



Evaluating corporate climate risks

Scenario analysis following the guidelines of the Task Force on Climate-related Financial Disclosures

This discussion paper describes how companies can use scenario analysis to identify and evaluate potential future risks and opportunities that arise as a result of climate change and can have a financial impact on the company. The Task Force on Climate-related Financial Disclosures (TCFD) was established in 2015 by the Financial Stability Board (FSB) for the purpose of developing a framework for transparent and effective corporate climate reporting.¹

The results presented in this discussion paper are based on the TCFD recommendations and draw from the supplementary TCFD document on the application of scenario analysis and practical experience from the 2018 Peer Learning Group Climate of the German Global Compact Network (DGCN). This paper also reveals the findings of a multi-stakeholder workshop of the DGCN and the German corporate sustainability network econsense held in Berlin in September 2018. More than 70 participants from the real and financial economy as well as representatives of civil society shared views on how scenario analysis can help companies identify, evaluate and disclose financial impacts of climate change.

1. BACKGROUND

Advancing global warming is associated with severe and unpredictable consequences for the environment, the economy and society. The more the Earth warms compared to pre-industrial times, the more likely it becomes that catastrophic impacts such as extreme weather events, heat waves, droughts, rising sea levels, loss of biodiversity, reduced crop yields or ecosystem degradation occur. This was made unequivocally clear in the Fifth Assessment Report (2014) and the Special Report (2018) of the Intergovernmental Panel on Climate Change.² At the same time, with the signing of the UN Paris Agreement in 2015, the international community laid the groundwork for a transformation of today's predominantly fossil-based economy to net zero emissions in the second

PRACTICAL RECOMMENDATIONS

- 1) Governance:** Integrating the managing board, risk management and strategy department in the process of addressing climate-related risks and opportunities is necessary for successfully identifying the impacts of climate change on business development and taking appropriate measures.
- 2) Focus on significant risks and opportunities:** Identifying the relevant climate risks and opportunities prior to running scenario analyses makes the interpretation of the results more focused and goal-oriented.
- 3) A minimum of two scenarios:** The scenario analysis should contain at least one <math><2^{\circ}\text{C}</math> scenario and one scenario with progressive global warming above - 4) Financial impact:** Financial impacts on the company should be evaluated first from a scenario perspective, then be discussed internally and, at least in the medium term, be made transparent to external stakeholders.
- 5) Measures:** External stakeholders should be informed about the measures the company is implementing to mitigate the risks and exploit the opportunities of future developments related to climate change.
- 6) Transparency:** The disclosed information should allow the public to assess the company's resilience to future developments such as the transition to a low-carbon economy (- 7) Getting started:** Companies should start to gain experience with scenario analysis, share their experiences and insights, develop procedures in collaboration with one another and improve the validity and usefulness of their disclosures in an iterative process over the years.

half of the century. The goal of the agreement is to limit global warming to well below two degrees or even 1.5 degrees.

One way or another, climate change will have profound implications for businesses in the years and decades to come. This is due on the one hand to political, technological and social developments that will accompany the

¹ Task Force on Climate-related Financial Disclosures: www.bit.ly/TCFDweb

² Intergovernmental Panel on Climate Change (2014): Fifth assessment report. www.bit.ly/IPCC-Report2014

Intergovernmental Panel on Climate Change (2018): Global warming of www.bit.ly/IPCC-SpecialReport2018

transition to a low-carbon economy, and on the other hand to the “physical” impacts of climate change. Aside from risks, opportunities arising from new business development must also be considered. Today, companies rarely, or only to a very limited extent, explore these opportunities. Indeed, most companies solely focus on the risks and financial implications of climate change on their current product portfolio and business model. They fail to consider long-term risks and opportunities and to report transparently about required transformation processes of their business model.

Following the financial and economic crisis of 2007-2009, the G20 mandated the Financial Stability Board (FSB) to examine further potential risks to the stability of financial markets. The FSB found that investors, lenders and insurance underwriters fail to sufficiently consider climate-change-related risks and opportunities affecting companies in their investment decisions. Criticism was raised that the current practice of corporate reporting offers insufficient transparency on the financial implications of climate change to allow associated risks and opportunities to be assessed. To remediate this situation, the FSB established the TCFD in December 2015 as a working group to develop recommendations for consistent corporate climate reporting that takes into account the financial risks and opportunities of climate change. In June 2017, after a consultation phase with stakeholders, the working group released its guidelines for corporate climate-related financial disclosure. The report is centered on four key recommendations³:

- ▶ **Recommendation 1:** The **governance** of the organization around climate-related risks and opportunities should be made transparent, especially the role of management.
- ▶ **Recommendation 2:** Companies should disclose the impacts of climate-related risks and opportunities on **strategy**, business model and financial planning, and examine the resilience of the organization’s strategy under different climate-related scenarios.

▶ The **Peer Learning Group Climate** was launched in 2015 by the German Global Compact Network (DGCN). The now two-tiered working groups currently consist of 16 large-scale German companies. Various sectors are represented, including retail, energy, chemicals/pharmaceuticals, (financial) services, transport, mechanical engineering and technology industries. Via webinars and face-to-face meetings, experts from different companies share their experiences in the field of corporate climate management and work together to develop concrete solutions. sustainable AG provides expert input and moderates the meetings. Past topics have included corporate climate strategies, Science Based Targets, greenhouse gas (GHG) data management, scope 3 materiality and data collection as well as climate risk analysis.



Figure 1: Four TCFD recommendations and dimensions of climate reporting

- ▶ **Recommendation 3: Risk management** regarding climate-related risks should be disclosed; particularly the processes used by the organization to identify, assess and manage climate-related risks.
- ▶ **Recommendation 4:** Companies should disclose key **metrics and targets** used to assess climate-related risks and opportunities, such as GHG inventory and existing climate targets.

While these essential dimensions of climate reporting (see Figure 1) are currently not mandatory, companies should incorporate them in future annual reports following the recommendations of the TCFD Report of 2017. Current regulatory developments at the EU level also highlight the importance of this information for investment decisions: one of the core objectives of the “Framework to Facilitate Sustainable Investment”⁴ introduced by the EU Commission in May 2018 is to create a unified and transparent classification system of sustainability and climate indicators (taxonomy) to help determine whether an investment is climate-friendly. This should enable financial market actors to better integrate environmental, social and governance (ESG) aspects into their decision-making processes and to better inform their clients’ investment decisions. This is only possible if companies disclose information about their impact on climate change and the financial impact of climate change on the company.

Although disclosure of such information is currently not mandatory, it represents a medium-term objective. Initially, most companies are faced with the task of assessing future climate-related risks and opportunities. To this end, scenario analysis can help examine the range of plausible future states.

