2. Scenario Analysis – Key Points of Practice

Chapter 2. Scenario Analysis - Key Points of Practice

This chapter explains how to practically undertake scenario analysis and describes key points of its practice, based on use cases performed by companies under the support program of the Ministry of the Environment.

Scenario Analysis Guide – Key Points of Practice

2. Scenario Analysis – Key Points of Practice

The momentum for decarbonization among various countries and institutional investors is growing[1] and climate change has now become a clear risk and opportunity for corporate management. In Japan, “carbon neutrality by 2050” was declared in October 2020, and with the revision of the Corporate Governance Code[2] in June 2021, companies listed on the prime market are required to disclose their response in line with the TCFD recommendations. Furthermore, with the amendments regarding the “Cabinet Office Ordinance on Disclosure of Corporate Affairs announced in January 2023, a section on sustainability has been added to the securities reports.[3] The importance of responding to climate change, including addressing the TCFD recommendations that require disclosure of climate-related information, is increasing.

In the TCFD recommendations' recommended disclosure items, the strategy section encourages the implementation of climate change scenario analysis in the following passage: "Describe the resilience of the organization's strategy based on a review of various climate-related scenarios, including scenarios for under 2°C"[4].

In response, we will use this section to explain the practical process for undertaking scenario analysis and to describe key points in its implementation based on use cases of companies under the support program of the Ministry of the Environment. Furthermore, in each initiative "STEP", we will describe a step-by-step direction for initiatives in line with the actual situation of the company as shown below.

・For companies that are conducting scenario analysis for the "first time," such as companies in their first year of scenario analysis (companies in their "first round" of scenario analysis): these companies should conduct scenario analysis in a sure and steady manner while keeping in mind the key points of practice in this guide. They should also work on implementing the "points for continuing companies" as much as possible.

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[1] Refer to Chapter 1 for information on the materiality of responding to TCFD recommendations, such as decarbonization trends for various nations and institutional investors.

[2] For details on the revision of the Corporate Governance Code, refer to Chapter 1, p.1-29

[3] For details on the enforcement of the amendments to the Cabinet Office Order on Disclosure, refer to Chapter 1 p.1-30

[4] Refer to Chapter 1, p.1-25

・For companies that are conducting scenario analysis for the "first time", but which are already working on initiatives related to climate change to some degree, or companies that have already implemented scenario analysis (companies in their "second round" of scenario analysis): these companies should move on to the next step of "points for continuing companies" and use this to increase the sophistication of climate change-related management. Additionally, they should use disclosures and dialogue with investors to enhance analysis and the presentation of evidence.

2-1. For beginning scenario analysis

When beginning scenario analysis, the first step in preparation is to involve internal stakeholders and establish a target scope for scenario analysis. Specifically, the following must be done: 1) Having management understand the materiality of responding to TCFD recommendations (having management be aware of the recommendations and instruct that they be complied with); 2) Establishing an execution team; 3) Choosing a target scope for scenario analysis; and 4) Selecting a time frame of "X" years in the future to look at when conducting the scenario analysis. In this preparation stage, the key is in how to input climate change initiatives into management.

or companies undertaking scenario analysis for the first time, the following are important measures for beginning the analysis: establishing internal consensus for conducting scenario analysis (management has agreed); asking for cooperation from operation divisions; and deciding on the target scope/parties responsible (structure) for scenario analysis.

Meanwhile, companies that are continuing to conduct scenario analysis should aim for the following: having management/responsible departments understand the results of the previous scenario analysis and having operation divisions take the lead in conducting the analysis; and expanding the target scope/responsible parties (structure) beyond what it was for the initial analysis.

① Gain management`s understanding

As the first step in preparation, it is necessary to obtain the understanding of the management team concerning the materiality of conducting scenario analysis.

Conscientious communication with the management team facilitates internal involvement in scenario analysis through helping management recognize what TCFD recommendations are and having them advance the initiatives necessary for scenario analysis in a top-down approach.

First of all, it is crucial for management to understand that investors expect that the scenario analysis the company performs in the course of its operations (i.e., recognition of a broad range of risks and identification of potential responses should the risk actually occur) should also include climate change. For example, if the company only envisions a foreseeable future with a reasonable degree of probability, it will only formulate linear PDCA cycles toward goals. This may result in business strategies that cannot respond immediately to future changes and lack of consensus regarding the company's future, which may result in risks such as investors questioning the resilience of the business. On the other hand, formulating hypotheses based on an uncertain future (and therefore one that also holds possibilities) allows business management that responds flexibly to future changes, enables discussion to take place without subjective viewpoints regarding the future, and allows management to assert the resilience of the business.

When gaining the understanding of the management team, it is also effective to have study groups with experts provide input on the potential impact of climate change responses on corporate value. There are increasingly frequent requests from multi-stakeholders for responses to climate change, so there may also be cases when management hears about these trends directly. However, it is still common that those messages do not reach management. In these cases, it is important to compile the "status of requests from multi-stakeholders" and provide input to management through study groups with experts and other means on the possible impact of climate change responses on corporate value.

Even for companies in their second round of scenario analysis, continuing to provide input to management from the results of climate change-related scenario analysis will further deepen management's understanding of the specific opportunities and risks climate change holds for the company, and may lead to increased integration of climate change initiatives and business management within the company.

② Create an execution team for scenario analysis

The second step for preparation is creating an execution team for scenario analysis. Internal involvement is essential for conducting scenario analysis. Because of this, a team should be formed where operation divisions are involved from the very beginning. Having the responsible parties in operation divisions understand the scenario analysis processes enables the divisions to think of climate change initiatives as something that involves them directly.

There are two separate patterns hypothesized for the structure of scenario analysis execution teams. The first is a pattern where relevant divisions and departments are involved as needed during the course of the scenario analysis. The second pattern is for the internal teams to be formed prior to beginning the analysis. The first pattern has the advantages of making the scenario analysis easy to begin, and of placing a minimal burden on each division/department. On the other hand, its disadvantages include the need for internal coordination in the scenario analysis process and the long reporting process from the environment/CSR division to management. For the second pattern, the advantages are that divisions are better able to cooperate due to internal coordination being completed in advance, and that reports reach management swiftly due to the analysis being conducted by a well-coordinated team. However, its disadvantages are that it takes time to start the analysis, and that there is a large burden on each division/department.

For use cases of involving operational divisions for companies that have implemented scenario analysis, the following examples have been cited as being effective: 1) using narratives suited to each division (e.g., how reductions in CO2 emissions over the entire company can be promoted through contributions by various areas such as products and procurement), and 2) leveraging management's commitment. Furthermore, regular communication of information related to TCFD recommendations and scenario analysis can facilitate understanding and make it easier to receive cooperation when moving ahead with the scenario analysis.

③ Choose target for analysis

The third step for preparation is selecting a target scope for scenario analysis. When considering a target scope, the following should be determined: the region (e.g., only domestic sites, or including overseas sites), the scope of operations (only some businesses or all businesses), and the corporate scope (only for the scope of the consolidated financial statements or including subsidiaries).

By defining the scope of operations covered in the scenario analysis in terms of "sales composition", "relation to climate change", and "difficulty of data collection", companies can conduct scenario analysis in accordance with their business model. For example, companies might consider covering operations with particularly high sales in the scope defined as "sales composition", or they might cover operations with high CO2 emissions by using the scope "relation to climate change". Operations that are easy to collect data for may be covered in the scope defined as "difficulty of data collection", and so on.

In scenario analysis support, it is common to first select certain operations to cover in the analysis, and then gradually lead up to a scenario analysis for the company as a whole.

④ **Choose time horizon to conduct scenario analysis**

Select which year in the future to look at when conducting the scenario analysis. Since the worldviews showing the impacts of climate change vary depending on the year that the analysis is based on, companies should select a time horizon with the maximum benefit for the company after comparing advantages and disadvantages in light of factors such as project length, the amount of internal involvement, and effect from physical risks on the company.

Considering decarbonization trends such as carbon neutrality in 2050, it is assumed that scenario analysis for 2050 will be useful in the current situation. Other advantages of selecting 2050 are that physical risks due to temperature rise and transition risks such as carbon taxes are emerging, and the results of the impact of risks and opportunities will be clearly apparent. On the other hand, the disadvantage is that the distance from the time axis of the business plan makes it difficult to imagine the project realistically, which makes internal involvement difficult and sometimes makes collaboration difficult.

For other sectors where climate change is material, it is possible to consider mid- to long-term appropriate "transition to decarbonization"[5] toward carbon neutrality by 2050, by conducting scenario analysis for the year 2030 in addition to 2050. The advantages of selecting 2030 additionally are that it is easy to involve the management and the company, since there is abundant data available for reference and it is relatively easy to link with business plans.

[5] For details on the consideration of transitions, refer to Chapter 2. P.2-15-16

2-2. STEP2. Assess materiality of climate-related risks

After finishing the preparations for scenario analysis, it is time to assess the risks and opportunities the company will face from the effects of climate change. The company should assess the materiality of these from the perspectives of whether or not the risks and opportunities hold the potential for significant impact in the future or if they are of concern to stakeholders.

Specifically, risk materiality should be determined through the following process: 1) list risks/opportunities for the targeted operation; 2) express the potential impact on operations from each listed risk/opportunity using qualitative terms; 3) determine the materiality of the risk based on how serious the impact on operations will be if the risk actually occurs. The key is to select risks from an industry/company perspective, and to consider the level of granularity to be used in assessing risk materiality.

For companies undertaking scenario analysis for the first time, the following are important when assessing the materiality of risks: climate-related risks material to the sector and company have been identified, and the specific impacts of these risks have been hypothesized.

Meanwhile, companies who are continuing to conduct scenario analysis should aim for greater fleshing out of climate-related risks that are material to the sector and company, and of the specific impact of risks. They should do this by involving operation divisions and outside experts, and while considering dialogue with investors on the results of prior scenario analysis.

① List risk items

For Phase 1, the company should list out risk and opportunity items for the operation division it chose to target in the preparation stage. The company should make a list of risk and opportunity items based on the examples of risks and opportunities listed in the TCFD recommendations and in consideration of external reports[6] such as industry-

[6] Examples of external reports include the SASB Standards (https://www.sasb.org/standards/download/?lang=ja-jp), which identified environmental, social and governance issues in 77 sectors, and scenario analysis reports issued by the WBCSD on sectors such as utilities, oil and gas, construction, mining, chemicals, food, agriculture and forestry products (https://climatescenariocatalogue.org/)

specific reports and other external information such as competitors' CDP responses. When doing this, it is important that the company consider and list a wide range of possible risks and opportunities to eliminate the unexpected, rather than attempting to keep the number of risk items listed to a minimum.

The listed risks and opportunities should be divided into two broad categories: transition risks, which are related to the transition to a low-carbon economy, and physical risks, which are related to physical changes caused by climate change. Examples of transition risks include risks from policies and regulations; market risks; technology risks; and reputational risks (changes in reputation with customers or investors). Meanwhile, physical risks include risks that occur on a chronic basis (e.g., increase in average temperature, changes in rainfall and weather patterns, rising sea level) and risks that occur on an acute basis (e.g., increasing severity of extreme weather conditions). When considering risk items, companies may wish to refer to examples of risk items used by support project companies.[7]

② **Identify potential impacts on business**

The company will qualitatively identify the impact on business, and use qualitative terms to describe the potential impact on business from the risks and opportunities listed in Phase 1. When doing this, it is important that the company separates risks and opportunities and evaluates opportunities as well as risks.

The company should use the results of discussions with internal stakeholders as input when making qualitative descriptions, while also referring to external information such as external reports and CDP responses from competitors. For discussions with internal stakeholders, in particular: the important thing is that the company match its awareness with stakeholders and use a narrative (story-like) format to describe potential impacts based on the company's business model. These discussions on qualitatively describing impact can further deepen mutual understanding of scenario analysis within the company or its divisions/departments. Furthermore, discussions with each individual operation division often reveal unanticipated risks and

[7] Refer to Chapter 3 for support project company examples

opportunities. Companies continuing to conduct scenario analysis may also consider holding discussions that include external stakeholders.

③ Assess materiality of climate-related risks

In Phase 3, the company will determine the materiality of risks based on the scale of impact on business if the risk/opportunity occurs. The company will go on to assess the impact on business for each of the risks/opportunities evaluated in Phase 1 and Phase 2 based on a scale of "Large", "Medium", "Small" and so on.

When assessing materiality, the company should compare each of the risks and opportunities from the perspective of the "scale of impact on the company's business". For example, the company may consider classifying risks/opportunities with a broad range of impact or that affect important products as "Large"; risks/opportunities with no impact on the company as "Small"; and using "Medium" for others. A specific example would be classifying the risk "increases or decreases in important products" as having a "Large" impact on the company's business, as it affects the cost toward raw materials, which occupy a large percentage of the company's sales costs.

It is also key to consider the level of granularity to use when assessing risk materiality. The same risk/opportunity can be evaluated by subcategorizing it by "differences in product (by sector)" or "affected supply chains (by supply chain)" to enable analysis that is adapted to the company's operations. For example, when performing assessment by supply chain, the impact from the same risk may be categorized as "Large" for the procurement stage, but "Small" for the sales stage.

2-3. STEP3. Identify and define range of scenarios

For identifying and defining the range of scenarios in STEP3, the company should define multiple scenarios that encompass the transitional and physical risks related to the organization. The company should examine scenario hypotheses and analysis methods along with perspectives on what scenarios (and narratives) are appropriate for the organization, and which scenarios out of existing scenario groups should be used as references.

The following process will be used to identify and define the range of scenarios: 1) choose scenarios; 2) obtain forecast information on relevant parameters; and 3) shape the worldview in consideration of stakeholders. The key is in selecting the type of scenario while considering the amount of available information and versatility, as well as use cases from competitors. Companies should also consider how they will align worldviews with their relevant divisions/departments.

Companies undertaking scenario analysis for the first time should use reliable external scenarios and select several scenarios (1.5°C/2.6°C-4°C) that include a scenario for 2°C or lower (1.5°C for the current situation). The company should aim toward building internal consensus after detailing the worldview listed in each scenario.

On the other hand, companies that are continuing scenario analysis should aim for the following: using reliable external scenarios and based on dialogue with investors on the results of the previous scenario analysis, supplementing them with additional data for material risks; having selected multiple scenarios, including one for 1.5°C (1.5°C, 2°C, 2.6°C-4°C); and detailing the worldview in each scenario and holding discussions that include outside experts.

