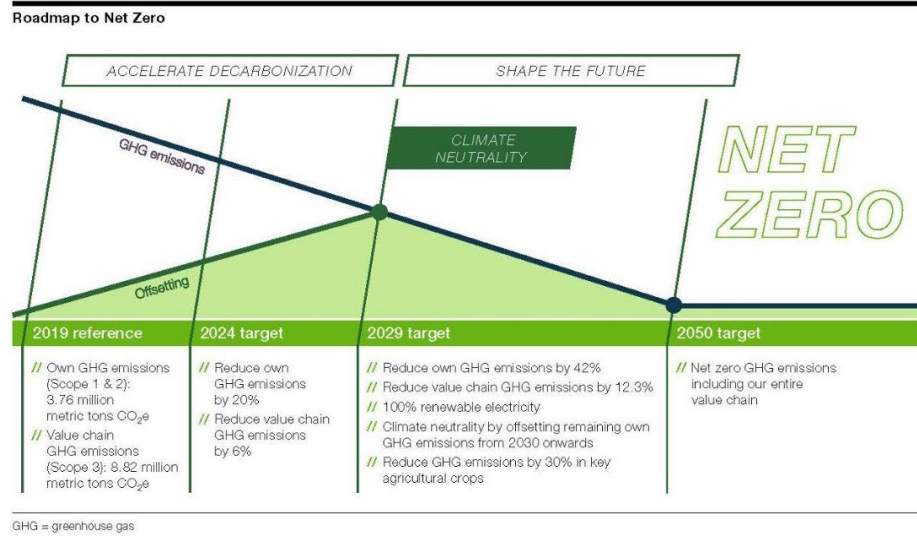
To achieve net zero across its value chain, [Bayer is working to better understand and shape its future business models](#).

The scenario analysis performed by the company has significantly contributed to building its approach to strategically respond to climate change and define its Net Zero Roadmap.

Bayer analyzed the possible effects of climate change across different scenarios and used these to understand the impact of climate drivers on its business and identify measures for mitigating risks and capitalizing on opportunities. This analysis enabled the company to develop transition strategies and solutions to help farmers increase their resilience to the effects of climate change and reduce GHG emissions while cultivating healthy and sustainable crops. For example,

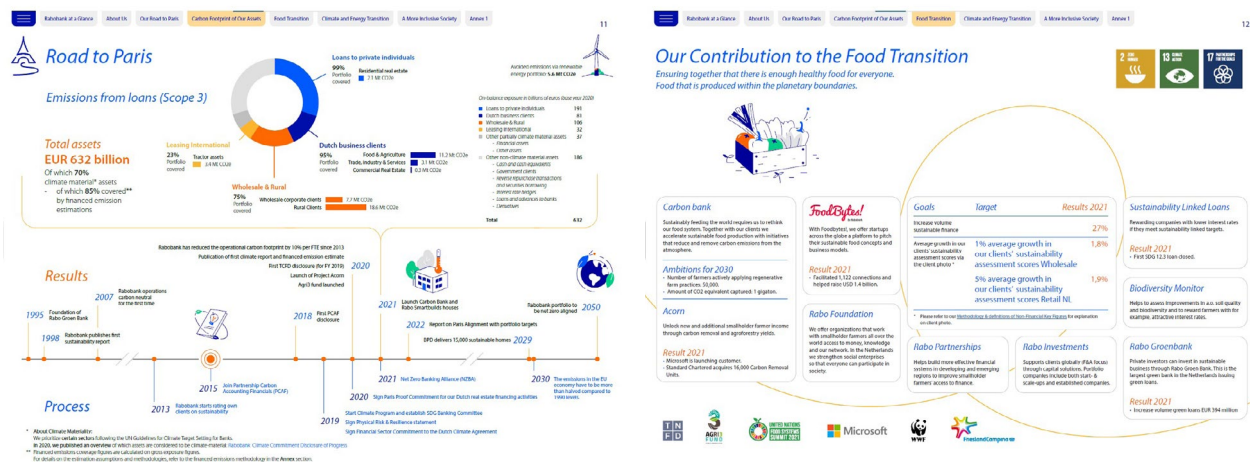
- Supporting carbon sequestration - giving farmers the tools and methods to increase the carbon retained in the soil and ensure it remains there, enabling them to measure and earn from it
- Reducing emissions from rice cultivation – training farmers in sustainable practices related to GHG emissions reduction, water efficiency and integrated weed management to improve environmental footprint and productivity, along with introducing dry seeded rice products with improved production and reduced GHG emissions.