3 Task Force on Climate-related Financial Disclosures (2017): Recommendations of the Task Force on Climate-related Financial Disclosures. www.bit.ly/TCFDRRecommendations

4 EU Commission (2018): Proposal for a Regulation of the European Parliament and of the Council on the Establishment of a Framework to Facilitate Sustainable Investment: http://bit.ly/EUComm_SustainableFinance

2. THE ROLE OF SCENARIO ANALYSIS

Scenario analysis initially helps companies understand how risks and opportunities may evolve with various medium to long term developments, such as a successful limitation of global warming to below 2°C or an uncontrolled further increase above 4°C. This knowledge is then used to evaluate how resilient the corporate strategy is. Finally, financial impacts on revenue, expenditures, assets and liabilities or capital and financing can be derived.

A scenario is not a forecast, but rather a hypothetical construct that describes a plausible development path leading to a particular outcome or condition in the future. Scenarios typically focus on central elements of this “future picture” and draw attention to the drivers that lead to it. For corporate applications, it is crucial to consider a set of different scenarios that describe the future effects of climate change on companies. The “scenario funnel” (Figure 2) illustrates how the selected scenarios represent different possible future developments of the company based on the current situation.

A proper analysis and evaluation of scenarios requires an examination of the assumptions, parameters and analytical approaches that underlie each scenario, in-

cluding time frames and system drivers that lead to the outcomes of the scenario (see Chapter 3, Step 2). Scenario analysis focuses primarily on the “future picture” presented by each scenario, which describes plausible climatic, political, technological or social developments if the scenario assumptions were to be met.

Detailed information on scenario analysis is available on the TCFD website in the form of guiding documents such as their “Technical Supplement⁵” and further supporting material. Yet companies still face many challenges when it comes to concrete application of scenario analysis and may struggle with selecting scenarios and supporting tools, prioritizing risks and opportunities for further considerations or determining financial impacts. The following section provides supplementary information on the TCFD’s recommendations and presents insights gained from initial experiences of DGCN, including from the above-mentioned DGCN and econsense workshop.

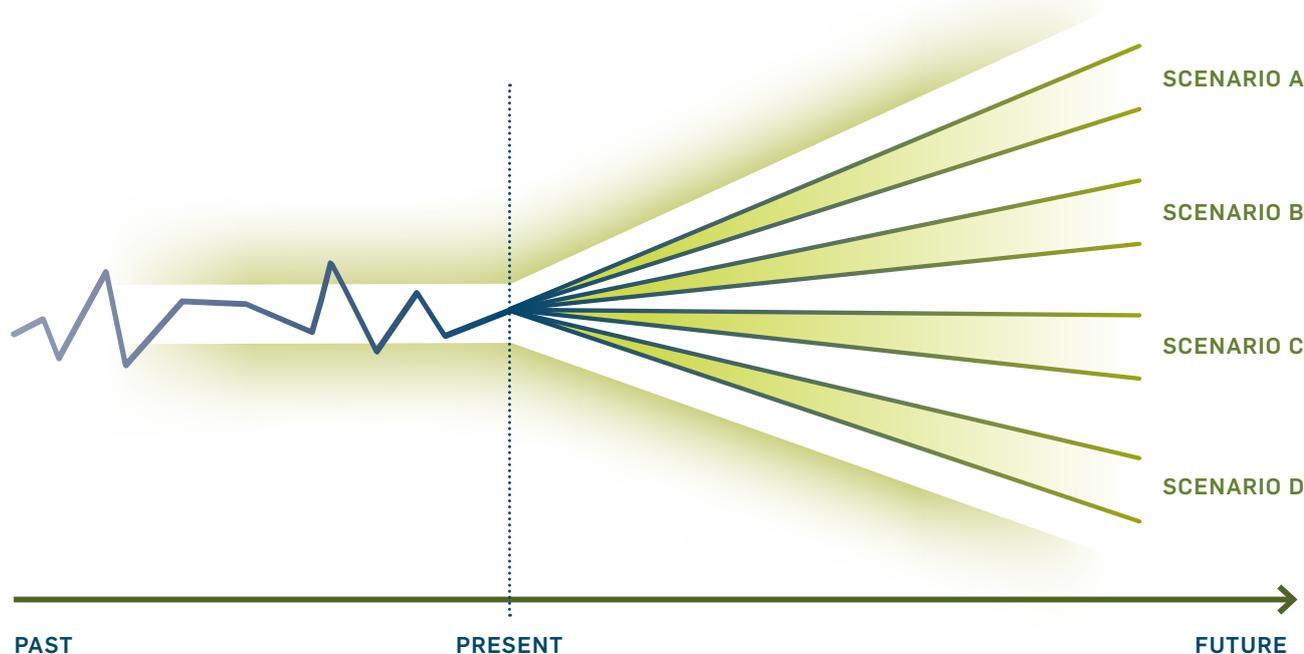


Figure 2: Scenario funnel with possible futures

5 Task Force on Climate-related Financial Disclosures (2017): Technical Supplement: The Use of Scenario Analysis in Disclosure of Climate-related Risk and Opportunities. www.bit.ly/TCFD_ScenarioAnalysis

3. SIX STEPS FOR APPLYING SCENARIO ANALYSIS ACCORDING TO THE RECOMMENDATIONS OF THE TCFD

The TCFD Technical Supplement outlines six steps for applying scenario analysis. This discussion paper uses these steps as a framework and provides hands-on recommendations for their implementation (see figure 3).

Applying scenario analysis begins with assigning responsibilities for climate-related risks and opportunities in the company. It is then followed by the actual analysis of scenarios and ends with reporting and disclosure of the results. Before companies can assess financial impacts and meet the disclosure recommendations of the TCFD, they first have to establish an overseeing governance structure (Step 1), identify and analyse climate risks and opportunities (Step 2) and select appropriate climate scenarios (Step 3). Financial implications are addressed in Steps 4 and 5 both on a qualitative and quantitative basis so that they can be published in Step 6.

Step 1: Establishment of a governance structure

In the first step, it is necessary to identify which stakeholders need to be involved in the identification and disclosure of climate-related risks and opportunities and define how the management can be involved in the process.

To implement the TCFD recommendations in the company, it is recommended to establish a committee consisting of senior managers and experts that convenes several times a year. This committee may include representatives of risk management, the strategy department

and managers responsible for sustainability (including climate management). The committee takes strategic, communication-related and, if necessary, investment-related decisions. Ideally, it is chaired by a managing director or a member of the board of directors. From a TCFD perspective, it is always advisable to keep the management informed about the work of the committee at regular intervals or even better to involve it directly.