① Choose scenarios

In Phase 1, the company will go on to choose scenarios from multiple temperature ranges, including the below-2°C (1.5°C) scenario, to respond to an uncertain future. Types of scenarios include the IEA (International Energy Agency) `s WEO (World Energy Outlook)[8], which is the most versatile and data-rich, SSP (Shared

[8] Medium- to long-term energy market forecasts. Lists future information on energy (qualitative/quantitative).

Socioeconomic Pathways)[9], PRI (Principles for Responsible Investment)`s IPR (Inevitable Policy Response)[10], and the NGFS (Network for Greening the Financial System).[11]

The TCFD recommendations encourage companies to perform scenario analysis by selecting scenarios for multiple temperature ranges, including the 2°C or lower scenario. It is important that scenarios be chosen based on their characteristics and parameters, and that scenarios match the company's industry and situation, investor trends, and trends for domestic and international policies. At present, based on the decarbonization trend, the selection of multiple scenarios including the 1.5°C scenario is effective.

The Sixth Assessment Report (AR6) WG1 Report (Natural Science Basis)[12] released by IPCC in 2021 sets multiple temperature ranges. For example, the SSP1-1.9 scenario assumes net zero CO2 emissions in the mid-21st century by adopting climate policies that limit temperature increase to about 1.5°C or less, and limit temperature increase to 1.0-1.8°C (average 1.4°C) relative to the industrial revolution. The SSP1-2.6 scenario is a scenario with zero net CO2 emissions in the second half of the 21st century, limiting temperature increase to 1.3-2.4°C (about 1.8°C). The SSP2-4.5 scenario is at the upper end of the emissions range based on the aggregated Nationally Determined Contributions (NDCs) of each country through 2030, with a temperature increase of 2.1-3.5°C (about 2.7°C), and the SSP3-7.9 Scenario is a scenario where no climate policy is introduced under regional conflictual development and the temperature rise is 2.8-4.6°C (about 3.6°C).[13]

Selecting scenarios in this manner, with different temperature ranges and worldviews

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[9] Socioeconomic scenario based on recent policies and the socioeconomic environment. Lists the macroeconomic information scenarios that are based on for each scenario.

[10] Scenario for climate-related policies that are likely to be implemented in the short-term. Lists qualitative and quantitative forecasts for climate-related policies.

[11] Common climate scenario for central banks and financial regulators. Scenario bifurcated by temperature zones, technological development and policy response speed.

[12] For the IPCC's Sixth Assessment Report, refer the IPCC website: https://www.ipcc.ch/report/sixth-assessment-report-working-group-i/
(Japanese translation by JMA: https://www.data.jma.go.jp/cpdinfo/ipcc/ar6/index.html)

[13] For a summary of each scenario, refer Ministry of the Environment, "Publication of the Report of Working Group I of the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) (Natural Science Basis)," https://www.env.go.jp/press/109850.html
The attached document "Reference Materials (Overview of the IPCC and Wording Used in the Report)" of the Ministry of the Environment, https://www.env.go.jp/press/109850/116630.pdf

whenever possible, may help eliminate the unexpected. When selecting each scenario, it is important to draw an appropriate transition path focusing on decarbonization in 2050 based on the time horizon for scenario analysis that was chosen in the preparation stage.

② Obtain information on parameters (variables)

For Phase 2, the company will obtain objective forecast information on parameters related to risks/opportunities to enable it to address an uncertain future. The company will also identify the effects of these on the company in further detail. For example, if the popularization of EVs is listed as an opportunity item, the task would be to obtain information on the EV penetration rate for the relevant year of the analysis timeframe.

When obtaining information, the company may use external sources such as IEA, PRI and SSP reports to obtain objective forecast information on parameters for transition risks. For physical risks, it may use climate change impact assessment tools such as physical risk maps and hazard maps.[14]

The point to keep in mind here is that the company may not be able to find all forecast information for the target year set as the analysis time horizon, so it will need to consider using other methods such as estimates and collecting qualitative information. For example, if the analysis timeframe is 2050, but data are only available up to 2040, the company may use estimation to calculate forecast information for 2050. (The company will need to consider which estimation method to use, such as linear or cumulative, according to the type of data). In cases where quantitative information is not available, it may also be useful to use qualitative information to draw a picture of the future world. At this stage, the key is that the company gather a wide range of forecast information on risk/opportunity items without getting too caught up in trying to obtain quantitative information.

③ Shape the worldview in consideration of stakeholders

[14] Refer to Chapter 5 for examples of transition risk and physical risk parameters

In Phase 3, the company should, if necessary, use forecast information to clarify the worldview surrounding the company, including the behavior of future stakeholders (including investors), and build consensus on the worldview within the company.

In the process of coordinating worldviews with the related divisions/departments, the key is to use dialogue to build a worldview that is convincing to these departments/divisions (including operation divisions). When staging dialogues, the company may consider preparing materials that facilitate discussion to move discussions with operation divisions forward. It can do this by organizing the worldview by factors such as newcomers/sellers/buyers/substitute products/the industry centered on the company, which is a method that uses 5forces analysis (a framework for business environment analysis). The company may also use narrative descriptions or illustrations in these discussion materials to give visible form to the worldview.

It may be useful to aim to build internal consensus after establishing a comprehensive worldview that also incorporates perspectives from outside of the company.

2-4. STEP4. Evaluate business impacts

When evaluating business impacts, we will evaluate the potential effects from each of the scenarios defined in STEP3 on the organization's strategic and financial position, and then perform a sensitivity analysis.

Business impact evaluation is performed by using the following process: 1) identify potential financial indicators affected by risks and opportunities; 2) consider a calculation formula and estimate financial impact; and 3) be aware of the gap between financial indicators in the estimated impact and in the business as usual. The key points are in deciding what kind of internal data can be used for estimation, and how the company treats data that cannot be quantitatively estimated. The company should also take care not to focus excessively on pursuing numerical accuracy.

Companies undertaking scenario analysis for the first time should aim to quantitatively (or qualitatively, if this is difficult) calculate the estimated impact on business for "significant risks" and have a rough understanding of the gap between the estimated impact on business and business as usual. The company will also need to involve operation divisions to obtain their consensus regarding the method of calculating the impact on business and the resulting figures.

Continuing companies should aim for the following: performing trial estimates for quantitative calculation of the impact on business from significant risks, even for impact that was initially calculated qualitatively (though qualitative calculation may still be used where this is difficult); understanding the gap between the impact on business and business as usual; and promoting discussion to obtain consensus from managers and outside experts regarding the method of calculating the impact on business and the resulting figures.

In addition, for sectors where climate change is material, it is useful to conduct business impact evaluation in the target year of 2030 in addition to 2050 from the perspective of decarbonization transitions for both companies undertaking scenario analysis for the first time and continuing companies.

① Identify potential financial indicators affected by risks and opportunities

In Phase 1, the company should identify which financial indicators from its financial statements (P/L and B/S) are affected by impact on business brought on by climate change.

When identifying the affected financial indicators, the key is in first roughly sorting out whether the business impact falls under "sales" or "expenses" in the P/L. This is because, while changes in expenses may be recorded as-is without any problems, changes in sales become changes in profit (as sales x profit ratio = profit), resulting in a much greater impact. For example, companies may consider organizing impact items in the following manner: having sales be affected by changes in operating revenues due to the effects of climate change, and having expenses be affected by changes in raw material procurement costs, carbon tax fluctuations, and damage from increased physical risk.

By using data that is commonly used by operation divisions (e.g., sales information by business/product, operational costs, cost structure, greenhouse gas emissions), it is possible to create estimates that are closer to actual company conditions. Since the company will need to gather information by making requests of/receiving cooperation from each operation division, it would be ideal to have each operation division develop an understanding of the TCFD recommendations scenario analysis through the preparation phase and the risk materiality assessment.

② Consider calculation formula and estimate financial impact

In Phase 2, the company will consider a calculation formula for financial indicators, and then estimate the financial impact based on internal information. Since performing calculation for all financial indicators would be too difficult, the key is in starting with financial indicators that are possible to estimate. When estimating financial impacts, for sectors where climate change is material, it is also useful to analyze the year of 2030 in addition to 2050 from the perspective of decarbonization transitions.

The company should consider a calculation formula by combining the data collected when obtaining the forecast information for related parameters in STEP3 with the internal data obtained in Phase 1. A hypothetical example would be taking the financial parameter "carbon tax fluctuations" and using the formula: "the company's 2050 Scope 1 and 2 CO2 emissions amounts (estimated based on internal data) x carbon tax per

tCO2 for Scope 1 and 2 emissions amounts (obtained from forecast information)".[15]

Interviews with outside experts and continuous monitoring may be effective methods for risk/opportunity items that cannot be quantitatively estimated due to the information being qualitative or having little scientific basis. The key is in classifying risks by review status (evaluated/not yet evaluated) and clarifying what the next action should be. For interviews with external sources, the company could conduct interviews toward outside experts such as research institutes and specialists regarding risks/opportunities that cannot be calculated and store the interview results as qualitative information. For continuous internal monitoring, the company could perform continuous monitoring to obtain up-to-date information on risks/opportunities.

③ Be aware of the gap between future outlook and financial indicators in the business as usual

In Phase 3, the company will develop awareness of the degree of impact on the future business outlook based on the estimate results it calculated in Phase 2. By giving visible form to the degree of impact climate change will have on business outlook as it currently stands (future business targets/plans), the company will be able to grasp which risks/opportunities have a significant impact on business, as well as how great of a threat climate change is to business outlook for future operations/targets.

When giving visible form to impact, the company should not simply make a list of financial figures from impact, but rather use waterfall graphs (for example) to illustrate this by adding/subtracting the estimated financial impact from the predicted operating income for the target year in the scenario analysis time horizon. This will show the final profit figures and make it easier for viewers to visualize the impact.

[15] For examples of calculation formulas, refer to Chapter 2, p.2-44~2-57

2-5. STEP5. Identify potential response

In identifying potential responses for STEP5, the company should identify applicable, realistic choices for managing the identified risks and opportunities. The following responses are indicated here: "changes to the business model", "changes to the portfolio mix", and "investments in capabilities and technologies".

Specifically, the following process will be used: 1) understanding current in-house responses to risks/opportunities; 2) considering future actions for responding to risks and acquiring opportunities; 3) establishing an organizational structure and reviewing specific actions and procedures for the scenario analysis. The company will need to consider whether any modifications should be made to strategic/financial plans. The key is that the company be prepared for multiple scenarios and that it discloses information from the perspective of the reader.

On premise, when considering business strategies, the actions of each operation division are determined in the process of creating the corporate vision, formulating the medium-term business plan, and incorporating the business strategies into the operation division's activities plan. It is possible that, in the course of this process, there may be a difference in the direction taken by operation divisions versus responses based on corporate visions and medium-term business plans that do not take climate change into account. Consequently, it is important that, on principle, the company include climate change in medium-term business plans. If this is not possible, approaches should be made based on management's approval (top-down). The company should take care in such cases, however, as this may vary according to the corporate culture.

Meanwhile, the TCFD recommendations require specific responses, such as portfolio changes, business model changes, and low-carbon investment. However, these are not possible to implement all at once. Consequently, in this Practical Guide, we describe a process that starts with having the company consider responses according to the "limited personnel and time period" of the scenario analysis as an extension of the TCFD recommendations. Based on this, the company will then go on to implement responses for the company as a whole and in a manner that facilitates incorporation into the medium-term business plan and implementation by the related divisions/departments (applicable and realistic options, as stated in the TCFD recommendations).

Companies undertaking scenario analysis for the first time should proceed in the following direction: 1) identify significant risks requiring responses, and understand the company's current response status to significant risks; 2) establish a direction for future responses to significant risks; and 3) create a rough roadmap for implementing future responses/scenario analysis.

On the other hand, continuing companies should establish specific initiatives for future responses to significant risks based on dialogues with investors concerning the results of prior scenario analysis. It is also important that they work to further flesh out roadmaps for implementing these initiatives, as well as the framework for the organization structure needed to carry them out. In addition, one guideline these companies may wish to consider is incorporating TCFD recommendations and climate change as a concept into the medium-term business plan.

① Understand company's current status on risks management and seizing opportunities

The company should understand its response status concerning risks/opportunities with a large impact on its business and confirm the response status of rival companies if necessary. It is common to have a situation where the company already has responses in place (but relevant parties did not realize this due to barriers between divisions/departments). Because of this, it is key that the company first confirm its current responses while involving internal stakeholders. It will also be important for the company to check that there are no problems with its current initiatives by using other companies as benchmarks.

② Consider counter measures for climate-related risk management and seizing opportunities

In Phase 2, the company will consider specific responses for risks/opportunities with a large impact on its business. The important point is in planning responses that are resilient in any given situation. The company may also consider deciding on a rough direction for responses as a bare minimum before going on to consider

responses in the course of ongoing implementation. When considering responses, the members responsible for scenario analysis initiatives may work as a team to come up with examples to use to identify candidates for potentially relevant divisions/departments. For companies that have calculated the business impact for 2030 in addition to 2050, if the impact for 2030 is large, it is important to additionally consider how to recover for 2050 (e.g., investment in technology, expansion of energy-saving facilities, etc.).

Additionally, there may be cases where, when incorporating responses into the medium-term business plan, the members responsible for scenario analysis initiatives will need to negotiate a list of responses with the relevant departments/divisions if climate change has been included in the departments/divisions' activities plans. If a good relationship has already been established with the relevant department/division, it will be possible to immediately select responses that are related to existing business operations (for example, EV development for automobile companies). In cases where there is no relationship with existing business operations, then it will be key to establish responses based on the medium-term business plan described above.

③ **Establish practical action plans on organization structure**

In Phase 3, the company should establish the organizational structure required to proceed with responses and commence with practical actions with the cooperation of the relevant department/division. It should also consider how it will proceed with scenario analysis in the future. Once the responses have been incorporated into the medium-term business plan and management has given its approval, the next step is to establish an organizational structure (involving the relevant departments/divisions) and moving on to practical actions with the relevant departments/divisions. It is important that the company continue conducting scenario analysis itself as well as monitoring external information at least once per year, so the company will need to define the methodology for these processes.