Figure 31: Extracted from Bayer Climate Program 2021²⁷



Source: Bayer

Figure 32: Extracted from Rabobank report - Our Impact in 2021²⁸

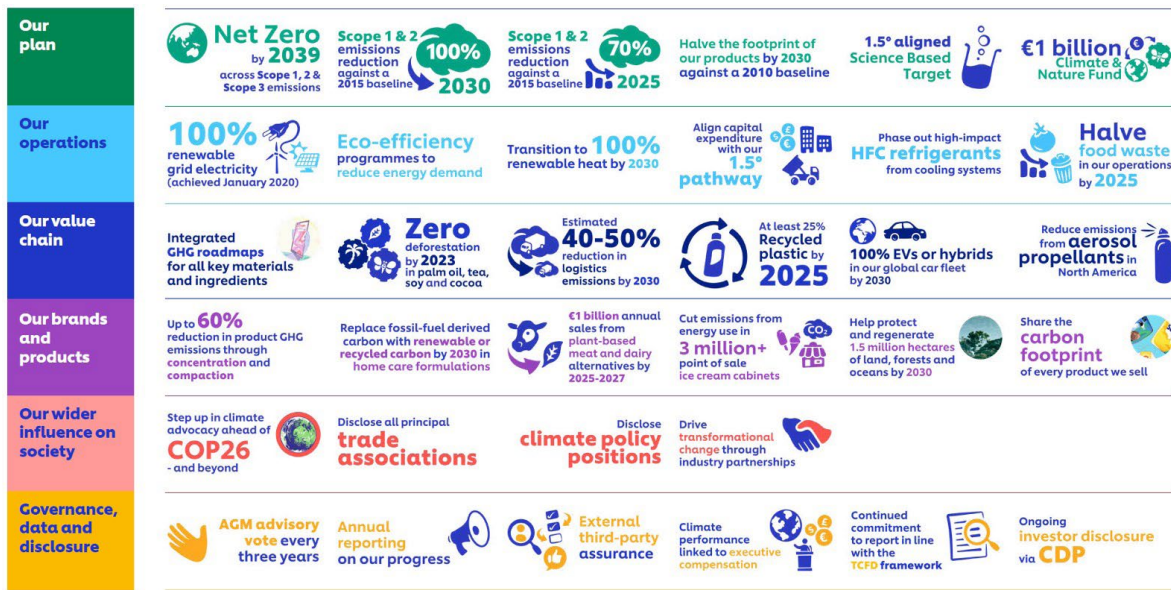


Source: Rabobank

Rabobank - aligning transition planning and financial solutions

In its report [Our Impact in 2021](#), Rabobank describes how it assesses the requirements and interconnections across Food, Climate and Energy and Inclusive Society to deliver transition solutions that facilitate sustainable business models. The report provides details of the bank's four-step approach to align its loan and investment portfolio with the Paris Climate Agreement targets, including using scenario analysis to support its benchmarking and target-setting.