Relevant departments in the company should also be identified and colleagues actively involved in the scenario analysis. As a scenario analysis is usually mandated by the overseeing committee described above, management of the process can be delegated to the sustainability department, which is able to coordinate the different departments of the company. To ensure that the results of the scenario analysis are integrated into strategic planning and risk management, the strategy department and risk management representatives should be involved at an early stage. Furthermore, should impacts be expected to occur primarily in the supply chain, it makes sense to involve the purchasing department, which coordinates supplier management. With cross-departmental and interactive scenario analysis workshops, different internal stakeholders can be brought together and become involved in the assessment of future risks and opportunities of climate change. External stakeholders such as market specialists, climate scientists or regional experts may also be included in the process.

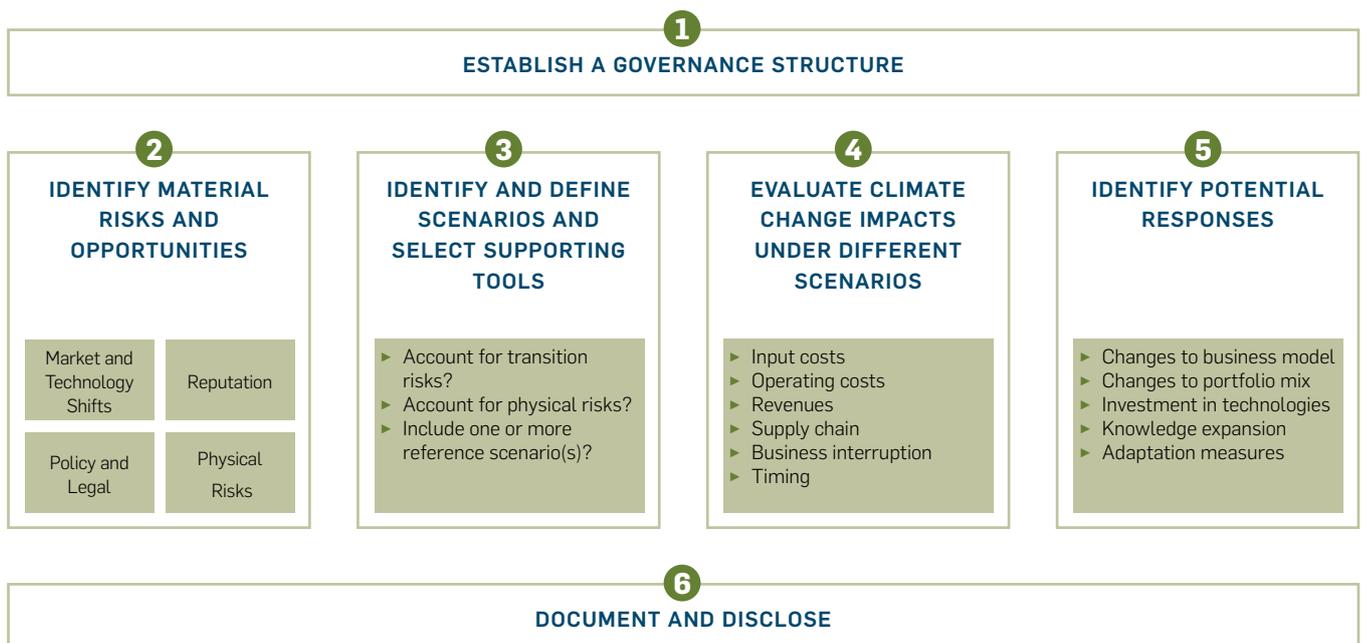


Figure 3: The six steps of scenario analysis according to TCFD

Hilde Roed
Vice President Sustainability, Equinor

“In order for scenario analysis to have the desired outreach, support from the management board is critical. Here at Equinor, we have raised awareness regarding potential climate risks for our business model over many years. Both the Paris Agreement and the growing interest of investors in the issue have tremendously supported this. Today, the results of our scenario analyses inform our investment decisions.”

Management should at least be actively involved in the evaluation of the results. Otherwise, the basic prerequisite for an appropriate level of engagement with climate-related issues is not fulfilled. The TCFD’s recommendations suggest that companies report on the processes and frequency by which the board and/or board committees are informed about climate-related risks and opportunities, whether and how climate-related issues are integrated into decision-making processes and who is responsible for the assessment and management of climate-related issues.⁶ If there is no willingness at the management level to engage in climate risk management, then the basic requirements for applying scenario analysis are not met and Step 2 should not be carried out until the prerequisites have been fulfilled.

Step 2: Identify material climate-related risks and opportunities

In the second step, companies identify the main risks and opportunities to which they could potentially be exposed in the future as a result of climate change. The TCFD distinguishes between two main risk categories: transition risks and physical risks.

It is highly likely that companies will be affected both by transition risks and physical risks in the future, and those risks are interdependent. The ongoing transition to a low-carbon society is already exposing companies to such risks. This holds true especially for businesses that are not well prepared to cope with current and future changes. A successful transition to a GHG-neutral economy, as targeted by the Paris Agreement, will compel companies to fundamentally adapt their business models and business practices in the near future if they want to avoid being subject to increasing transition risks. This applies in particular to industries that are still largely dependent on fossil fuels (for example power generation and automotive industries), companies with energy-intensive production processes and companies with high transportation needs. If, however, attempts to limit climate change to well below 2°C are unsuccessful, physical risks already being felt today (at a current warming level of 1°C)⁷ will intensify considerably and businesses will be increasingly affected.

INFOBOX: TRANSITION RISKS

Transition risks are risks that companies face because of the transition to a lower carbon economy: changing policy frameworks, technological developments, changing markets and societal expectations are transforming the business environment, which may translate into significant risks for organizations (see Table 1).

Table 1: Types of potential transition risks for companies

Risk category	Potential risks for companies:
<p>Political risks</p> <p>Risks from policy actions that seek to promote the transition to a low-carbon society</p>	<ul style="list-style-type: none"> ▶ Increased pricing of CO₂ emissions ▶ Enhanced climate reporting obligations ▶ Regulations relating to products (e.g. energy efficiency standards) and services ▶ Changes in tax regulations
<p>Litigation or legal risks</p> <p>Litigation claim risks associated with climate change</p>	<ul style="list-style-type: none"> ▶ Lawsuits against companies as contributors to climate change ▶ Complaints of non-compliance with political objectives
<p>Technology risks</p> <p>Risks from disruptive technological development and market shift towards lower-emission technology options</p>	<ul style="list-style-type: none"> ▶ Substitution of existing products and services with lower-emission alternatives ▶ Failure to invest in new technologies ▶ Costs of transition to lower-emission technologies
<p>Market (price) risks</p> <p>Risks from shifts in the supply of and demand for certain commodities, products and services as well as changing market prices</p>	<ul style="list-style-type: none"> ▶ Shifts in supply and demand due to climate change ▶ Changing customer behaviour ▶ Uncertainty in market signals ▶ Rising or volatile commodity costs ▶ Changes in costs as a result of regulation (e.g. energy taxation)
<p>Reputation risks</p> <p>Risks to the company’s reputation from the public perception of its contribution to climate change mitigation</p>	<ul style="list-style-type: none"> ▶ Decline in demand due to shifts in consumer preferences ▶ Stigmatisation of certain sectors, products and services ▶ Increased stakeholder concern and negative feedback from stakeholders