The key points are the following: 1) incorporating climate change into business plans such as medium-term management plans; 2) establishing an organizational structure (or restructuring) based on management's understanding of the above (covered by the required governance items in the TCFD recommendations: “Describe the board's

oversight of climate-related risks and opportunities"; and "Describe management's role in assessing and managing risks and opportunities" [16]). When establishing an organizational system, a cross-sectional organization on climate change and related issues could be created directly under the corporate planning department in order to make the scenario analysis results more effective.

Additionally, it is key that the company conduct scenario analysis/disclosure/business strategy as a cycle (not as a one-time effort, as the goal is to create corporate value), because this will give the process consistency and enable the necessary continuous monitoring.

[16] Refer to Chapter 1, p.1-25

2-6. STEP6 Document and disclose information

In STEP6, the company will perform information disclosure after appropriately documenting the contents of the steps up to STEP5. In Japan, the revised Corporate Governance Code requires disclosure based on the TCFD recommendations for companies listed on the prime market, and the importance of appropriate disclosure is increasing. In addition, to the announcement at the end of January 2023 on the amendments toward “Cabinet Office Order on Disclosure of Corporate Affairs” by the Financial Services Agency, a section on sustainability information has been added to the securities reports. Due to the increasing demands for climate related financial disclosures, the number of cases of disclosures in securities report as well as integrated reports are increasing.[17]

When disclosing, the key points are for the company to document the positioning of the scenario analysis in the TCFD's recommended disclosure items as well as the results obtained from each step to ensure proper disclosure and enhance corporate value. Specifically, this should be done according to the following process: 1) describe the relationship between the TCFD's recommended disclosure items and the scenario analysis; 2) describe the results from each step. It may also be helpful to reference the TCFD Guidance[18].

Companies undertaking scenario analysis for the first time should proceed in the following direction: 1) describe the relationship between the TCFD disclosure items and scenario analysis; 2) describe the results for each step of scenario analysis toward significant risks; and 3) describe the company's response policy to risks.

On the other hand, companies continuing with scenario analysis should aim for the following based on dialogues with investors concerning the results of prior scenario analysis: 1) describe the relationship between TCFD disclosure items and the scenario analysis; 2) describe the results of scenario analysis toward significant risks in as quantitative a manner as possible for each step; and 3) describe the company's response policy to risks and specific initiatives.

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[17] For examples of disclosure in integrated reports and securities report, refer to Chapter 4。

[18] Refer to “TCFD Guidance 3.0” at the following URL
https://tcfd-consortium.jp/news_detail/22100501

① Describe the relationship between the TCFD`s recommended disclosure items and the scenario analysis

When performing disclosure, the company should first describe the positioning of the scenario analysis in relation to the TCFD's recommended disclosure items (11 items total)[19] . Specifically, the relevant part of scenario analysis considered here is Strategy: C in the TCFD recommendations, which states: " Describe the resilience of the organization’s strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario ".

Scenario analysis is only part of the TCFD's recommended disclosure items, so it may be helpful to effectively use contrast charts and other methods to show an overall picture of the disclosure in line with the TCFD recommendations.

② Describe the results obtained from each step

The next process is to list the scenario analysis results obtained up until now for each individual step. The key points are to clearly describe what kinds of risks/opportunities have been identified through the scenario analysis and show the organization's strategic resilience regarding climate change, such as what kinds of responses the company will implement. There is the view that it is not the disclosure itself that investors and experts are actually interested in; they are more concerned that the disclosure show the identified risks/opportunities and the impact on business strategy that can be seen in the scenario analysis results.

Specific items that should be included in order to show the organization's strategic resilience include the following: the status of climate change-related governance structure; information of data used as the basis for each scenario analysis; explanation of the appropriate transition of the company toward decarbonization by 2050; current/future initiatives toward risks/opportunities identified from the scenario analysis; narrative for climate change-related value creation based on scenario analysis results; and how the company will proceed with scenario analysis in the future and achieve the

[19] Refer to Chapter 1, p.1-25

goals.

On the other hand, the question of what information to disclose, and to what extent (when disclosing quantitative information, for example) is an issue often faced by companies undertaking scenario analysis. Some investors say that, in view of the penetration of the system and the recent trend to strengthen disclosure of climate-related information, it has been suggested that the disclosure of quantitative information will also be considered. Companies may consider performing disclosures while bearing in mind that investors are focusing on the effect on business, such as management's involvement in scenario analysis and how scenario analysis results will be leveraged into the company's business/management.

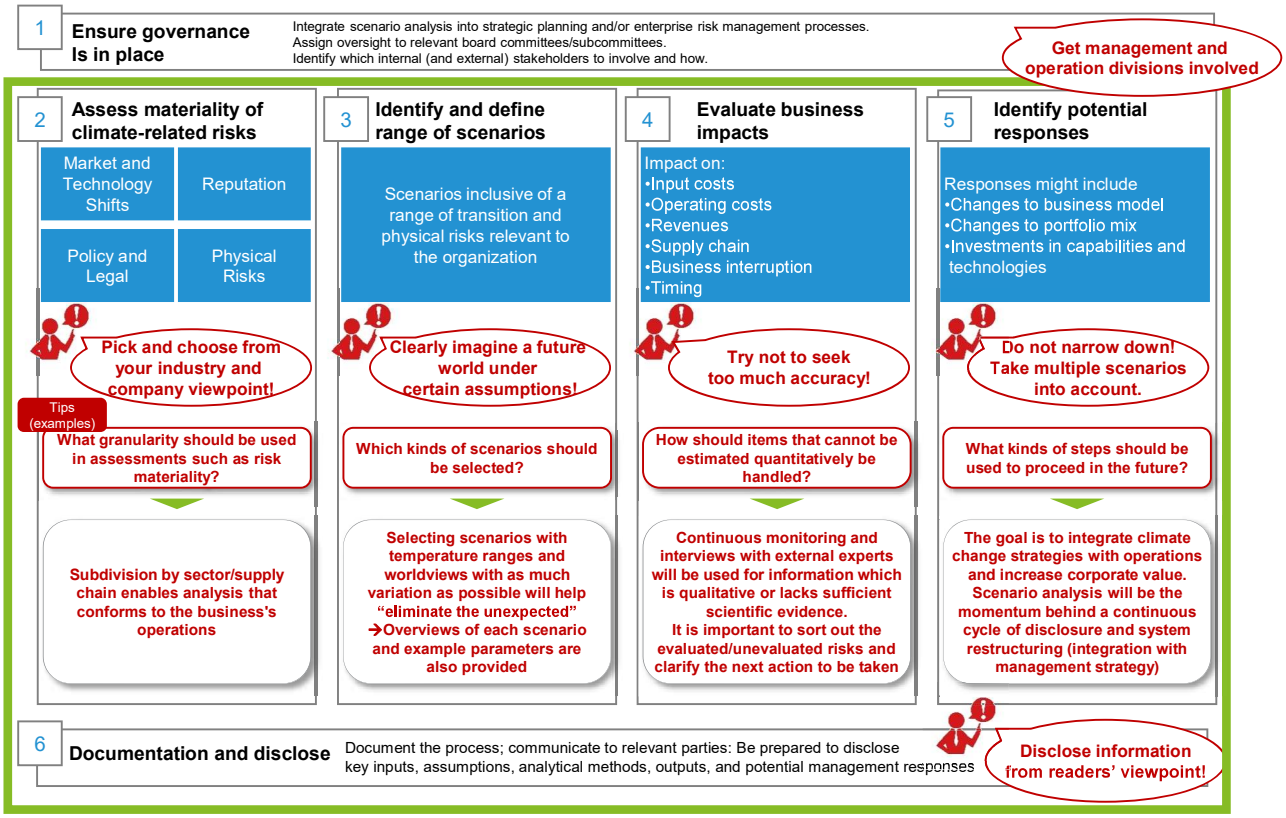
Furthermore, companies should not perform disclosure once and then leave it at that, but rather continuously increase the sophistication of the scenario analysis by having continued dialogue with investors based on the disclosure. Gradually enhancing the disclosure of the information used as evidence in the analysis based on dialogues with investors may lead to increased corporate value.

2. Scenario Analysis - Key Points of Practice

Chapter 2. Scenario Analysis - Key Points of Practice

This chapter explains how to practically undertake scenario analysis and describes key points of its practice, based on use cases performed by companies under the support program of the Ministry of the Environment.

The TCFD recommendations present 6 steps as a procedure for scenario analysis; we explain these with a focus on STEP2 to STEP6

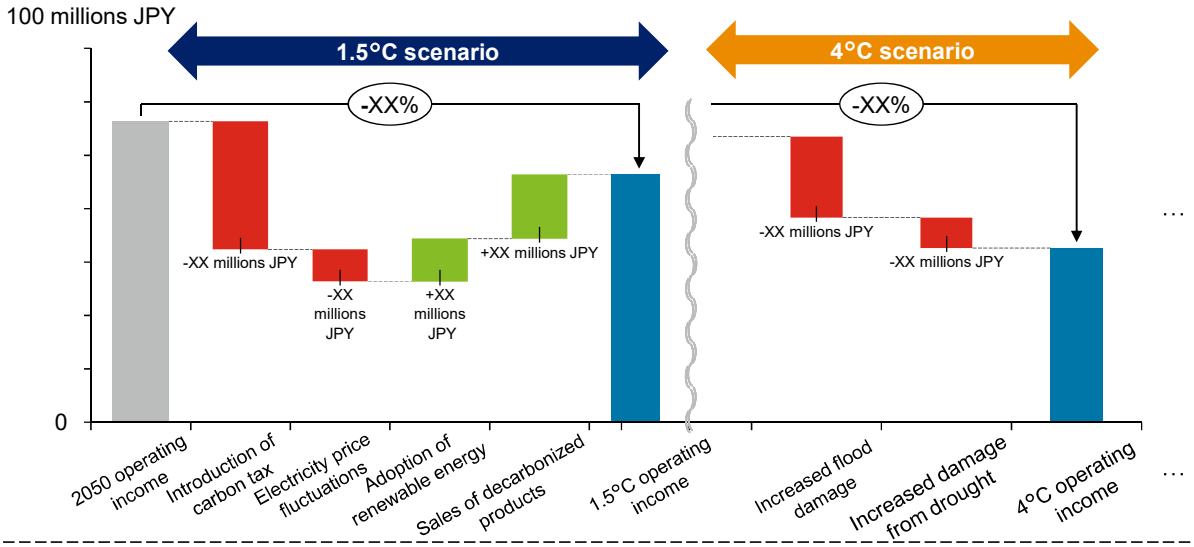


Sources: The Task Force on Climate-related Financial Disclosures, "Technical Supplement: The Use of Scenario Analysis in Disclosure of Climate Related Risks and Opportunities", June 2017.

(Notes in red: Points to consider in each step were added after the support program)

″Scenario analysis″ is the analysis of the impact of climate change on the company based on a set scenario; by quantifying impact, it can lead to understanding of specific impacts and to effective disclosures

[Scenario analysis: Sample evaluation of impact on business]



Understand the degree of impact climate change will have on the current business outlook trajectory (future management goals/plans)

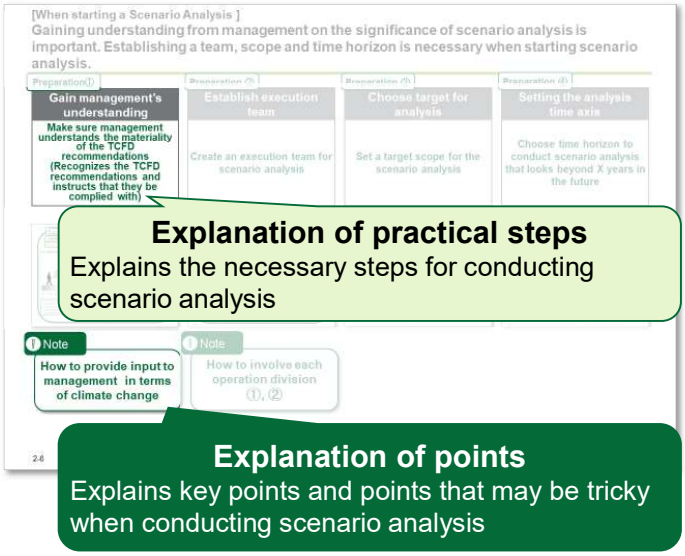
- ✓ Scenario analysis is conducted as a process where **the materiality of climate change risks is evaluated, a set of scenarios are selected, and then the impact on business is evaluated** p2-2
- ✓ Of the various STEPs, **it is particularly important** to use business impact evaluation (STEP 4) to **understand the financial impact of climate change** p2-38～2-57
- ✓ **It is a key to take a step-by-step approach** in quantifying financial impacts, such as starting with items that have a significant impact, such as carbon tax p2-4～2-6

Page number

【How to View the Key Points of Practice】

We describe scenario analysis procedures and the different levels for companies based on their prior experience with conducting scenario analysis

TCFD scenario analysis procedures



＋ Description of the different levels for implementing gradual initiatives based on companies' prior experience

Level	Assumed targets	Direction for "gradual" initiatives
"First time" companies	✓ Companies conducting scenario analysis for the **"first time"** (for example, companies in their first year of scenario analysis)	✓ Sure and steady implementation with awareness of the key points of practice, in line with the direction for "First time" companies ✓ Try starting to implement the "points for continuing companies" as much as possible
Continuing companies	✓ Companies conducting scenario analysis for the **"first time"**, but which are **already working on initiatives related to climate change to some degree** ✓ Companies **that have already implemented scenario analysis** (for example, companies in their second year of scenario analysis)	✓ Move on to the next step of "direction for continuing companies" and use this to increase the sophistication of decarbonized management ✓ Use disclosures and dialogue with investors to enhance analysis and presentation of evidence

【Directions for Scenario Analysis (1/2)】

Scenario analysis should be conducted on an ongoing basis, and built upon gradually