Figure 33: Unilever Climate Transition Action Plan²⁹

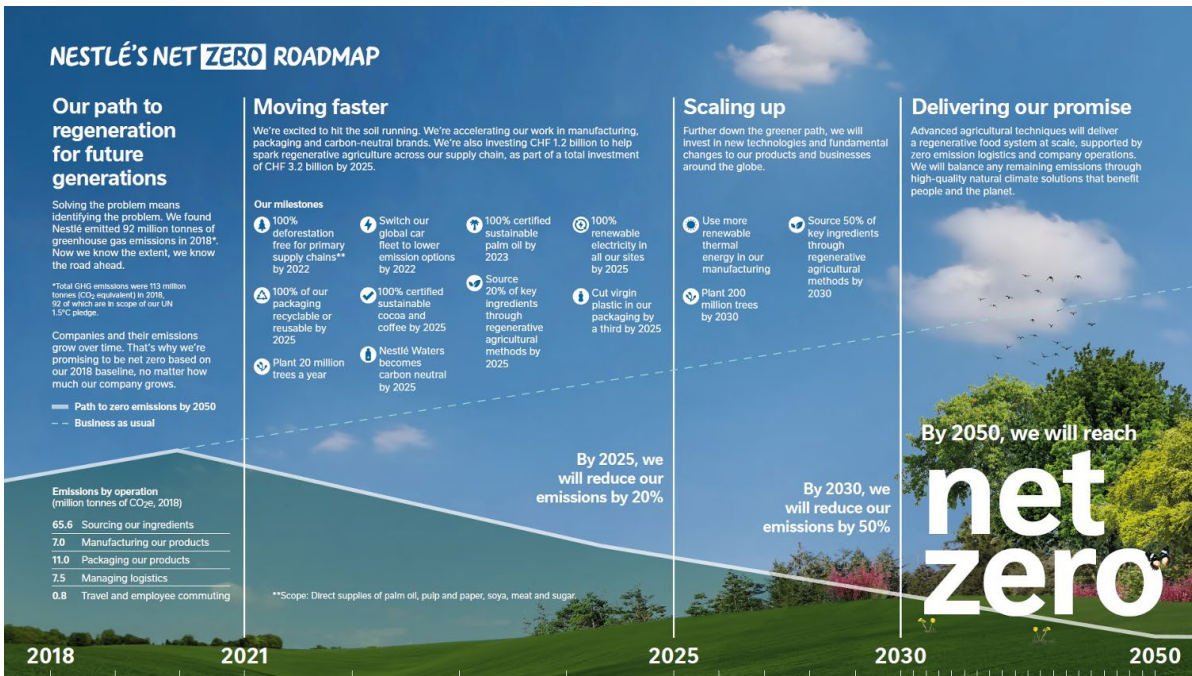


Source: Unilever

Unilever – taking action across the business

Unilever’s [Climate Transition Action Plan](#) provides a clear public-facing explanation of its approach to climate transition that provides transparency on the scope (inclusions and exclusions), foundations, principles and governance underpinning its plans and actions.

Figure 34: Summary overview of Nestlé’s Net Zero Roadmap³⁰



Source: Nestlé

Nestlé – actions and quantifying impact

In its [Net Zero Roadmap](#), Nestlé highlights the key actions in its transition plan supported by detailed milestones and quantifiable measures for its strategy, investment and business change.

Figure 35: Example of Nestlé GHG emissions commitment in its transition plan. Source: "Expectations for Real-economy Transition Plans", GFANZ, June 2022



Source: Nestlé

Kellogg – actively engaging with suppliers

By understanding risks across its value chain and actively engaging and supporting its suppliers, Kellogg built the demand and capabilities to transition to more sustainable agriculture practices

Figure 36: Example of Kellogg's commitment to reduce supplier emissions. Source: "Expectations for Real-economy Transition Plans", GFANZ, June 2022.

EXAMPLE 10 (KELLOGG'S): DRIVING ACTION THROUGH ENGAGEMENT WITH SUPPLIERS⁸⁴

Type: Real-economy disclosures

Sector: Food manufacturer

Relevant component: Value chain

Commitment: Kellogg's has committed to reduce supplier emissions by 50% by 2050 and to reduce its emissions in its facilities by 65% by 2050.

Kellogg's has engaged with 75% of its suppliers (400+) to implement smart agricultural practices focused on emissions reductions. This engagement is a critical piece of Kellogg's plan to transition. Kellogg's has implemented several specific initiatives to support its engagement with suppliers:

- **Asked suppliers to respond to the CDP supply chain questionnaire** to have accurate information on GHG emissions and potential avenues for emissions reductions.
- **Developed materials for suppliers** to help them understand the challenges associated with reducing emissions and the various solutions they can employ.
- **Designed 35 programs globally** to support farmers to help them decrease their GHG emissions.
- **Collated research and aggregated learning** from best practices learned from suppliers and then shared it with individual farmers so they can benefit from collective information.

Underlying this engagement with its suppliers, Kellogg's has committed to support the livelihoods of half a million farmers through partnerships, research, and training. These farmers are the ones who suppliers source their ingredients from and are a key piece of Kellogg's value chain.

Source: Kellogg Company

Further examples of transition plans across a range of sectors are available in the [Climate Transition Action Plans – Transformation Guide](#) from Transform to Net Zero and the GFANZ [Expectations for Real-economy Transition Plans](#).

The role of climate scenario analysis in transition planning

Climate scenario analysis should inform transition planning, provide guardrails for planning goals, and challenge or support a transition strategy. No single climate scenario can form the basis for a transition plan – the plan should reflect the company’s assessment against a range of potential outcomes and consider a combination of mitigative and adaptive measures to facilitate its transition.

Climate scenario analysis can provide a view of the potential risks and opportunities that may affect a company’s operations and highlight the potential consequences of inaction, be it a manifesting risk or a missed opportunity. Climate scenario analysis should inform a company’s strategy and allow it to identify priority areas for action.