⁶ Task Force on Climate-related Financial Disclosures (2017): Recommendations of the Task Force on Climate-related Financial Disclosures. www.bit.ly/TCFDRecommendations

⁷ Climate Action Tracker December (2018) Update: www.bit.ly/ClimateActionTracker

INFOBOX: PHYSICAL RISKS

Physical risks arising from climate change can be event-driven (acute) and result, for example, from an increase in the severity of extreme weather events. Chronic physical risks result from fundamental changes in climate conditions, such as higher temperatures or altered precipitation patterns, leading to long-term adverse impacts, such as chronic heat waves or sea-level rise. A company's exposure to acute and chronic physical risks is determined by a number of factors, such as the geographic location of the organization's premises and its value chain as well as the organization's production process, the degree of dependency on infrastructure, the degree of internationalization, the supply chain strategy and procurement structures.⁸

Table 2 outlines the potential risks this can pose for companies.

Table 2: Types of possible physical risks for companies

Risk category	Potential risks for companies:
Acute physical risks Event-based risks	▶ Increased exposure to extreme weather events such as cyclones and floods affecting operations, employees, supply chains or logistics
Chronic physical risks Long-term risks from changes in climate	▶ Effects of chronic heat waves, rising sea levels, unstable weather or changing precipitation patterns affecting operations, employees, supply chain or logistics

Even limiting global warming to 1.5°C will have severe consequences. Companies with long-lived assets, located and supplied in climate-sensitive regions or highly dependent on water availability will be particularly affected.

At the same time, companies can also seize opportunities arising from climate change and especially from the transition to a low-carbon economy, such as reduced costs and access to new markets. Table 3 highlights some examples of benefits that companies can derive from climate change and climate mitigation.

Before beginning with the actual scenario analysis, companies must first examine which risks and opportunities are most pertinent to their business model and value chain and have therefore the potential to be material in the future. In the case of transition risks and opportunities, potential impacts of climate change on business depend not only on the degree to which the respective industry is affected by climate change regulation, but also on the extent to which the company has already initiated its own greenhouse gas emission reductions.

The selected material risks and opportunities provide the basis for a more detailed analysis of these risk categories under different scenarios and for determining the financial impact on the company (step 4).

Table 3: Categories of opportunities from climate change

CLIMATE-CHANGE-RELATED OPPORTUNITIES FOR COMPANIES

Categories of opportunities	Potential opportunities for companies:
Resource efficiency Reduction of operating costs through increased efficiency in resource use	<ul style="list-style-type: none"> ▶ Use of more efficient modes of transport ▶ Improve efficiency of production and distribution processes ▶ Recycling ▶ More efficient buildings ▶ Reduced water consumption
Energy source Cost benefits from switching to alternative energy sources	<ul style="list-style-type: none"> ▶ Use of low-emission energy sources ▶ Benefits from supporting policy incentives ▶ Use of new technologies ▶ Participation in carbon markets ▶ Switch to decentralised energy generation
Product and services Higher competitiveness by adapting the product and service portfolio	<ul style="list-style-type: none"> ▶ Development and expansion of (low-emission) products and services through innovation, research and development ▶ Ability to further develop and diversify the business model ▶ Development of climate change adaptation measures or insurance risk solutions ▶ Shifting consumer preferences
Markets Benefits from diversifying business activities and accessing new markets	<ul style="list-style-type: none"> ▶ Access to new markets ▶ Issuance of green bonds and financing of infrastructures
Resilience Benefits of increased resilience to the impacts of climate change	<ul style="list-style-type: none"> ▶ Substitution and diversification of used primary materials ▶ Purchase of renewable energy and adoption of energy efficiency measures

⁸ The Climate Check and the associated tool of the German Federal Ministry of Economic Affairs and Energy (2014) provides a helpful typology of business that helps companies assess the relevance of different types of climate risks according to specific business characteristics.
www.bit.ly/Klimacheck_Leitfaden und www.bit.ly/Klimacheck_Tool (both only available in German)

David Knewitz

Manager Sustainable Finance, WWF Deutschland

Step 3: Identification and definition of scenarios and selection of supporting tools

Companies using scenario analysis for the first time may want to consider starting with a simple yet robust implementation process that can be easily repeated every year without the need to make any major adjustments. Companies may begin exploring potential financial impacts of climate change on the organization with qualitative scenario analysis and with greater experience they can begin to incorporate quantitative aspects and further refine their approach. The more significantly a company expects to be affected by climate-related transition and physical risks, the greater effort it should invest in developing rigorous and sophisticated scenario analysis.

The goal is to develop customized climate-related scenarios and use them to determine the implications of relevant climate risks and opportunities for future business development. For financial market actors, scenario analysis may show heterogeneous outcomes depending on the type of assets being considered; while some parts of a portfolio (asset classes, lending business) may benefit from a particular scenario, others may face a loss in value.

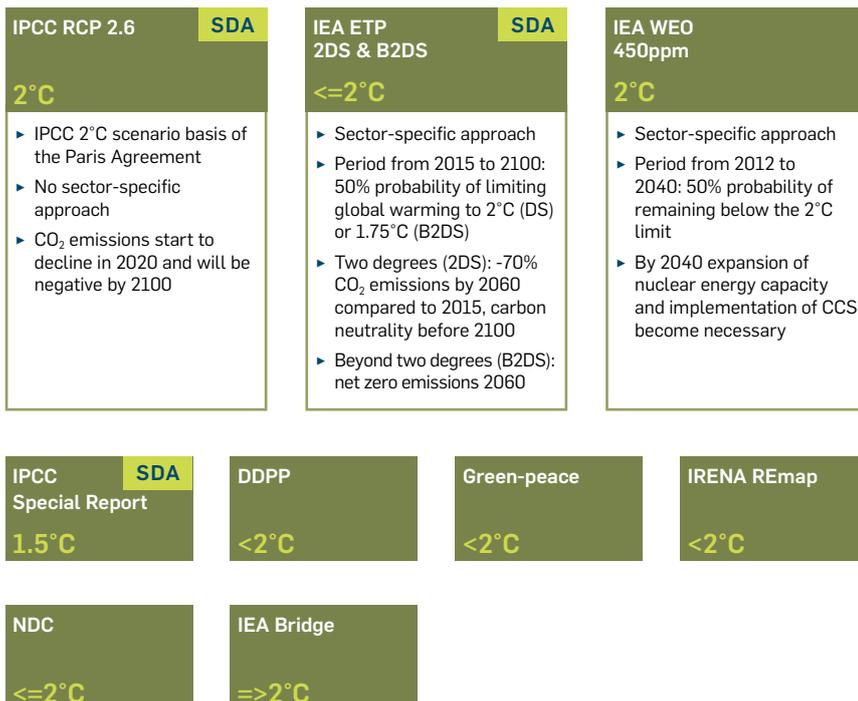
Relevant Climate Scenarios

When defining future scenarios, a wealth of publicly available scenarios can be used to describe developments either in line with limiting global warming to below 2°C