Page number

	For beginning scenario analysis	STEP2 Assess materiality of climate-related risks	STEP3 Identify and define range of scenarios
Direction for "first time" companies	☐ **Internal consensus has been reached** for conducting scenario analysis (management consents) p2-9~10 ☐ The **cooperation** of operation divisions has been **obtained** p2-11~13 ☐ The **scope/parties responsible (structure)** for scenario analysis have been **identified** p2-11~16	☐ Main climate-related risks for the sector and the company **have been identified** p2-19~21 ☐ Additionally, the specific impacts from risks **have been hypothesized** p2-21~23	☐ Reliable external scenarios **are being used** p2-27~35 ☐ Multiple scenarios, including those for 2°C or lower **(currently 1.5°C)**, have been selected (1.5°C, 2.5°C – 4°C) p2-27~35 ☐ The worldview for each scenario has been described in detail, and **internal consensus has been reached** P2-36~37
Direction for continuing companies	☐ The results of the previous scenario analysis are **understood by management / the heads of the responsible divisions** p2-9~10 ☐ Operation divisions can **take the lead** in conducting scenario analysis p2-11~13 ☐ **The scope / parties responsible (structure)** for scenario analysis **has increased compared to the initial effort** p2-11~16	**(Based on dialogue with investors)** ☐ Main climate-related risks for the sector and the company have **been further specified through increasing the involvement of operation divisions and outside experts** p2-19~21 ☐ The specific impacts from risks have also **been further specified through increasing the involvement of operation divisions and outside experts** p2-21~23	**(Based on dialogue with investors)** ☐ Reliable external scenarios are being used, and **additional scenario information for significant risks have also been supplemented** p2-27~35 ☐ Multiple scenarios, **including those for 1.5°C**, have been selected (1.5°C, 2°C, 2.5°C – 4°C) p2-27~35 ☐ The worldview for each scenario has been described in detail, and **has also been discussed with outside experts** P2-36~37

【Directions for Scenario Analysis (2/2)】

Page number

	STEP4 Evaluate business impacts	STEP5 Identify potential responses	STEP6 Document and disclose information
Direction for "first time" companies	☐ The impact on business from significant risks has been calculated quantitatively **(or qualitatively if the former proves difficult)** even if this is only a trial estimate p2-41~45, P2-52~57 ☐ The gap between the impact on business and normal results is understood p2-46~49 ☐ **The operation division agrees** with the method of calculating the impact on business and the resulting figures p2-50~51, P2-57 ☐ In sectors significantly affected by climate change, the impact on business has been calculated with **2030 to 2050 as the target fiscal years** p2-45~49	☐ Risks requiring responses have been identified p2-62 ☐ The company's current status in addressing significant risks is understood p2-62 ☐ **Policies for future responses toward** significant risks **have been established** p2-63 ☐ **A rough roadmap** for future response measures / how to proceed after scenario analysis **has been prepared** p2-64	☐ The relationship between TCFD disclosure items and the scenario analysis has been described p2-71 ☐ The results of scenario analysis toward significant risks has been described for each step p2-72~74 ☐ The company's response policy to risks has been described p2-72~74 ☐ An appropriate disclosure medium has been selected p2-72~74
Direction for continuing companies	**(Based on dialogue with investors)** ☐ Trial estimates for quantitative calculation of the impact on business from significant risks has been performed even for **impact that was initially calculated qualitatively** (though qualitative calculation may still be used where this is difficult) p2-41~45, P2-52~57 ☐ The gap between the impact on business and normal results is understood p2-46~49 ☐ **Management and outside experts agree** with the method of calculating the impact on business and the resulting figures p2-50~51, P2-57 ☐ In sectors significantly affected by climate change, the impact on business has been calculated with **2030 to 2050 as the target fiscal years** p2-45~49	**(Based on dialogue with investors)** ☐ Risks requiring responses have been identified p2-62 ☐ The company's current status in addressing significant risks is understood p2-62 ☐ **Specific initiatives for future responses toward** significant risks **have been established** p2-63 ☐ **A roadmap and organizational structure** for future response measures / **scenario analysis has been established** p2-64	**(Based on dialogue with investors)** ☐ The relationship between TCFD disclosure items and scenario analysis has been described p2-71 ☐ The results of scenario analysis toward significant risks has been described **in as quantitative a manner as possible** for each step p2-72~74 ☐ The company's response policy to risks and **specific initiatives** have been described p2-72~74 ☐ An appropriate disclosure medium has been selected p2-72~74

2. Scenario Analysis - Key Points of Practice

Scenario Analysis Guide - Key Points of Practice

2-1. For beginning scenario analysis

2-2. STEP2. Assess materiality of climate-related risks

2-3. STEP3. Identify and define range of scenarios

2-4. STEP4. Evaluate business impacts

2-5. STEP5. Identify potential responses

2-6. STEP6. Document and disclose information

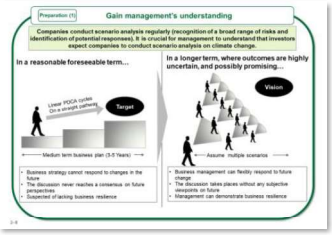
Chapter 2. Scenario Analysis - Key Points of Practice

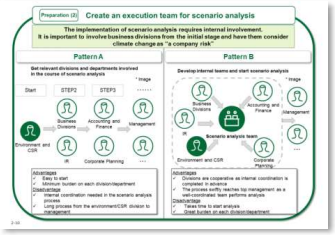
This chapter explains how to practically undertake scenario analysis and describes key points of its practice, based on use cases performed by companies under the support program of the Ministry of the Environment.

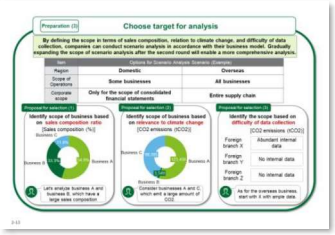
【When starting a Scenario Analysis】

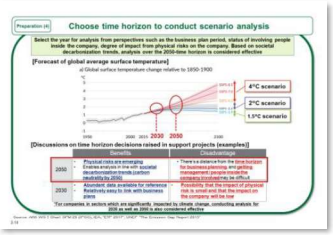
Gaining understanding from management on the significance of scenario analysis is important. Establishing a team, scope and time horizon is necessary when starting scenario analysis

Preparation (1)	Preparation (2)	Preparation (3)	Preparation (4)
Gain management's understanding	**Establish execution team**	**Choose target for analysis**	**Setting the analysis time axis**
Make sure management understands the materiality of the TCFD recommendations (Recognizes the TCFD recommendations and instructs that they be complied with)	Create an execution team for scenario analysis	Set a target scope for the scenario analysis	Choose time horizon to conduct scenario analysis that looks beyond X years in the future









Note

How to provide input to management in terms of climate change

Note

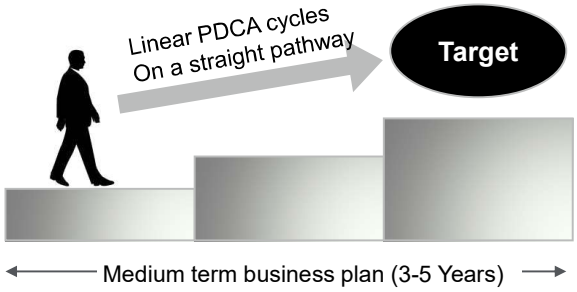
How to involve each operation division (1), (2)

Preparation (1)

Gain management's understanding

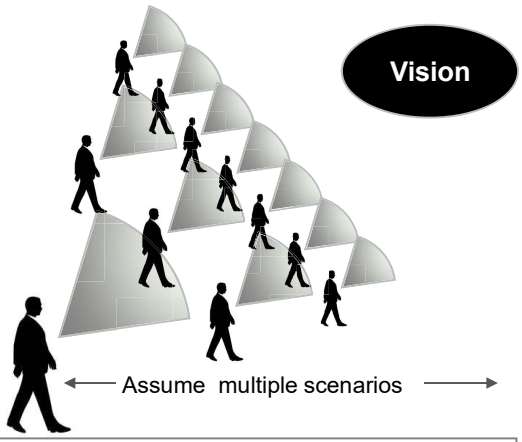
Companies conduct scenario analysis regularly (recognition of a broad range of risks and identification of potential responses). It is crucial for management to understand that investors expect companies to conduct scenario analysis on climate change.

In a reasonably foreseeable term…



- Business strategy cannot respond to changes in the future
- The discussion never reaches a consensus on future perspectives
- Suspected of lacking business resilience

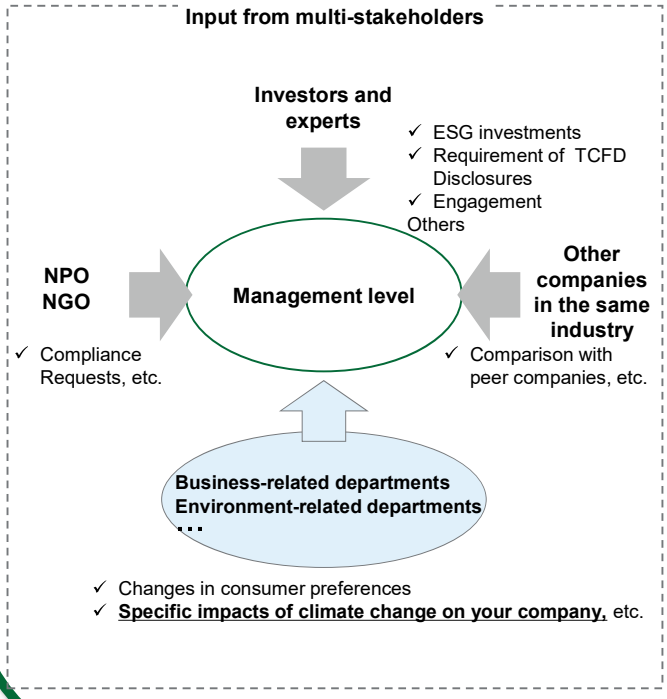
In a longer term, where outcomes are highly uncertain, and possibly promising…



- Business management can flexibly respond to future change
- The discussion takes places without any subjective viewpoints on future
- Management can demonstrate business resilience

How to provide input to management in terms of climate change

It is effective to convey the effect that climate change solutions have on the value of businesses through workshops with experts



- There are increasingly frequent requests from multi-stakeholders for responses to climate change. While there are cases where management hears about these trends directly, there are also cases where those messages don't reach management.
- In such a case, it is important to compile **the status of requests from multi-stakeholders**, and input to management **through study groups with experts and other means that responding to climate change can affect corporate value**.
- Continuing to input the results of climate change-related scenario analysis from the second round and after onward will further deepen management's understanding of the specific opportunities/risks related to climate change for the company.

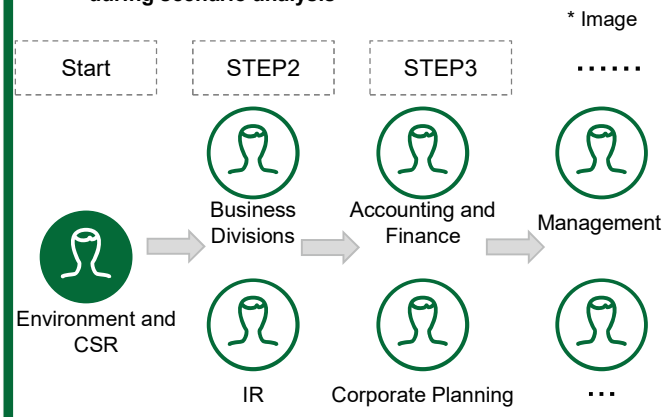
Preparation (2)

Create an execution team for scenario analysis

**The implementation of scenario analysis requires internal involvement.
It is important to involve business divisions from the initial stage and have them consider climate change as "a company risk"**

Pattern A

Get relevant divisions and departments involved during scenario analysis

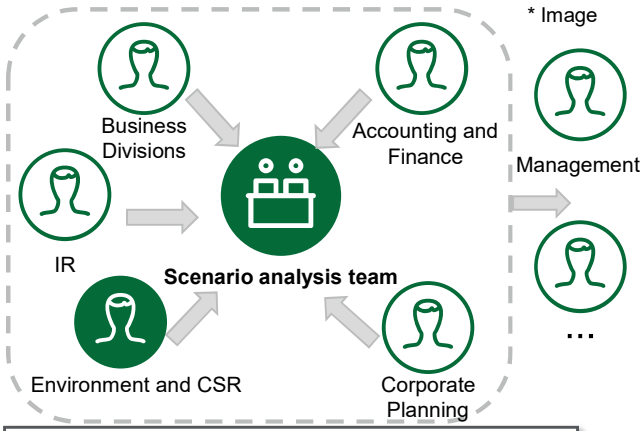


Advantages
- ✓ Easy to start
- ✓ Minimum burden on each division/department

Disadvantage
- ✓ Internal coordination needed in the scenario analysis process
- ✓ Long process from the environment/CSR division to management

Pattern B

Develop internal teams and start scenario analysis



Advantages
- ✓ Divisions are cooperative as internal coordination is completed in advance
- ✓ The process swiftly reaches top management as a well-coordinated team performs analysis

Disadvantage
- ✓ Takes time to start analysis
- ✓ Great burden on each division/department

How to involve each operation division (1)

**The following use cases exist as examples for involving operation divisions for companies that have implemented scenario analysis.
Effectively leveraging management's commitment and using narratives suited to each division/department are useful strategies, and daily communication of information within the company will also help promote understanding.**

Narratives for each operation division

- It may be good to put the focus on **how the company as a whole can reduce its CO2 emissions through the contributions of various areas such as products and procurement,** rather than concentrating only on reducing emissions from processes. Framing it in such a way could promote greater participation from each operation division.
- Since each operation division is connected, **we can motivate them by having each operation division consider strategies they can implement and come up with a storyline** for what to do. The important thing is **showing what they can do as a business**, and not being limited to environmental measures.

Effectively leveraging management's commitment

- We communicate with operation divisions in the following manner: "we are planning to discuss the results we reviewed based on external data at the management committee, **so if there is anything that you as a division think should be corrected, please let us know**".
- The backing of **management's commitment** allows us to use the momentum to involve operation divisions
- **While centered on the reduction targets set for the entire company**, the project involves related departments, executives involved in sustainability promotion, and conference bodies.

- There are many other issues besides climate change, and some might argue that those issues should be addressed first. However, we emphasize that **there is a need for us to focus on measures against climate change, as this is something that is required of us as a company**.
- Having **management position climate change measures as a priority issue** enables us to gain operation divisions' understanding that this is an important issue for the company.