A transition plan needs to convince management, the market and investors that a company will implement actions at both the strategic and operational level to realize climate transition commitments aligned with a 1.5°C outcome pathway. It should demonstrate how a company can build resilience and agility to proactively address future climate-related risks. Accordingly, it is necessary to assess and understand the sensitivity of future performance and the robustness of business capabilities under a range of scenarios, temperature outcomes and policy and innovation pathways. This is precisely what effective scenario analysis should support.

A transition plan should take consideration of scenario analysis to inform its roadmap and vice versa, as well as considering other aspects such as contributions to a just transition⁹ and whether the company has the potential to influence its suppliers and customers to decarbonize.

Rather than simply articulating a decarbonization trajectory and a target date, a climate transition plan should overlay climate risk and employ scenario analysis to drive the timing of deployment of specific actions, as well as setting the required governance processes.

A core element of transition planning is the incorporation of decisive, deliverable actions that reflect how strategy, business model, operating model and value creation may be impacted by climate risks and opportunities presented by transitioning to a low-carbon economy. The transition plan should consolidate the insight and strategic action identified from the use of scenario analysis presented in the previous section:

- Engagement and education
- Strategic adaptation and resilience
- Public and policy engagement
- Assessing financial impact
- Reporting and disclosure.

Scenario analysis should be an indirect but critical input to transition planning to drive strategic action. The following are key areas where it can inform the development of transition plans or is important to support their implementation and impact:

1. Taking ownership of climate transition

- Transition planners need to be clear on why transition planning is essential to the organization and ensure there is clear leadership from management to drive climate transition. Climate scenario analysis can be used as a tool to highlight the uncertainties of future performance and possible impacts on the market context and business performance.

⁹ A ‘just transition’ for workers and communities as the world’s economy responds to climate change was included as part of the 2015 Paris Agreement on climate change. A just transition seeks to ensure that the requirements and benefits of a transition (such as environmental sustainability as well as decent work, social inclusion and poverty eradication) are shared widely, while also supporting those who stand to lose economically.

- By raising awareness of possible business trajectories to alternative future states, management can be educated and motivated to take ownership of climate transition and drive the quality of transition plans.
- 2. Building a coherent narrative for transition**
- Performing analysis of sensitivities across a range of scenarios builds understanding of the sensitivities of business performance to scenario outcomes and pathways.
 - By exploring and understanding the variation and uncertainty of future performance, scenario analysis can be used to justify the narrative that supports the assumptions, strategic rationale and drivers of transition plans.
 - In turn, the analysis supports identification and articulation of the transition activities and levers that the company will engage to drive transition activities e.g., alternative sourcing of commodities, subsidy shifts for commodities, investment in R&D, data capture across the value chain, fleet emissions reduction, etc.
- 3. Providing coherency on transition strategies**
- Companies can use scenario analysis to explore the business resilience of key material and at-risk commodities and geographies under different transition pathways and to map transition activities to different scenario futures – effectively to “stress test” transition plans.
 - By examining all plausible climate scenarios and the range of impacts that could affect the business, organizations can define plausible extremes of drivers and establish guardrails within which an adaptation strategy or transition plan is set.
 - Businesses should look across all plausible climate scenarios to understand the range of impacts that could affect the business. This range gives a set of guardrails to set an adaptation strategy or transition plan against.
 - Use of recognized climate scenarios as a transparent starting point for scenario analysis provides a common basis for assessing and challenging transition plans and considering how stakeholders might view performance.
- 4. Establishing a clear basis for climate action**
- Conducting climate scenario analysis against a clear set of sector-relevant scenarios provides a common basis for investors and ratings agencies to understand how organizations have examined future market uncertainties and utilized that insight in the design of a strategic response.
 - Transparency on the approach to assessing climate uncertainties gives stakeholders confidence in the rationale and robustness of climate adaptation strategies and motivates recognition and reward of positive climate action and resilience measures.
- 5. Motivating investment in more granular data and analysis**
- The conduct of scenario analysis motivates organizations to analyze business performance at more granular levels and to consider vulnerabilities and opportunities at localized or sub-regional levels.
 - As part of the analysis, it is necessary to review and challenge the validity of transition assumptions across different levels of granularity (e.g., the impact of technology in Europe or North America vs. emerging economies) and to reflect variations in the transition strategy and activities.
 - In turn, organizations must consider the alignment of aggregated and disaggregate analyses and how, for example, strategies at a sub-regional level are implemented and reflected in an aggregated approach.
 - By performing climate scenario analysis at different levels of granularity, organizations can better understand the sensitivity of the aggregated structure, demonstrate the robustness of transition plans and inform the estimated costs of transition.
 - By applying climate scenario analysis at a more granular level, organizations are required to examine data quality and coverage across their value chains and supply chains and decide how to balance qualitative and quantitative assessments of risk, opportunity and resilience.