“In line with the TCFD Final Report, WWF recommends companies to consider at least a <2°C scenario and a significantly more pessimistic scenario, e.g. 4°C global warming, in their scenario analysis. On this basis the impacts on the company’s business model should be made transparent.”

or going beyond this threshold. Royal Dutch Shell, for example, has carried out its own modelling.⁹ Usually, however, companies use already existing scenarios and combine and change them according to their company-specific circumstances. The TCFD encourages companies to consider the scenario of limiting global warming to well below 2°C in any case. Furthermore, it is advisable to consider two to three alternative scenarios considered relevant to the company’s situation. To this end, scenarios describing the physical effects of progressive global warming beyond 2°C can be applied. It is also possible to examine scenarios based on the nationally determined contributions (NDCs) submitted by each country as part of their efforts to meet the objectives of the Paris Agreement.¹⁰

SCENARIOS IN LINE WITH <2°



>2°C SCENARIOS



Figure 4: Overview of <2°C and more pessimistic climate scenarios

9 Task Force on Climate-related Financial Disclosures (2017): The Use of Scenario Analysis in Disclosure of Climate-Related Risk and Opportunities. www.bit.ly/TCFD_ScenarioAnalysis

10 Task Force on Task Force on Climate-related Financial Disclosures (2017): Technical Supplement: The Use of Scenario Analysis in Disclosure of Climate-Related Risk and Opportunities. www.bit.ly/TCFD_ScenarioAnalysis

According to the TCFD guidelines, companies should pay particular attention to relevant scenarios published and regularly updated by the International Energy Agency (IEA) and the Intergovernmental Panel on Climate Change (IPCC). Both organizations developed scenarios that have long been used by scientists and policy-makers to assess future risks and opportunities for national economies arising from climate change. Figure 4 shows the most relevant climate scenarios, most of which are detailed in the TCFD Technical Supplement. In addition to the IEA and IPCC scenarios, scenarios from DDPP (Deep Decarbonization Pathways Project), Greenpeace, IRENA (International Renewable Energy Agency) and national scenarios based on NDCs provide a basis for companies to conduct a climate-related impact assessment.

Typically, companies use general climate scenarios as a basis and tailor them to fit the company's circumstances. For example, Equinor used existing external climate scenarios for their scenario analysis, but for its own modelling assumed that the emission intensity of the electricity mix would decrease more rapidly.

INFOBOX: SCIENCE BASED TARGETS INITIATIVE

Several companies now apply the methods of the Science Based Targets Initiative¹¹ (SBTi) to determine how much they need to reduce their greenhouse gas emissions in the future to make an adequate contribution to limiting global warming to (well-below) 2°C or 1.5°C. The method developed by SBTi - the Sectoral Decarbonization Approach (SDA) - is based on the "RCP 2.6" scenario from the IPCC's Fifth Assessment Report. To account for sector-specific GHG emission reduction pathways, it also draws from more recent scenarios from the IEA's Special Report on Limiting Global Warming to 1.5°C as well as from the "2°C Scenario (2DS)" and "Beyond 2°C Scenario (B2DS)" scenarios listed in Figure 4.¹² Setting science-based targets for one's own company can help in understanding what a <2°C development requires and can serve as a basis for determining which transition-related risks and opportunities such reduction in emissions would ensue for the company.

Tools

In addition to the scenarios described above, several organizations provide tools for the analysis of transition and physical risks and thus support the application of complex climate scenarios for companies and financial institutions (see Figure 5). Table 4 lists a selection of recommended tools and methods, most of which are also listed in the TCFD Technical Supplement. Additional links and updated information can be found on the TCFD Knowledge Hub website.¹³

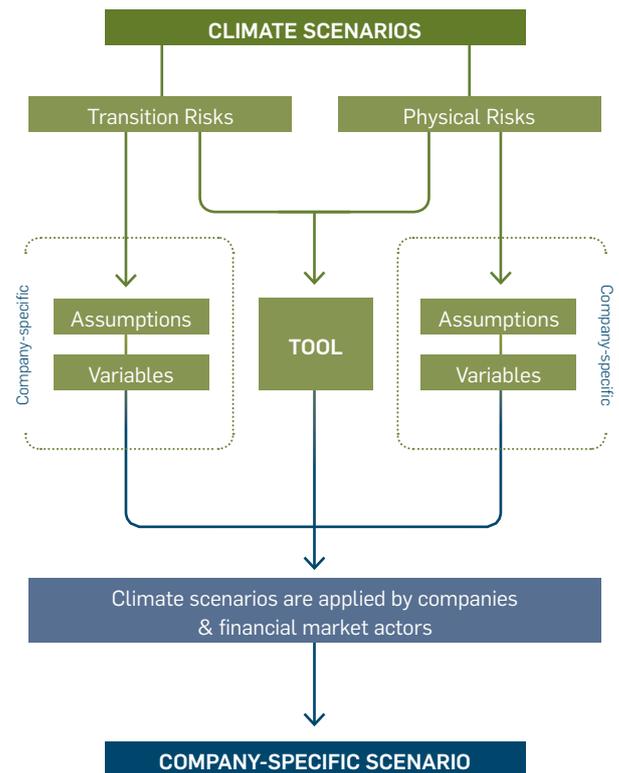


Figure 5: From the selection of climate scenarios to company-specific scenarios to assess financial impacts

11 Science Based Targets Initiative: www.bit.ly/ScienceBasedTargets

12 Intergovernmental Panel on Climate Change (2014): Climate Change 2014 – Synthesis Report. www.bit.ly/IPCC-Report2014

Intergovernmental Panel on Climate Change (2018): Global Warming of 1.5°C. www.bit.ly/IPCC-SpecialReport2018

International Energy Agency (2017): Energy Technology Perspectives 2017. www.bit.ly/IEA_ETP2017

13 TCFD Knowledge Hub: www.bit.ly/TCFD_Hub

Tabelle 4: Overview of available tools for analyzing physical and transition risks