Strengthening communication of information within the company

- We started **communicating information within the company** about the TCFD recommendations from the beginning stage of their implementation, so there was no sense of resistance internally as our staff was already aware of them.
- **When it became time to proceed with the scenario analysis, each division responded quickly by assigning members to the scenario analysis team.**

How to involve each operation division (2)

Operation divisions should also take the lead and be involved in the scenario analysis process. In the initial stages, it is assumed that operation divisions will provide interviews/data regarding the analysis results from ESG/sustainability-related departments

	Structure for conducting scenario analysis	How operation divisions are involved	Positions in the operation division that are involved
Companies undertaking scenario analysis for the first time	✓ Departments or other units responsible for ESG/sustainability will take the lead in conducting scenario analysis and interviews with operation divisions	✓ Provide data to those conducting scenario analysis ✓ Provide feedback on analysis results (for analysis conducted by other divisions)	✓ Not specified ✓ However, the responsible parties within the operation division should understand the significance and overview of scenario analysis
Companies continuing to conduct scenario analysis	✓ ESG/sustainability-related departments perform a secretarial role ✓ Operation divisions conduct scenario analysis/intra-divisional interviews	✓ Provide data to those conducting scenario analysis ✓ Conduct scenario analysis for related target areas ✓ Intra-divisional interviews	✓ Positions closest to decision making processes should be involved, as it will be necessary to involve operation division members in tasks such as data collection and promoting countermeasures

Preparation (3)

Choose target for analysis

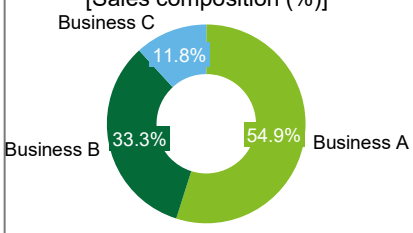
By defining the scope in terms of sales composition, relation to climate change, and difficulty of data collection, companies can conduct scenario analysis in accordance with their business model. Gradually expanding the scope of scenario analysis after the second round will enable a more comprehensive analysis

Item	Options for Scenario Analysis Scenario (Example)	
Region	**Domestic**	**Overseas**
Scope of Operations	**Some businesses**	**All businesses**
Corporate scope	**Only for the scope of consolidated financial statements**	**Entire supply chain**

Proposal for selection (1)

Identify scope of business based on sales composition ratio

[Sales composition (%)]

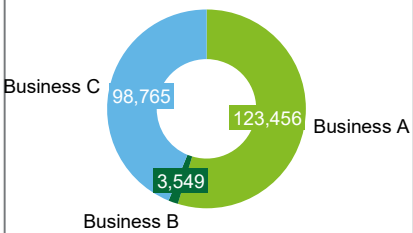


Let's analyze business A and business B, which have a large sales composition

Proposal for selection (2)

Identify scope of business based on relevance to climate change

[CO2 emissions (tCO2)]



Consider businesses A and C, which emit a large amount of CO2.

Proposal for selection (3)

Identify the scope based on difficulty of data collection

	[CO2 emissions (tCO2)]
Foreign branch X	Abundant internal data
Foreign branch Y	No internal data
Foreign branch Z	No internal data

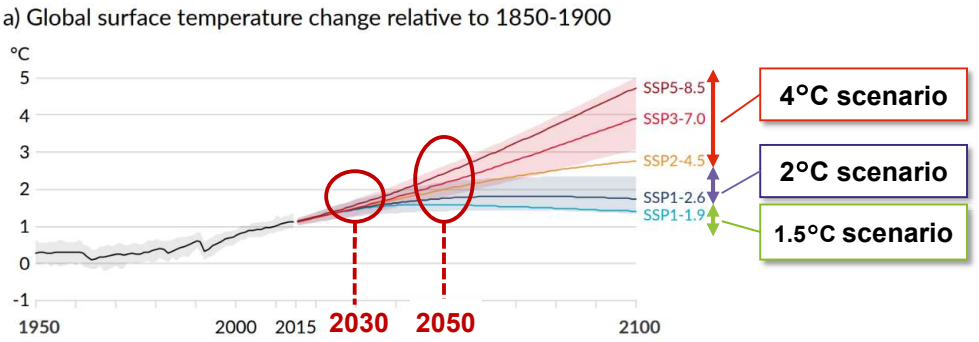
As for the overseas business, start with X with ample data.

Preparation (4)

Choose time horizon to conduct scenario analysis

Select the year for analysis from perspectives such as the business plan period, status of involving people inside the company, degree of impact from physical risks on the company. Based on societal decarbonization trends, analysis over the 2050-time horizon is considered effective

[Forecast of global average surface temperature]



[Discussions on time horizon decisions raised in support projects (examples)]

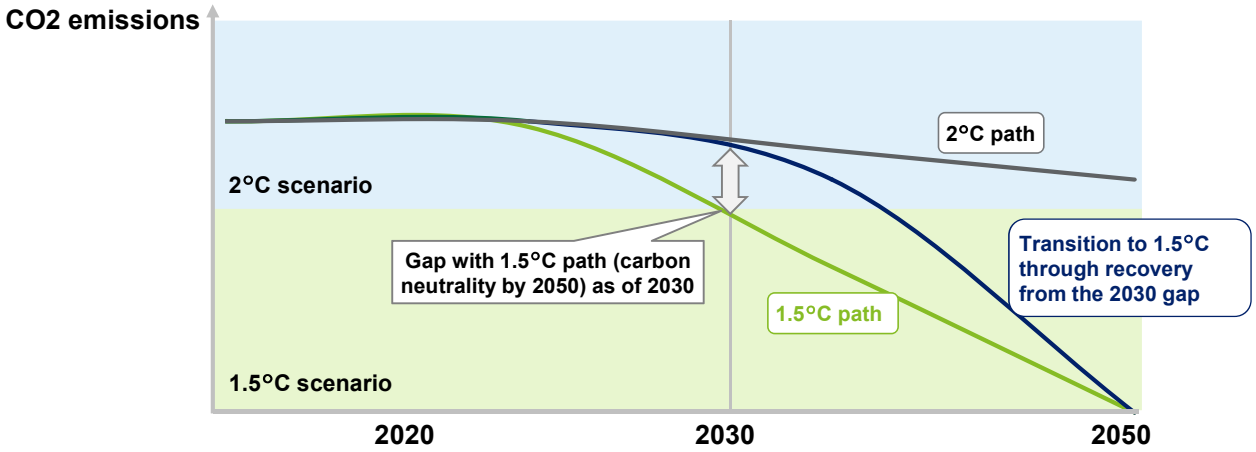
	Benefits	Disadvantage
2050	• Physical risks are emerging • Enables analysis in line with societal decarbonization trends (carbon neutrality by 2050)	• There's a distance from the time horizon for business planning, and getting management / people inside the company involved may be difficult
2030	• Abundant data available for reference • Relatively easy to link with business plans	• Possibility that the impact of physical risk is small and that the impact on the company will be low

***For companies in sectors which are significantly impacted by climate change, conducting analysis for 2030 as well as 2050 is also considered effective**

Source: AR6 WG I Chart SPM.29 (IPCC), IEA, "ETP 2017", UNEP "The Emission Gap Report 2015"

Considering a plan for transitioning to decarbonization

In sectors where climate change has a significant impact, scenario analysis for the target year 2030 in addition to 2050 can be useful to examine the mid- to long-term "transition to decarbonization" for carbon neutrality by 2050.
The transition path toward 2050 may not necessarily follow the 1.5°C path



The following points should be considered when investigating the transition toward decarbonization for carbon neutrality by 2050:

- ✓ **Is there a significant financial impact in the 1.5°C scenario as of 2030? (i.e., is there a gap between the 1.5°C path and the company's own path?)**
- ✓ **If there is a significant financial impact, how will the company recover from it? (investing in technologies, building more low-energy facilities, etc.)**

Furthermore, there are many things to consider when determining a transition plan (the company's starting position and track record, capital investment timing, etc.), so short and medium-term targets (e.g., for 2030) may not necessarily be on the same linear axis as long-term targets (2050), and also the path may not even be linear

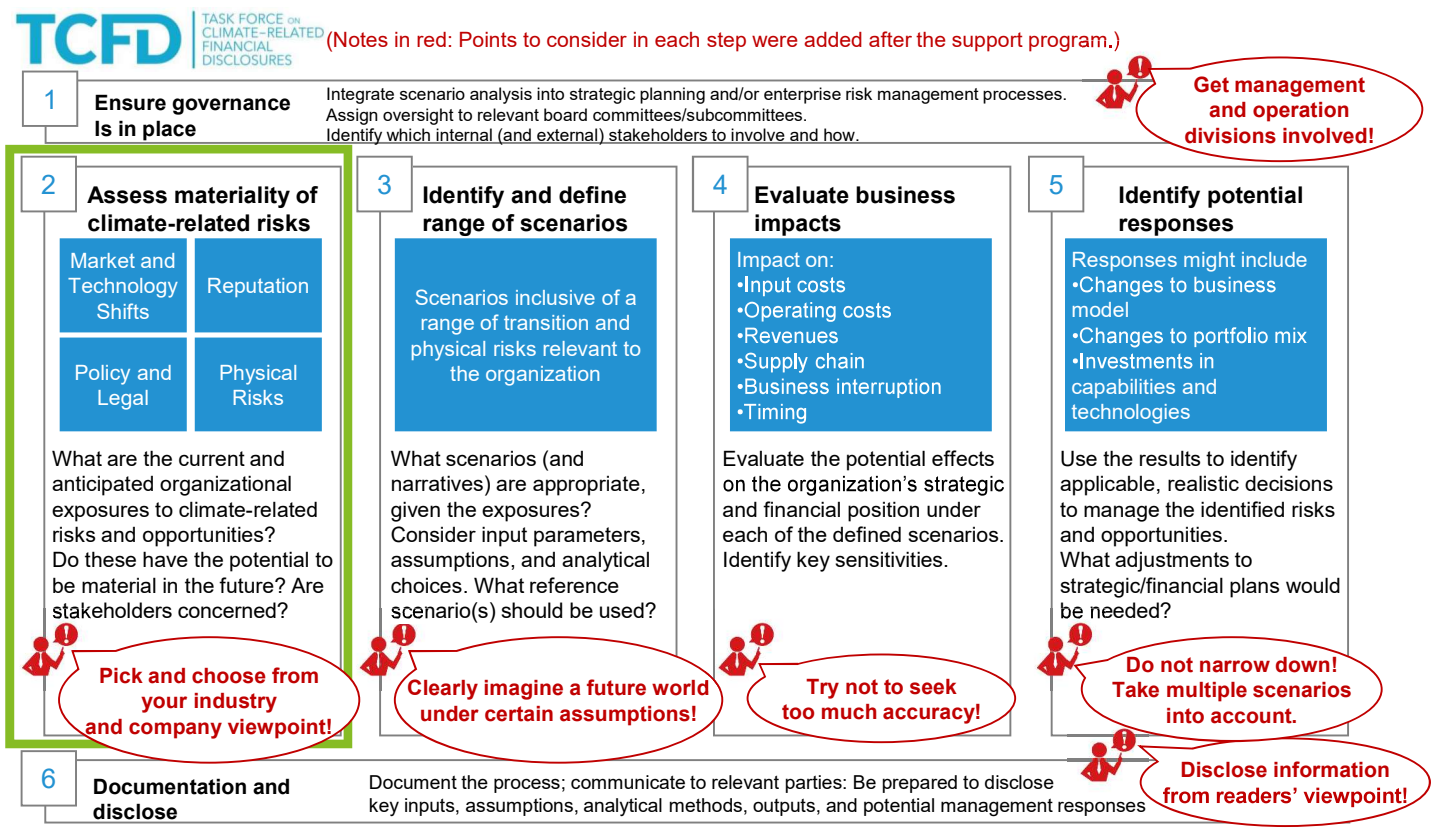
 Source: Financial Services Agency, Ministry of Economy, Trade and Industry, Ministry of the Environment, "Basic Guidelines on Climate Transition Finance" (2021)

2. Scenario Analysis - Key Points of Practice

Chapter 2. Scenario Analysis - Key Points of Practice

This chapter explains how to practically undertake scenario analysis and describes key points of its practice, based on use cases performed by companies under the support program of the Ministry of the Environment.

Assess materiality of climate-related risks: What are the current and anticipated organizational exposures to climate-related risks and opportunities?



Sources: The Task Force on Climate-related Financial Disclosures, "Technical Supplement: The Use of Scenario Analysis in Disclosure of Climate Related Risks and Opportunities", June 2017.

【Overview】

List risk items, identify the potential impacts on business, and assess materiality of climate-related risks

Stage1 — **List risk items**

List the risks and opportunities related to targeted business areas

Stage2 — **Identify potential impacts on business**

From the list of risk and opportunities, qualitatively describe the potential impact on business

Stage3 — **Assess the materiality of climate-related risks**

Conduct risk assessment based on scale of impact (large to small) and determine how important it is

Image

Transition risk / Physical risk classification	Index	Business Impact: Discussion: Risks	Business Impact: Discussion: Opportunities	Assessment
Carbon emission targets/policies of each country (Carbon tax)	Spending	Plant operating costs may increase due to the application of carbon taxes by governments of various countries	Quick responses such as shifting to use low-carbon energy could make it possible to limit energy cost increases	Large
Carbon emission targets/policies of each country	Spending	Production costs may rise due to rising costs of raw materials	Quick responses to anticipated future regulations could make it possible to limit production cost increases	Large
Changes in the energy mix	Spending	Electricity fees may rise and manufacturing costs may increase due to higher rates of reusable energy Costs may increase due to significant reductions in CO2 emissions for manufacturing plants	Expanding investment and increasing the use of renewable energy may lead to greater revenue from enhanced production capability	Large
Changes in important products/prices	Revenue Spending	Production costs of key products may rise due to requirements to display the carbon footprint of manufactured products, including in the textile industry	Options may increase for new materials, new products, and new services adapted to a circular economy, resulting in increased sales	Large
Changes in customer behavior	Revenue Spending	As more consumers and stakeholders make purchasing decisions based on environmental impact, delayed action may lead to loss of customers and decreased sales There is a risk of increased costs for presentation of risks such as use of hazardous substances and supply chain risks	By responding to changes in purchasing trends and expanding its line of environmentally friendly products, such as functional clothing that uses less energy and products utilizing recycled materials, GUNZE can maintain its market superiority and connect these to increased revenue	Large
Changes in investor's reputation	Revenue	Failing to keep pace with the apparel industry's standard-setting for energy, water, and material use may lead to increased costs for addressing potential reputation damage and decreased sales	Meeting sustainability requirements could lead to deeper relationships with customers, employees, regulators, and interest groups, which could lead to increased revenue	Medium

Note

To what extent should the risk assessment be conducted?