6. Setting credible targets and quantifying metrics

- Detailed climate-related scenario analysis can inform realistic climate-related targets, including setting interim GHG emissions reduction targets and net zero GHG emissions targets.
- By examining performance over time and across different scenario pathways, the context and validity of the targets can be presented. This builds confidence in the relevance and alignment of target values and in the setting of interim targets and monitoring metrics to track transition performance.
- By establishing interim targets and monitoring metrics informed by scenario analysis, organizations are more strongly positioned to explain the criteria required for transition adaptation, to assess their transition against expectations, and to be agile in their transition journey.

7. Building the case for funding and investment

- A clear representation of how scenario analysis has informed strategic transition plans can be used as the foundation for investor dialogue and to explain why the business wishes to secure investment.

- For example, changes in commodity prices or provision can drive a supply constraint that requires finance to adapt, innovate or implement new technology.
- Combined with cross-functional discussion, scenario analysis can be used to demonstrate capital and operational expenditure requirements under different scenario outcomes and critically inform a transparent investment case to support transition activities and strategy.

Themes for enhancement of transition plans

Through development of the scenarios for Food, Agriculture and Forest Products and discussion with Forum members and Advisors on their role in supporting transition planning, a set of themes emerged on how the approach to transition planning might be enhanced.

Transition needs to have a credible trajectory

Transition is a journey that needs to follow a credible trajectory that sets a clear pathway towards achieving targets. It cannot reliably be delivered by a future step change in performance. There needs to be a systemic response that shows sector participants moving together along the same pathway, well ahead of 2050. This means transition plans need to contain front-end and mid-term interim targets aligned to end-state

targets and clearly represent pathways that do not defer transition.

Be open about what is and is not included in the transition plan, and why

To build stakeholder confidence in the accuracy and coverage of transition plans, it is important to discuss the elements that are not covered by the transition plan and why. Discussions with stakeholders highlight a greater confidence in transition plans that are supported by clear disclosures of the elements that are not captured and reasons for exclusion.

There is also appetite for organizations to be clearer on how far they can assess along the value chain and where there are boundaries of control or a lack of data that prevent or reduce the effectiveness of transition activities or necessitate a qualitative rather than a quantitative approach.

Greater clarity on mitigation vs. adaptation measures

There is often a lack of sufficient distinction between climate adaptation and mitigation actions. These can be easy to conflate, and it can be unclear in transition plans that there is a clear distinction between climate change mitigation and climate change adaptation activities.

Companies should be clear what adaptation actions they will take ownership of and in what timeframe. For example, diversifying crops so that they are better able to adapt to changing climates, or adopting regenerative agriculture and managing food, water and other natural resources wisely in the context of a changing climate. Completing physical risk analysis, scenario analysis at the relevant level of granularity is a useful tool for examining the local risks and opportunities that are strategically addressed through transition plans and strategy.

More dynamic assessment of transition plans is needed

Transition plans reflect a strategy focused on company performance over a 25-to-30-year timeframe and a range of potential future states.

Plans are developed at a point in time and require ongoing assessment of actual versus planned performance and the relevance of the transition plan, its underlying assumptions and of transition pathways.

There is currently a lack of consistency in the frequency and triggers by which transition plans are reviewed and updated. Ensuring transition plans are integrated into strategy planning cycles and enterprise risk management processes can support monitoring of performance and a regular review of assumptions. Scenario analysis linked to risk measurement and assessment can help organizations build in thresholds that could trigger a review of assumptions.

Think beyond only climate to take a holistic approach

By designing solutions with a broader range of social, ecological and economic goals in mind, businesses can identify opportunities, be clear about trade-offs and boundaries of transition strategies, reflect and include considerations of the just transition, open channels of engagement, and reduce costs in the long run.

Inclusion of just transition elements within transition strategies and plans is necessary for stakeholders and investors to ensure climate actions consider the impacts on individuals, workers and communities. Disclosure components encouraging company descriptions of supporting just transition are proposed by the GFANZ workstream on real-economy transition.