Selected tools for the analysis of physical risks
International Institute of Applied Systems Analysis (IIASA)¹⁴ Platform with online tools and databases for physical risk scenarios
European Climate Information Portal¹⁵ Platform with satellite-based data and in-situ observations including an online toolbox
BMWi Klimacheck-Tool¹⁶ Identification of climate-related risks and development of the first approaches to handle those risks
Aqueduct (World Resources Institute)¹⁷ Tool for companies, investors, governments and local stakeholders to identify water risks (including those arising from climate change)
WWF Water Risk Filter¹⁸ Tool to analyse water risks associated with various factors, such as human footprint or protected areas.
CarbonBrief Interactive Tool¹⁹ Climatic impacts of global warming reaching 1.5°C, 2°C and >2°C

Selected tools for the analysis of transition risks
Deep Decarbonization Pathways Project (DDPP)²⁰ Excel-based tool for performing analyses through the entry of input variables to calculate energy ratios and GHG emission values.
The Global Calculator²¹ <ul style="list-style-type: none"> ▶ Online tool developed by an international research team offering 26 climate scenarios ▶ Modelling of global energy, land use and food systems until 2050 ▶ For each climate scenario, adjustments can be made to the indicators (e.g. heat, energy, etc.) to modify the scenarios
Science Based Targets Initiative (SBTi)²² <ul style="list-style-type: none"> ▶ Sectoral Decarbonization Approach based on IPCC and IEA scenarios to determine climate targets for companies in line with what is required to limit global warming to (well-below) 2°C or 1.5°C ▶ Overview of other available methods to develop <2°C targets

Parameters, assumptions and analytical choices

To construct company-specific scenarios and perform scenario analysis, companies must make certain assumptions that significantly influence the developments described in the scenarios:

- ▶ *Selection of relevant parameters:* discount rate, GDP, employment rate, demographic factors, etc.
- ▶ *Assumptions:* Assumptions related to policy frameworks, development and deployment of technologies, energy mix, price of CO₂, prices of commodities or production materials, geographical differentiation of transitional and physical impacts, timing of potential impacts, etc.
- ▶ *Analytical choices:* Considerations either only related to a company's location or also considering its value chain, choice of scenarios considering their provider and relevance, time frames considered, risks and opportunities considered, quantitative or qualitative approach, supporting data and models, etc.

Companies should also identify and understand the key drivers of value creation and business performance in order to build these into their scenarios. Disclosure of critical parameters, assumptions and analytical choices (see step 6) along with the results of the scenario analysis is crucial to significantly improve direct comparability of results between organizations.

In the course of the DGCN and econsense multi-stakeholder workshop, participants identified basic challenges in the selection of suitable scenarios, such as the lack of credibility and involvement of scenario developers, the high degree to which climate scenarios can be manipulated by the company, and a lack of a basic understanding of the input-output variables of climate scenarios. Standardization would constitute a solution to those challenges, however it is not yet feasible. Other operational challenges include dealing with a large number of assumptions and disclosing them transparently, the wide range of possible future CO₂ prices, determining the sensitivity of the results of the analysis, the large amount of work involved and the resources required, and selecting tools to facilitate the interpretation of scenarios. Participants stressed the need for continued sharing of experiences in carrying out scenario analysis, for instance in peer learning groups. Furthermore, developing common approaches to scenario analysis at the level of industry associations, including financial market actors and representatives of civil society, could be helpful. However, an early start with scenario analysis and initial experience is important, even if there are still a large number of open questions.

Step 4: Evaluation of climate change impacts based on scenarios

The assessment of climate-related risks and opportunities is a key element of the TCFD recommendations to make financial impacts transparent. To make sound financial estimates and take appropriate decisions, investors, lenders and insurance underwriters need to understand how climate-related risks and opportunities will impact a company's future financial position.

¹⁴ International Institute for Applied Systems Analysis: <http://www.bit.ly/IIASAweb>

¹⁵ European Climate Information Portal: www.bit.ly/CLIPIC

¹⁶ BMWi Klimacheck Tool: www.bit.ly/Klimacheck_Tool

¹⁷ WRI Aqueduct: www.bit.ly/WRIAqueduct

¹⁸ WWF Water Risk Filter: www.bit.ly/WWF_WaterRisk

¹⁹ CarbonBrief Interaktives Tool: www.bit.ly/CarbonBriefTool

²⁰ Deep Decarbonization Pathways Project: www.bit.ly/DDPProject

²¹ The Global Calculator: www.bit.ly/GlobalCalc

²² Science Based Targets Initiative: www.bit.ly/ScienceBasedTargets

A decisive factor is how climate-related risks and opportunities affect the income statement, the cash flow statement and the balance sheet of the company (see Figure 6). The impacts of climate change affect all sectors of the economy, but the level, nature and extent of risk and the impacts vary from industry to industry and from one business model to another. For companies, identifying the key climate-related drivers that can have financial implications for their business is a major challenge. There are many reasons for this, including the limited knowledge of climate-related matters within organizations. In addition, it is common practice to concentrate mainly on short-term risks without adequately taking into account long-term risks. Many companies face the challenge of communicating financial repercussions of climate change without alarming their shareholders and facing liability claims. Companies that already report in line with the TCFD recommendations tend to describe financial impacts qualitatively, as quantitative information is still considered confidential. Many companies also need to set up the necessary internal structures to be able to obtain quantitative information in the first place.

The TCFD identifies four major categories for the analysis of financial impacts of climate change and future transparent climate risk reporting.²³ While impacts on revenue and expenditure affect the income statement,

impacts on assets and liabilities as well as capital and financing affect the balance sheet. The categories and potential impacts are briefly described below:

- ▶ **Revenues:** Both transition risks and physical risks may affect demand for products and services and thus the company's revenue situation. Therefore, companies should consider potential impact on their revenue. In particular, future CO₂ prices or other mechanisms to regulate GHG emissions can have a significant financial impact on the companies concerned.
- ▶ **Expenditures:** Expenses for climate mitigation and adaptation measures, increased expenses for purchasing materials or investments in R&D can significantly increase operating costs. Companies can provide investors and lenders with comprehensive information on their cost structure and the resulting ability to adapt. For financial institutions, the level of debt or equity required to finance climate-related risks and opportunities is particularly important to understand. Transparency toward expenditure can provide greater access to capital markets and improved financing terms for companies. It is advisable to provide an estimate of the range of possible costs, as emission-intensive companies may be exposed to a high degree of climate-related stress, which is difficult for investors to assess.