【Stage1: List risk items】

List risk and opportunity categories for targeted business areas

External reports
(Industry-specific reports such as SASB Standard, WBCSD Scenario Analysis Guide, etc.)

TCFD Recommended Disclosures

CDP responses from competitors

Other external information
(CDP responses, etc.)

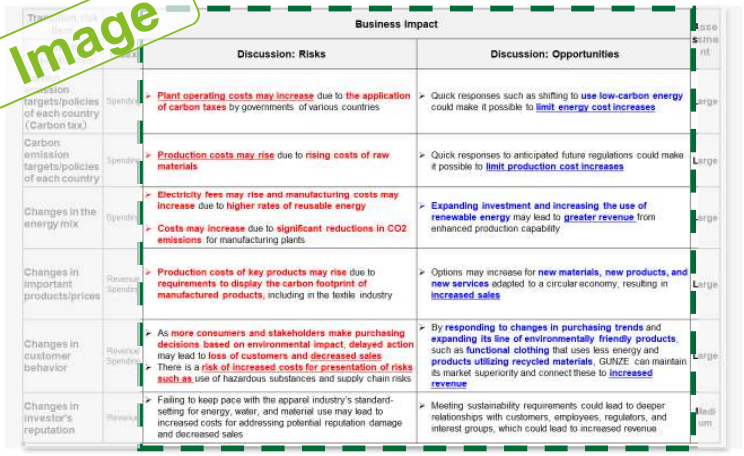
Classification	Risks and Opportunities Related to Climate Change (Examples)	
Transition Risk / Opportunity	Policy Regulation	Carbon price
		Carbon emissions targets/budgets in each country
		Energy-saving policy
		Fossil fuel subsidies
		Subsidies for renewable energy, etc.
	Market	Changes in the energy mix
		Changes in energy demand
		Changes in important products/prices
	Technologies	Diffusion of renewable energy and energy-saving technologies
	Reputation	Changes in customer reputation
		Changes in investor's reputation
Physical Risk / Opportunity	Chronic	Increase in average temperature
		Changes in rainfall and weather patterns
		Rising sea level
	Acute	Increasing severity of extreme weather conditions

Image

【Stage2：Describe the possible business impact qualitatively】

From the list of risk and opportunity items, qualitatively describe the potential impact on business

Image



Business Impact

	Discussion: Risks	Discussion: Opportunities
Carbon emission targets/policies of each country (Carbon tax)	Plant operating costs may increase due to the application of carbon taxes by governments of various countries	Quick responses such as shifting to use low-carbon energy could make it possible to limit energy cost increases
Carbon emission targets/policies of each country	Production costs may rise due to rising costs of raw materials	Quick responses to anticipated future regulations could make it possible to limit production cost increases
Changes in the energy mix	Electricity fees may rise and manufacturing costs may increase due to higher rates of reusable energy Costs may increase due to significant reductions in CO2 emissions for manufacturing plants	Expanding investment and increasing the use of renewable energy may lead to greater revenue from enhanced production capability
Changes in important products/prices	Production costs of key products may rise due to requirements to display the carbon footprint of manufactured products, including in the textile industry	Options may increase for new materials, new products, and new services adapted to a circular economy, resulting in increased sales
Changes in customer behavior	As more consumers and stakeholders make purchasing decisions based on environmental impact, delayed action may lead to loss of customers and decreased sales There is a risk of increased costs for presentation of risks such as use of hazardous substances and supply chain risks	By responding to changes in purchasing trends and expanding its line of environmentally friendly products, such as functional clothing that uses less energy and products utilizing recycled materials, GUNZE can maintain its market superiority and connect these to increased revenue
Changes in investor's reputation	Failing to keep pace with the apparel industry's standard-setting for energy, water, and material use may lead to increased costs for addressing potential reputation damage and decreased sales	Meeting sustainability requirements could lead to deeper relationships with customers, employees, regulators, and interest groups, which could lead to increased revenue

It is important to consider not only the company's risks but also its opportunities

Separate the risks and opportunities and examine them

CDP responses from competitors

External reports and other external information

Describe the possible impact in a narrative manner through discussions with related parties within the company, based on the company's business model, etc. If the analysis is to be conducted in the second round, it may be a good idea to include external stakeholders in the discussion.

Discuss with internal stakeholders

Source: This Practical Guide (example of GUNZE: 3-69)

【Stage3：Determining risk materiality】

Determine the materiality by looking at the magnitude of the business impact for each risk and opportunity

Image

Business impact	Risks and opportunities tied to business impact	
Large	• Carbon price • Changes in important products/prices	• Policies and regulations of each country • Changes in rainfall and weather conditions
Medium	• Changes in the energy mix • Changes in the reputation of customers and investors	
Small	• Energy-saving policy • Fossil fuel subsidies • Subsidies for renewable energy, etc. • Energy demand • Improving efficiency	• Diffusion of renewable/energy-saving technologies • Rising sea levels • Increasing in severity of extreme weather conditions

Compare each risk and opportunity item from the perspective of the **size of the business impact**

Example: **Rate risks and opportunities that impact in a wide range, and those that relate to important goods as "Large." Rate those that have no impact on the business as "small" and for others rate them as "medium."**

Example of Analysis (Changes in important Products)

Since raw materials account for a large proportion of the cost of sales, the business impact may be "large."

To what extent should the risk assessment be conducted?

Assessing materiality of risks after categorizing them by differences in products (by sector) and affected supply chains (by supply chain) enables an analysis that is convincing to management

Example (1)

Materiality assessment of risks by sector

Image

Risk Item	Materiality assessment of risks by sector		
	X	Y	Z
Risk A	Large	Medium	Small
Risk B	Small	Small	Large
Opportunity C	Large	Medium	Medium
Opportunity D	Medium	Large	Large

Example (2)

Materiality assessment of risks by supply chain

Image

Risk Item	Materiality assessment of risks by supply Chain			
	Procurement	Transportation	Sales	・・・
Risk A	Large	Large	Small	Medium
Risk B	Small	Small	Large	Large
Opportunity C	Large	Medium	Medium	Small
Opportunity D	Medium	Large	Large	Large

2. Scenario Analysis - Key Points of Practice

Chapter 2. Scenario Analysis - Key Points of Practice

This chapter explains how to practically undertake scenario analysis and describes key points of its practice, based on use cases performed by companies under the support program of the Ministry of the Environment.

Identify and define range of scenarios: What scenarios (and narratives) are appropriate, given the exposures?

TCFD TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES (Notes in red: Points to consider in each step were added after the support program.)

1 Ensure governance is in place

Integrate scenario analysis into strategic planning and/or enterprise risk management processes.
Assign oversight to relevant board committees/subcommittees.
Identify which internal (and external) stakeholders to involve and how.

Get management and operation divisions involved!

2 Assess materiality of climate-related risks

Market and Technology Shifts | Reputation | Policy and Legal | Physical Risks

What are the current and anticipated organizational exposures to climate-related risks and opportunities?
Do these have the potential to be material in the future? Are stakeholders concerned?

Pick and choose from your industry and company viewpoint!

3 Identify and define range of scenarios

Scenarios inclusive of a range of transition and physical risks relevant to the organization

What scenarios (and narratives) are appropriate, given the exposures?
Consider input parameters, assumptions, and analytical choices. What reference scenario(s) should be used?

Clearly imagine a future world under certain assumptions!

4 Evaluate business impacts

Impact on:
•Input costs
•Operating costs
•Revenues
•Supply chain
•Business interruption
•Timing

Evaluate the potential effects on the organization's strategic and financial position under each of the defined scenarios.
Identify key sensitivities.

Try not to seek too much accuracy!

5 Identify potential responses

Responses might include
•Changes to business model
•Changes to portfolio mix
•Investments in capabilities and technologies

Use the results to identify applicable, realistic decisions to manage the identified risks and opportunities.
What adjustments to strategic/financial plans would be needed?

Do not narrow down! Take multiple scenarios into account.

6 Documentation and disclose

Document the process; communicate to relevant parties: Be prepared to disclose key inputs, assumptions, analytical methods, outputs, and potential management responses

Disclose information from readers' viewpoint!

Sources: The Task Force on Climate-related Financial Disclosures, "Technical Supplement: The Use of Scenario Analysis in Disclosure of Climate Related Risks and Opportunities", June 2017.

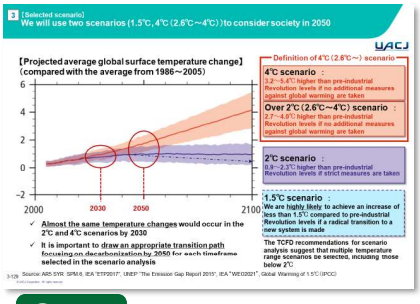
【Overview】

Choose scenarios, obtain forecast information on parameters, and shape the worldview

Stage 1

Choose scenarios

Choose a number of scenarios with different temperature targets, including the below 2°C (1.5°C).



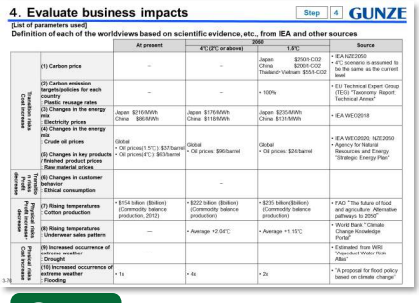
Note

What kind of scenarios should be chosen?

Stage 2

Obtain forecast information on relevant parameters (variables)

Obtain objective forecast information of relevant parameters on each risk and opportunity items and identify the effects to the company in further detail.



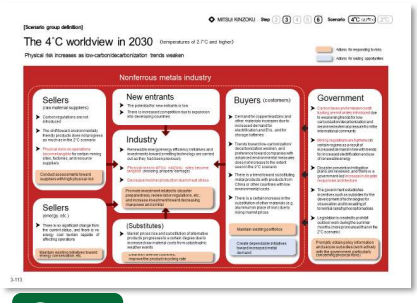
Note

What kind of scenario is the 1.5° C scenario? Parameter Example

Stage 3

Shape the worldview in consideration of stakeholders

Based on forecast information, shape the company's worldview such as future stakeholders' performance, and work towards achieving internal and external consensus by incorporating the perspectives from outside of company (If needed).



Note

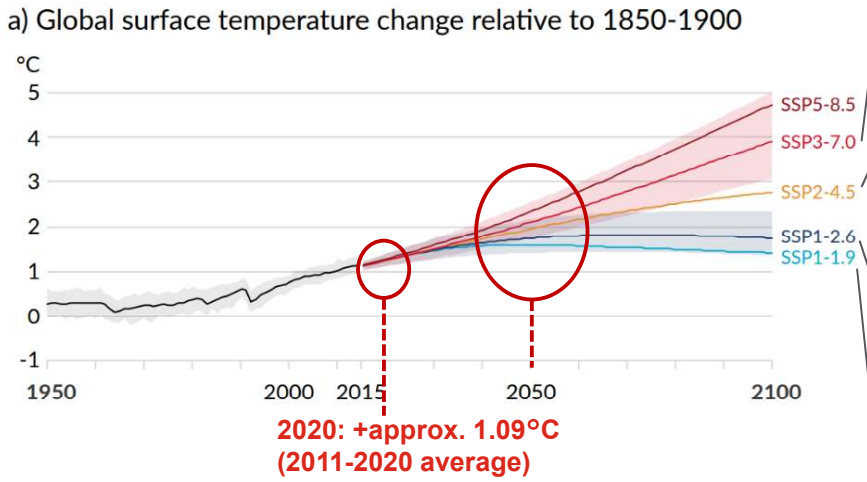
How to coordinate the worldview with each business division?

Sources: This Practical Guide (UACJ example: 3-129, GUNZE example: 3-76, Mitsui Mining & Smelting example: 3-113)

【Stage1: Choose scenarios】

We will select scenarios from multiple temperature ranges, including the below 2ºC (1.5°C) scenario, in order to respond to an uncertain future

[Predicted global surface temperature change]
(Difference with the 1850 – 1900 average)



SSP3-7.9: +2.8 – 4.6°C (approx. 3.6°C)
Mid- to high level reference scenario in which climate countermeasures are not adopted due to confrontational stances toward development between different regions Large volume of emissions besides CO2, such as aerosols

SSP2-4.5: +2.1 – 3.5°C (approx. 2.7°C)
Climate countermeasures are adopted, and development is neutral. Emission levels are largely on par with the upper limit of aggregated "Nationally Determined Contributions (NDCs)" for each country. The temperature increase compared to pre-industrial levels by the end of the 21st century is approx. 2.7°C (best estimate)

SSP1-2.6: +1.3 – 2.4°C (approx. 1.8°C)
There is sustainable development, and climate countermeasures are adopted to keep the temperature increase to below 2°C compared to pre-industrial levels. Net zero CO2 emissions is expected to be achieved by the latter half of the 21st century

SSP1-1.9: +1.0 – 1.8°C (1.4°C)
There is sustainable development, and climate countermeasures are adopted to keep the increase in temperature (median value) by the end of the 21st century mostly to approx. 1.5°C (there may be cases where it exceeds it slightly) or below compared to pre-industrial levels. Net zero CO2 emissions is expected to be achieved by the mid-21st century

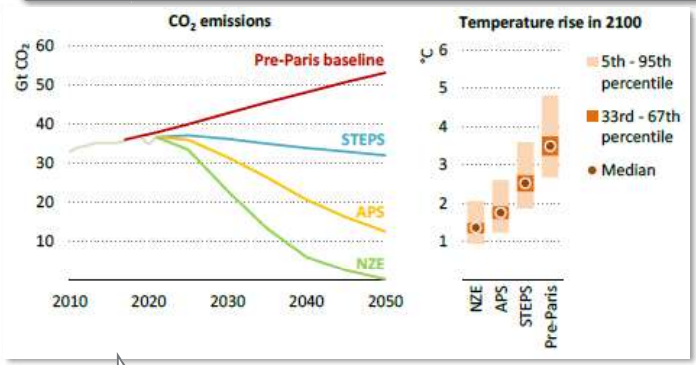
- ✓ **Up to 2030, the 2°C and 4°C scenarios have mostly the same level of temperature change. Starting in 2030, the gap between the scenarios widens**
- ✓ **The equilibrium climate sensitivity (ECS) for 2100 has a likely range of 2.5 – 4°C and a very likely range of 2 – 5°C, and a median value of 3°C**
- ✓ **If current trends continue, global warming will exceed 1.5°C and 2°C within the 21st century if emissions of CO2 and other greenhouse gases are not significantly reduced within the next few decades**