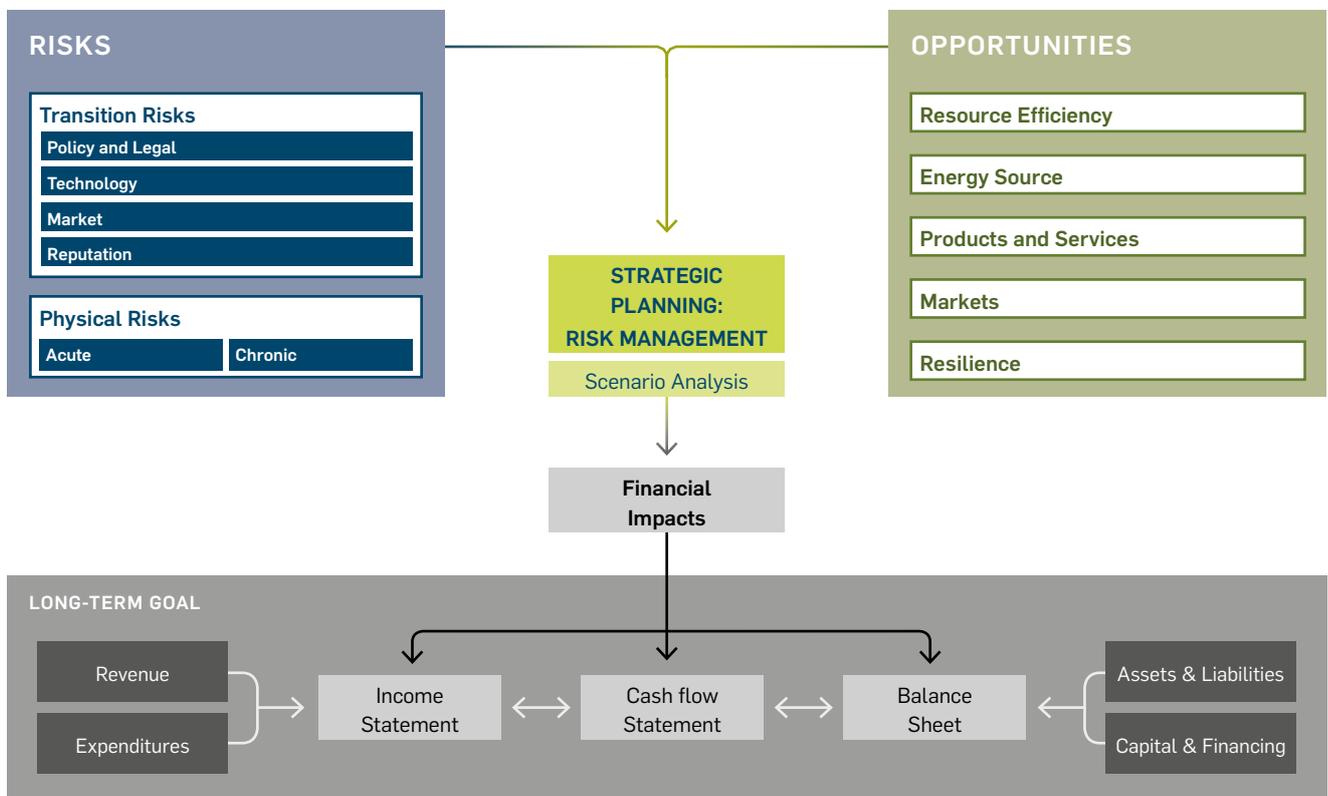


Figure 6: Classification and relationship between climate-related risks and opportunities for companies (according to TCFD)

²³ Task Force on Climate-related Financial Disclosures (2017): Recommendations of the Task Force on Climate-related Financial Disclosures. www.bit.ly/TCFDRRecommendations

- **Assets & liabilities:** Changes in supply and demand due to changes in regulations, technologies and market dynamics can affect the valuation of companies' assets and liabilities. This includes the use of long-lived assets and reserves that have thus far been reported in the balance sheet. Therefore, from the TCFD's point of view, it is critical that companies provide an indication of the potential climate-related impacts of their assets and liabilities. This is particularly relevant for long-lived assets in order to exclude the risk of a stranding asset. With this in mind, future investment decisions, corporate restructuring through mergers, write-downs and impairments should be assessed in the company's balance sheet.

DEFINITION STRANDING ASSETS:

Assets that will suffer significant depreciation in value in the future as a result of unanticipated or premature write-downs and devaluations and will therefore be depreciated before the end of their expected lifetime. The risk factors are mostly incorrectly evaluated and can therefore play a major role in causing a total loss.

- **Capital & financing:** Climate-related risks and opportunities can significantly change a company's financial structure, either by increasing the level of debt to compensate for reduced operating cash flow in the future or by raising the capital required to finance R&D activities. Financial impacts will also adversely affect corporate financing, i.e. raising new debt or refinancing existing debt. The volume of existing borrowings may also be reduced. In addition, changes in equity may result from operating losses, write-downs on assets or the need to raise new equity to cover investments that significantly change the capital and financing structure.

Ingo Speich
Head of Sustainability & Engagement, Deka Investment

"From our point of view as investors, it is crucial that companies explore widely accepted climate change-related scenarios. These should cover not only <2°C scenarios, but also significantly more pessimistic scenarios. Taking into account the sensitivity of the model, we expect at least one qualitative statement on the impacts of climate change on the company's business model."

Step 5: Identification of potential responses

In step 5, companies should use the results obtained to define and implement measures to lower or mitigate the identified risks and turn investments into opportunities. Companies may react by adapting their business model, changing their product portfolio and investing in new technologies.

Divesting represents a possible course of action for companies and financial institutions to respond to financial opportunities and risks. A number of well-known companies have employed this approach: E.ON and Uniper, RWE and innogy as well as thyssenkrupp and Tata Steel. Current developments in the automotive industry show how companies, in response to tighter CO₂ regulations, new technologies and changing social expectations, are gradually shifting their business models from manufacturers of fossil-fuel vehicles to providers of mobility services focusing on electrically powered vehicles. The range of possible adaptation or response strategies has not yet been exhausted.

Step 6: Documentation and disclosures

According to the TCFD Technical Supplement, the following information regarding the scenario analysis should be disclosed:²⁴

- Information on the procedure followed to perform scenario analysis
- Scenarios applied
- Parameters, assumptions and analytical choices
- Key results
- Possible responses from management

²⁴ Task Force on climate-related financial disclosures (2017): Technical Supplement: The Use of Scenario Analysis in Disclosure of Climate-Related Risk and Opportunities. www.bit.ly/TCFD_ScenarioAnalysis

For external reporting, information on the choice of scenarios and underlying assumptions is particularly relevant, for example with regard to the development of key technologies and their dependence on parameters such as (CO₂) prices. This information allows external stakeholders to understand the analytical process behind the scenario analysis and thus how the conclusions were derived. Only then can investors and other stakeholders assess the robustness of an organization's strategy under different climate change scenarios. This information further helps financial institutions to make better decisions when assessing the risk of capital allocations.

Given the high number of input variables and analytical approaches to scenario analysis, it is natural to have many different scenarios that deliver different results. For this reason, direct comparability between companies represents a major challenge and reinforces the importance of disclosing information on key aspects of the scenario analysis. The aim is to increase the level of transparency over time (see also the AP2 Case Study in Chapter 4).

During the multi-stakeholder workshop of DGCN and econsense, participants suggested to convert the results of the scenario analysis into the format of a SWOT analysis (strategic planning instrument) or at least to process them in this format to help improve transparency. This could also increase both internal and external acceptance of the results.

In September 2018, the TCFD published a status report that revealed the extent to which 1750 companies from eight different sectors of the financial and real economy have included disclosures in their financial reports in line with the TCFD recommendations since their release.²⁵ The report indicates that in the current early phase of the implementation of TCFD recommendations in companies, the disclosure of the results of scenario analysis and of statements on corporate strategy resilience to climate-related risks is still weak, despite this being a key area of focus for the TCFD recommendations on strategy disclosures.²⁶

Similar conclusions for the German context were obtained during the DGCN and econsense workshop. According to the participating companies, the first step involved collecting relevant data and information and carrying out initial scenario analysis. During the initial phase of implementation, complex issues of climate risk scenario analysis can only be reported in the form of qualitative statements revealing internal structures and the organization's governance around climate-related risks and opportunities. In the medium term, a basic description of the range of scenarios being considered, time frame and critical assumptions could be included in the disclosures and used to identify potential climate risks and opportunities. Disclosing the associated financial implications remains however challenging due to the large degree of uncertainty associated with the scenarios and the sensitivity of the data.

²⁵ Task Force on climate-related financial disclosures (2018): www.bit.ly/TCFD_StatusReport

²⁶ Task Force on Climate-related Financial Disclosures (2017): Recommendations of the Task Force on Climate-related Financial Disclosures. www.bit.ly/TCFDRecommendations

4. CASE STUDIES

Case study Unilever – Reporting on 2°C and 4°C scenario analysis²⁷

In 2016, Unilever conducted a scenario analysis to examine the impact of 2°C and 4°C climate scenarios on the company's operations. A number of different third-party climate scenarios were applied (for example, CO₂ prices were taken from the IEA WEO 450ppm, see Fig. 4) and in accordance with the TCFD recommendations, impacts resulting from transition risks were separated from those resulting from physical risks. The details of the scenario analysis including the underlying assumptions were published in the company's 2017 Annual Report. Additionally, material impacts of climate change, such as the rise in commodity and packaging costs due to carbon pricing, chronic water stress and extreme weather conditions, were described.

The outcome of the analysis suggested that without countermeasures, both scenarios (2°C and 4°C) resulted in financial risk to Unilever, though the business model did not need to change significantly as a result of these risks. Among potential policy measures to be expected, Unilever mentions rising CO₂ prices and regulation towards net zero deforestation. For many years, Unilever has reported on mitigation measures against the impacts of climate change. The results of the scenario analysis were used to further enhance their report by disclosing their exposure to physical and transition risks and the resilience of their strategy.

According to Unilever, the following barriers had to be overcome when carrying out scenario analysis: developing the business case to demonstrate relevance in day-to-day business; selecting the right climate models; dealing with complexity and uncertainties. In presenting the results of the scenario analysis, particular care was required to appropriately deal with the uncertainties associated with this type of forward-looking analysis. The results were presented as midpoints of ranges rather than as precise answers. Furthermore, Unilever carried out a number of simulations to overcome previously identified issues. Finally, many practical issues had to be considered from a reporting perspective, in particular how and where the TCFD disclosures should be integrated into the annual report. Possibilities were sought to integrate the disclosures throughout the strategic report. However, Unilever concluded that these disclosures would be more useful to the target audience if they were in the Risk Management section.

Case study AP2 – Climate report based on TCFD's recommendations²⁸

The Second Swedish National Pension Fund (AP2) began implementing the TCFD recommendations in autumn 2017. The Swedish pension fund applied the guidelines of the TCFD recommendations to analyse its activities in climate management and assess potential impacts on the industry, especially on asset managers. The responsible parties immediately started reporting to gain as much experience as possible and increase their ability to communicate with external stakeholders. In the initial reporting cycle, the objective was to transparently report the available data and information in line with the requirements of the TCFD. Management supported the reporting process based on TCFD. The project team consisted of experts from the areas of strategy, asset management, risk and ESG.

A challenge for future reporting in AP2 is the availability of data and the application of suitable indicators for scenario analysis. The pension fund considers the TCFD recommendations to be clearly structured and easy to use. Nevertheless, they acknowledge that it will take several years before all TCFD recommendations can be implemented in a satisfactory manner. The main challenges include the monetary quantification of climate-related impacts and improving the resilience of the business strategy. The TCFD criteria help to assess the performance of climate management to identify gaps that can be addressed in the next reporting period. The Swedish pension fund recommends climate reporting according to TCFD even if the organization is not yet in a position to comply with all recommendations.

²⁷ Unilever Annual Report and Accounts (2017): www.bit.ly/Unilever_Report2017

²⁸ AP2's climate report based on TCFD's recommendations: www.bit.ly/AP2Report

5. CONCLUSION AND RECOMMENDATIONS

Scenario analysis is a well-established method for strategic planning. It is particularly useful for evaluating outcomes that are highly uncertain, have medium to long-term implications and may have a significant impact on a company's future success. Scenario analysis can help companies address strategic questions, evaluate and rank a range of possible management decisions and determine key metrics to monitor the external environment.

Applying climate-related scenario analyses is not without challenges. Most scenarios have been developed to conduct global or macroeconomic analyses of potential climate change impacts that can inform scientists and policy makers. These macro-scale climate-related scenarios often lack the ideal level of transparency, range of data output and appropriate tools that would facilitate their application in a business or investment setting.

To achieve the TCFD's goal of transparent disclosure of climate-change-related financial impacts in annual corporate reports in the mid-term, many organizations begin by assigning clear responsibilities, involving relevant

internal stakeholders and conducting initial analyses with available scenarios. This leads to a greater understanding of which risks and opportunities may be particularly relevant for the company.

The application of scenario analysis to estimate potential implications of climate change on business is still at an early stage. It is important that more companies begin to gain experience with the evaluation of climate risks to have a solid knowledge base they can build on in the coming years. Sharing experiences and approaches to scenario analysis across organizations is thus crucial to further the use of climate-related scenario analysis. Organizations can play an important role in this respect, not only by facilitating the exchange of information and experience among themselves during workshops, in working groups or on online platforms such as the TCFD Knowledge Hub, but also by jointly developing tools, data sets and methodologies and defining standards.

PRIMARY LITERATURE

Task Force on Climate-related Financial Disclosures (2017):
Recommendations of the Task Force on Climate-related Financial Disclosures.

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Task Force on climate-related financial disclosures (2017):
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Available online:
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