Source: AR6 WG Ⅰ Figure SPM.29 (IPCC), Ministry of the Environment

(Reference)

WEO 2022 evaluates NZE, which is a prescriptive scenario, and APS and STEPS, which are exploratory scenarios, as the 3 main scenarios

Global temperature rise in each WEO 2022 scenario



※The maximum temperature is introduced with a 50% probability

Assumption

- ✓ **Temperature rise in 2100 will be 2.5°C in STEPS, and 1.7°C in APS**
- ✓ **Temperature rise in the NZE scenario peaks below 1.6°C around 2040 and then falls to around 1.4°C in2100**
- ✓ Demand, electricity and fuel conversion are modeled for 26 countries and regions, while the supply side is modeled for all major producers
- ✓ **Assumes the war in Ukraine will not end in a quick and stable manner and that the international sanctions against Russia will be prolonged.** On the other hand, the report assumes that the international situation in other countries with major resources subject to sanctions (such as Iran and Venezuela) will gradually normalize

Source：IEA "World Energy Outlook 2022"

Exploratory

The Stated Policies Scenario (STEPS)

- ✓ "Stated Policies Scenario
- ✓ The temperature rise in 2100 will be 2.5°C
- ✓ Realistically examines the current policy situation and indicates the direction of the energy system in the absence of new policies
- ✓ Based on detailed sector-by-sector review of the policies and measures that are in place or under development in variety of areas. Also assesses relevant regulatory, market, infrastructure and financial constraints. goals

Exploratory

The Announced Pledges Scenario (APS)

- ✓ "Announced Pledges Scenario"
- ✓ The temperature rise in 2100 will be 1.7°C
- ✓ All climate change commitments are accounted, including NDC and long-term net zero targets. Assumes all targets are met on-time.
- ✓ Expanded the analysis to consider the impact on countries that have not made ambitious long-term commitments when cost reductions in clean energy technologies are accelerated

Prescriptive

Net Zero Emissions by 2050 Scenario (NZE)

- ✓ "Net zero emission scenario"
- ✓ The temperature rise in 2100 will be 1.4°C
- ✓ With a rapid increase in clean energy policies and investments, leading developed countries will reach net zero faster than others
- ✓ Meet key elements of the UN Sustainable Development Goals for energy: achieving universal access to energy and significantly improving air quality by 2030

⇒See chapter 5 for examples of the parameters

Which scenario should be chosen?

Selecting scenarios with temperature ranges and worldviews with as much variation as possible will help "eliminate the unexpected". It is important to consider the characteristics and parameters of each scenario and choose a scenario that matches the company's industry and situation, investor trends, and trends for domestic and international policies. It will also be effective to consider scenarios based on recent decarbonization trends (currently 1.5°C)

Scenario/temperature range	IEA WEO (World Energy Outlook)	SSP (Shared Socioeconomic Pathways)	PRI IPR (Inevitable Policy Response)	NGFS (Network for Greening the Financial System)
	• Lists medium- to long-term energy market forecasts ✓ Lists future information (quantitative/qualitative) related to energy	• Socioeconomic scenario based on recent policies and the socioeconomic environment ✓ Lists the macroeconomic information scenarios are based on for each scenario	• Scenario for climate-related policies that are likely to be implemented in the short term ✓ Lists qualitative and quantitative forecasts for climate-related policies ✓ FPS scenarios also include some forecasts for natural policies	• A common climate scenario for central banks and financial supervisors ✓ Scenarios are divided into temperature zones, technological development, and speed of policy response

		SSP1	SSP2	SSP3	SSP4	SSP5		
RCP8.5 (4°C)	—	—	—	—	—	○	—	—
RCP6.0	—	○	○	○	○	○	—	• Current Policies (3°C+, Hot house world)
RCP4.5	• STEPS (2.5°C, Stated Policies Scenario)	○	○	○	○	○	—	• NDCs (2.6°C, Nationally Determined Contributions, Hot house world)
RCP3.4	—	○	○	○	○	○	—	—
RCP2.6	• APS (1.7°C, Announced Pledges)	○	○	○	—	△ Partial achievement	• FPS (1.8°C, Forecast Policy Scenario) • FPS + Nature (FPS added nature related policies)	• Delayed Transition (1.6°C, Disorderly) • Below 2°C (1.6°C, Orderly)
RCP1.9 (Under 1.5°C)	• NZE (1.4°C, Net Zero Emissions by 2050)	○	—	—	—	—	• RPS (1.5°C, Required Policy Scenario)	• Divergent Net Zero (1.4°C, Disorderly) • Net Zero 2050 (1.4°C, Orderly)

*RCP stands for Representative Concentration Pathways. The subsequent values are the radiative forcing values (for example, RCP 2.6 indicates a radiative forcing increase of 2.6W/m2 by the end of the 21st century compared to pre-industrial levels)

✓: Climate models corresponding to RCPs exist
(✓) Some portions lacking models

Source：IEA website、Riahi et al. (2017) https://doi.org/10.1016/j.gloenvcha.2016.05.009 、PRI website、NGFS website

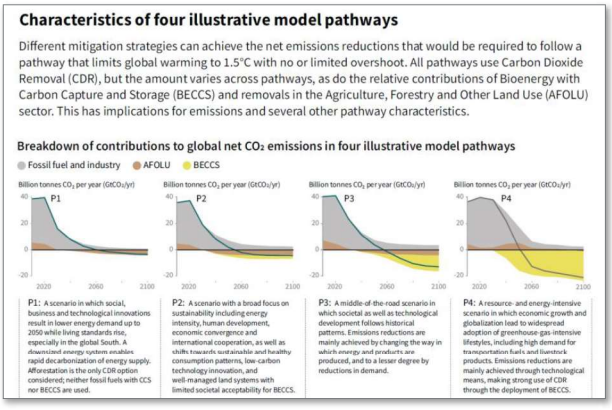
What kind of scenario is the 1.5˚C scenario?

The Paris Agreement indicated that efforts will be pursued to keep the global average temperature increase well below 2˚C and to keep it at 1.5˚C compared to pre-industrial levels.
In October 2018, the Intergovernmental Panel on Climate Change (IPCC) prepared a special report on the effects of a 1.5˚C global warming and the pathways through which it can emit greenhouse gases

Impact difference between 2˚C and 1.5˚C scenario (Examples)

	1.5° C scenario	2°C scenario
Sea level rise by 2100	Rise of 26 – 77cm	Rise of 30 – 93cm
Biological species loss	Insects：6% decrease Plants：8% decrease Vertebrates：4% decrease	Insects:18% decrease Plants:16% decrease Vertebrates:8% decrease
Disappearance frequency of sea ice in the Arctic Ocean during summer	Once in 100 years	Once in 10 years
Decrease ratio of catches	1.5 million tons	3.0 million tons
Impacts on coral reef	Approximately 70% – 90% dies	Mostly annihilated

Greenhouse gas emissions pathways to 1.5˚C



- Examples of 4 representative pathways (P1 to P4) are listed.
  - **P1: Low energy demand. No use of CCS**
  - **P2: Wide focus on sustainability**
  - **P3: Middle of the road scenario (business as usual)**
  - **P4: Expected use of CCS**

Source: Global Warming of 1.5° C (IPCC) https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SPM_version_report_LR.pdf

【Stage2：Obtain future information on related parameters】

Obtain objective forecast of risk and opportunity item`s parameters and identify the effects on the company in detail

List of Risks and Opportunities

Image

【Step2：Significance assessment of risks/opportunities】

Climate-related risks and opportunities in Nishitetsu Group's bus business

Type			Evaluation	Risks	Opportunities
Transition Risk	Policy	Carbon tax	Large	-Increased costs due to introduction of a carbon tax	-Decreased fuel procurement costs due to introduction of EV buses, etc.
		Regulations	Large	-Costs incurred for addressing demands to transition to EV buses, etc. -Difficult to continue business if these cannot be addressed	-Preemptive investment/introduction made possible through implementation/strengthening of policies and subsidy programs to promote the spread of EV buses
	Technologies	Spread of low-carbon technologies	Large	-Increased procurement costs for EV buses, etc. -Increased operation costs such as storage battery management costs and replacement costs -Increased maintenance costs for EV buses, etc. -Increased hard infrastructure construction costs for fueling facilities, etc.	-Lower prices for EV buses, etc., and the capacity to travel long distances lead to lowered vehicle procurement costs and barriers toward introduction -Reduced fuel procurement costs due to improved fuel efficiency from lighter vehicles -Increased sales due to the introduction of mixed passenger-cargo transportation -Revenue source secured through leveraging storage battery for energy management, etc.
		Development of next-generation technologies	Large	-Costs incurred for introducing automated driving technology -Increased maintenance costs for automated vehicle fleet	-Reduced costs from the spread of automated driving technology curbing fuel and personnel needs -Increased sales due to active use of public transportation due to the spread of MaaS and AI on-demand services, etc.

Parameters list

Image

【Step3：Identify and define range of scenarios】

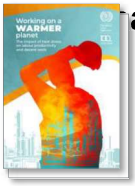
Definitions of various worldviews based on scientific evidence from IEA and other sources

Key items	Assumed parameter	Parameter area	Unit	BAU	2030 4℃	2030 1.5℃	2050 4℃	2050 1.5℃	Source
Carbon emissions targets/policies in each country	Carbon tax (Carbon border adjustment mechanism)	Developed countries	Yen/tCO2	-	-	14,300	-	27,500	・IEA WEO2020 ・IEA NZE2050 ・4℃ scenario is assumed to be the same as the current level
	Spread of environmentally friendly vehicles (EV/FC buses)	World	%	-	2%	23%	6%	78%	・IEA WEO2020 ・IEA NZE2050
Changes in the energy mix	Percentage change in price of fuel	World	%	-	21%	-5%	48%	-35%	・IEA WEO2020 ・IEA NZE2050
	Electricity prices	Japan	Yen/kWh	23,760	22,880	25,410	19,360	25,850	・IEA WEO2018
Development of next-generation technologies	Changes in numbers of private automobile users / bus users due to decarbonization	World	%	-	-	-	-	20-50%	・IEA NZE2050 ・4℃ scenario is assumed to be the same as the current level
Increasing severity of extreme weather conditions	Rate of change in instances of rainfall continuing for 12 hours or more	Japan (Hokkaido, Northwest area, Kyushu)	%	-	40%	15%	40%	15%	・"Vision for Flood Control Planning that takes Climate Change into Account, Basic Policy Recommendations" (Study Group on Flood Control Planning that takes Climate Change into Account)

* IEA (International Energy Agency): The IEA was established in 1974, after the first oil crisis, as an autonomous organization within the framework of the OECD. Its executive office is located in Paris. It has earned a high international reputation for its expertise in all aspects of energy policy.

It is important to obtain objective forecast information on parameters from external sources

Scenario Report
(IEA WEO (World Energy Outlook), IEA ETP (Energy Technology Perspectives) etc.)



External reports
(Industry-specific reports, academic papers, etc.)

Climate Change Impact Assessment Tools
(Physical Risk Map, Hazard Map, etc.)

⇒See chapter 5 for examples of parameters

Source：This Practical Guide (Nishi-Nippon Railroad examples: 3-55, 58)

What kind of parameters should be used? : Example of transition risks/opportunities ①

For transition risks/opportunities, the IEA have partially released parameter data for NZE (1.4°C), APS (1.7°C), STEPS (2.5°C, business as usual) scenarios, and parameter data such as the following is available

Parameter （ex.）	Parameter information that allows comparison of multiple scenarios
Carbon Price （2030・2050）	Table B.2 ▷ CO_2 prices for electricity, industry and energy production in selected regions by scenario ✓ **NZE (1.4°C) scenario** for developed countries • 2030 **140** USD/tCO2 • 2050 **250** USD/tCO2 ✓ **APS (1.7°C) scenario** for countries that have pledged net zero emissions by 2050 • 2030 **135** USD/tCO2 • 2050 **200** USD/tCO2 ✓ **STEPS scenario (2.5°C, business as usual)** for developed countries (EU) • 2030 **90** USD/tCO2 • 2050 **113** USD/tCO2
System power emission factor （2030・2050）	Table 5.1 ▷ Key energy indicators by scenario, 2010-2050 ✓ **NZE (1.4°C) scenario** for global • 2030 **165** g-CO2/kWh • 2050 **-5** g-CO2/kWh ✓ **APS (1.7°C) scenario** for global • 2030 **280** g-CO2/kWh • 2050 **41** g-CO2/kWh ✓ **STEPS scenario (2.5°C, business as usual)** for global • 2030 **325** g-CO2/kWh • 2050 **158** g-CO2/kWh

Table B.2 ▷ CO_2 prices for electricity, industry and energy production in selected regions by scenario

USD (2021) per tonne of CO_2	2030	2040	2050
Stated Policies Scenario			
Canada	54	62	77
Chile, Colombia	13	21	29
China	28	43	53
European Union	90	98	113
Korea	42	67	89
Announced Pledges Scenario			
Advanced economies with net zero emissions pledges[1]	135	175	200
Emerging market and developing economies with net zero emissions pledges[2]	40	110	160
Other emerging market and developing economies	-	17	47
Net Zero Emissions by 2050 Scenario			
Advanced economies with net zero emissions pledges	140	205	250
Emerging market and developing economies with net zero emissions pledges	90	160	200
Other emerging market and developing economies	25	85	180

Table 5.1 ▷ Key energy indicators by scenario, 2010-2050

			STEPS		APS		NZE	
	2010	2021	2030	2050	2030	2050	2030	2050
Electricity generation (1 000 TWh)	22	28	35	50	36	61	38	73
CO_2 intensity of generation (g CO_2/kWh)	524	459	325	158	280	41	165	-5
Share of low-emissions generation	32%	38%	53%	74%	59%	91%	74%	100%

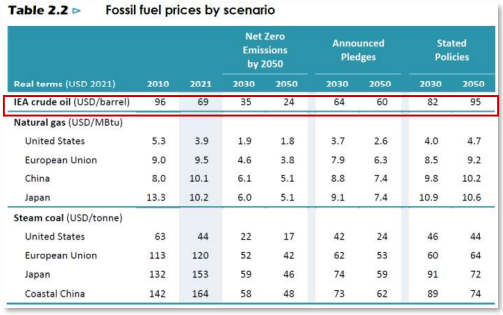
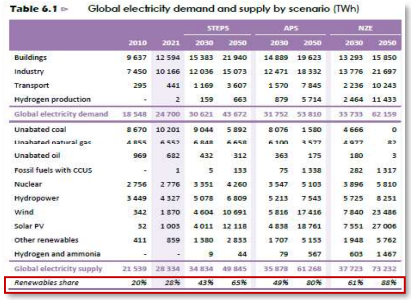
⇒See p2-52 for examples for calculating the impact of carbon tax introduction

⇒ See Chapter 5 for examples of other parameters

Source：IEA “World Energy Outlook 2022”

What kind of parameters should be used? : Example of transition risks/opportunities ②

For transition risks/opportunities, the IEA have partially released parameter data for NZE (1.4°C), APS (1.7°C), STEPS (2.5°C, business as usual) scenarios, and parameter data such as the following is available

Parameter（ex.）	Parameter information that allows comparison of multiple scenarios
Crude Oil Price（2030・2050）	**Table 2.2** ▷ Fossil fuel prices by scenario  ✓ **In the NZE (1.4°C) scenario**, globally • 2030 **35** USD/barrel • 2050 **24** USD/barrel ✓ **In the APS (1.7°C) scenario**, globally • 2030 **64** USD/barrel • 2050 **60** USD/barrel ✓ **In the STEPS (2.5°C, business as usual) scenario**, globally • 2030 **82** USD/barrel • 2050 **95** USD/barrel
Percentage of renewable energy in power mix（2030・2050）	**Table 6.1** ▷ Global electricity demand and supply by scenario (TWh)  ✓ **In the NZE (1.4°C) scenario**, globally • 2030 **61** % • 2050 **88** % ✓ **In the APS (1.7°C) scenario**, globally • 2030 **49** % • 2050 **80** % ✓ **In the STEPS (2.5°C, business as usual) scenario**, globally • 2030 **43** % • 2050 **65** %

⇒ See Chapter 5 for examples of other parameters

 Source：IEA “World Energy Outlook 2022”

What kind of parameters should be used? : Example of transition risks/opportunities ③

For transition risks/opportunities, the IEA have partially released parameter data for NZE (1.4°C), APS (1.7°C), STEPS (2.5°C, business as usual) scenarios, and parameter data such as the following is available

Parameter（ex.）	Parameter information that allows comparison of multiple scenarios
Hybrid/EV vehicle manufacturing costs（2030・2050）	**Table B.5** ▷ Capital costs for selected technologies by scenario  Notes: kW = kilowatt; tpa = tonne per annum; kWh = kilowatt-hour; n.a. = not applicable. All values are in USD (2021). ✓ **NZE (1.4°C) scenario,** globally • 2030年 (hybrid) **14,460** USD/vehicle (EV) **14,783** USD/vehicle • 2050年 (hybrid) **14,638** USD/vehicle (EV) **13,251** USD/vehicle ✓ **APS (1.7°C) scenario,** globally • 2030年 (hybrid) **14,528** USD/vehicle (EV) **15,265** USD/vehicle • 2050年 (hybrid) **14,718** USD/vehicle (EV) **13,618** USD/vehicle ✓ **STEPS scenario (2.5°C, business as usual),** globally • 2030年 (hybrid) **14,686** USD/vehicle (EV) **15,772** USD/vehicle • 2050年 (hybrid) **14,861** USD/vehicle (EV) **14,185** USD/vehicle

Future costs of hybrid vehicles will increase due to regional fuel economy and emissions regulations

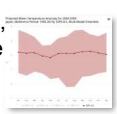
⇒ See Chapter 5 for examples of other parameters

 Source：IEA “World Energy Outlook 2022”

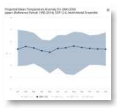
What kind of parameters should be used? : Example of physical risks/opportunities

For physical risks, the World Bank and others have released parameters, and parameter data such as the following is available to obtain

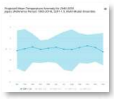
Parameter (ex.)	Parameter data
Increase in Average temperature (2040-2059)	✓ In the **4°C scenario (SSP5-8.5)**, there is an **average** temperature increase of **2.13°C** for Japan between 2040 – 2059 ✓ In the **2°C scenario (SSP1-2.6)**, there is an **average** temperature increase of **1.40°C** for Japan between 2040 – 2059 ✓ In the **1.5°C scenario (SSP1-1.9)**, there is an **average** temperature increase of **1.04°C** for Japan between 2040 – 2059
Rainfall, flow rate and frequency of flooding (Since 2040)	✓ In the **4°C scenario**, Japan at the end of the 21st century will have: • Rainfall: **approx. 1.3 times** • Flow rate: **approx. 1.4 times** • Flood frequency: **approx. 4 times** ✓ In the **2°C scenario**, Japan at the end of the 21st century (from 2040*) will have: • Rainfall: **approx.1.1 times** • Flow rate **approx.1.2 times** • Flood frequency: **approx.2 times**



Average temperature increase (°C)	Jan	Feb	Mar	Apr	May	Jun
Average 2.13	2.21	2.15	2.18	1.95	1.84	2.13
	Jul	Aug	Sep	Oct	Nov	Dec
	2.14	2.14	2.25	2.28	2.17	2.06



Average temperature increase (°C)	Jan	Feb	Mar	Apr	May	Jun
Average 1.40	1.36	1.57	1.45	1.22	1.09	1.42
	Jul	Aug	Sep	Oct	Nov	Dec
	1.47	1.61	1.49	1.42	1.37	1.35



Average temperature increase (°C)	Jan	Feb	Mar	Apr	May	Jun
Average 1.04	0.84	1.02	1.18	0.97	1.07	1.16
	Jul	Aug	Sep	Oct	Nov	Dec
	0.98	0.95	1.14	1.29	1.14	0.74

気候変動シナリオ	降雨量	流量	洪水発生頻度
2℃上昇時	約1．1倍	約1．2倍	約2倍
4℃上昇時	約1．3倍	約1．4倍	約4倍

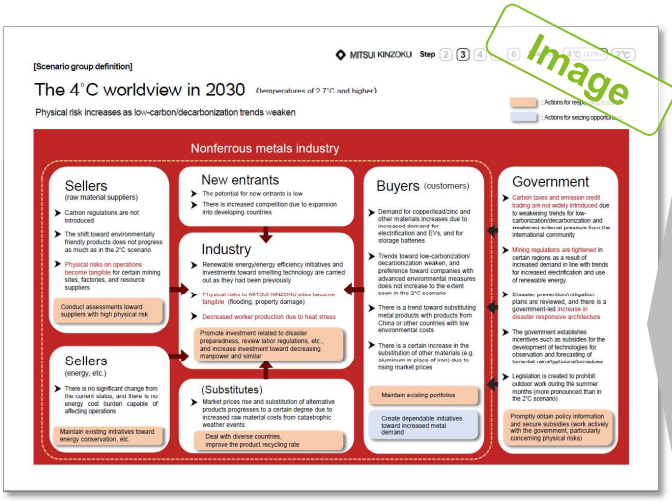
⇒See p2-54~55 for examples for calculating the impact of extreme weather
⇒ See Chapter 5 for examples of other parameters

*For 2°C (RCP2.6), the temperature increase is level until around 2040, so it is possible to apply values from after 2040

Sources: The World Bank, "Climate Change Knowledge Portal", Ministry of Land, Infrastructure, Transport and Tourism, Technical Study Group on Flood Control Planning in Consideration of Climate Change, "Proposal for Flood Control Planning in Consideration of Climate Change" (Revised April 2021)

【Stage3: Shape the worldview in consideration of stakeholders】

Based on forecast information, shape the company's worldview such as future stakeholders' performance and work towards achieving internal and external consensus by incorporating the perspectives from outside of company (if needed)



It would be useful to aim for building internal consensus after incorporating the perspectives from outside of company in order to understand comprehensive worldview.

Components of the worldview surrounding the company (e.g.)

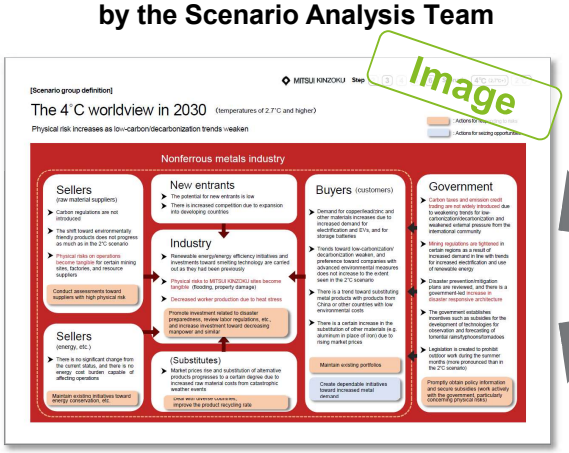
Government	✓ Legal systems and regulations related to risks ✓ Policies to promote opportunities
Industry	✓ Trends, technologies and tendencies related to climate change that are mainstream in the industry
Buyer (Customers)	✓ Customer trends and tendencies affecting products, businesses, and services we provide
Seller (Suppliers)	✓ Trends affecting raw materials and costs required for business
New comer	✓ Businesses themselves and new entrants who can change supply chains
Substitute product	✓ Substitutes, etc., that could affect the market for the products, businesses, and services provided

Source: This Practical Guide (example of Mitsui Mining & Smelting: 3-113)

How to coordinate worldview with each business division?

It is important to create a worldview that can convince relevant departments including business division through dialogue. In order to encourage relevant department members to think of climate change as their own problem, and to share the scenario's meaning and perspective, it is important to have a written narrative or some type of visualization to facilitate discussion

Worldview (draft) developed by the Scenario Analysis Team



Points in the discussion with each department to coordinate the worldview (Example)

Business Divisions

- ✓ Are there any discrepancies in the worldview, technology, products, etc., related to each business?
- ✓ Is it a worldview that is likely to occur in the future relative to the behavior of the sellers and buyers who interact with us in our day-to-day operations?

Corporate Planning

- ✓ Are there any discrepancies compared with the company's management strategy?
- ✓ Are there any prospects for the future compared to the industry outlook mentioned in our daily operations?

Source: This Practical Guide (example of Mitsui Mining & Smelting: 3-113)

2. Scenario Analysis - Key Points of Practice

Chapter 2. Scenario Analysis - Key Points of Practice

This chapter explains how to practically undertake scenario analysis and describes key points of its practice, based on use cases performed by companies under the support program of the Ministry of the Environment.

Evaluate business impacts:
Evaluate the potential effects on the organization's strategic and financial position under each of the defined scenarios.

TCFD TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES (Notes in red: Points to consider in each step were added after the support program.)

1 Ensure governance is in place
Integrate scenario analysis into strategic planning and/or enterprise risk management processes.
Assign oversight to relevant board committees/subcommittees.
Identify which internal (and external) stakeholders to involve and how.
Get management and operation divisions involved!

2 Assess materiality of climate-related risks
- Market and Technology Shifts
- Reputation
- Policy and Legal
- Physical Risks

What are the current and anticipated organizational exposures to climate-related risks and opportunities?
Do these have the potential to be material in the future? Are stakeholders concerned?
Pick and choose from your industry and company viewpoint!

3 Identify and define range of scenarios
Scenarios inclusive of a range of transition and physical risks relevant to the organization

What scenarios (and narratives) are appropriate, given the exposures?
Consider input parameters, assumptions, and analytical choices. What reference scenario(s) should be used?
Clearly imagine a future world under certain assumptions!

4 Evaluate business impacts
Impact on:
- Input costs
- Operating costs
- Revenues
- Supply chain
- Business interruption
- Timing

Evaluate the potential effects on the organization's strategic and financial position under each of the defined scenarios.
Identify key sensitivities.
Try not to seek too much accuracy!

5 Identify potential responses
Responses might include
- Changes to business model
- Changes to portfolio mix
- Investments in capabilities and technologies

Use the results to identify applicable, realistic decisions to manage the identified risks and opportunities.
What adjustments to strategic/financial plans would be needed?
Do not narrow down! Take multiple scenarios into account.

6 Documentation and disclose
Document the process; communicate to relevant parties: Be prepared to disclose key inputs, assumptions, analytical methods, outputs, and potential management responses
Disclose information from readers' viewpoint!

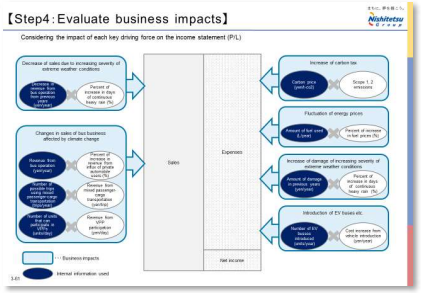
Sources: The Task Force on Climate related Financial Disclosures, "Technical Supplement The Use of Scenario Analysis in Disclosure of Climate Related Risks and Opportunities", June 2017.

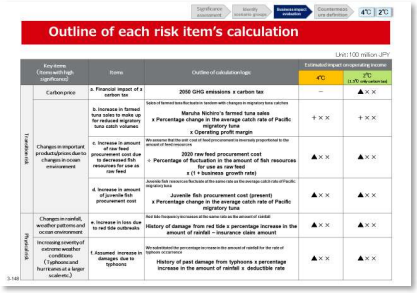
【Overview】
Estimate the financial impact on P/L and B/S, then compare the gap between future perspectives and financial items in the business as usual

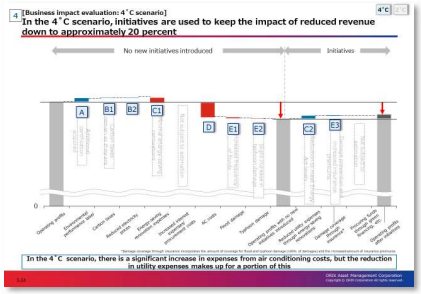
Stage 1
Identify potential financial items affected by risks and opportunities
Identify which financial indicators are possibly affected by business impact of climate change

Stage 2
Consider calculation formula and estimate financial impact
Consider calculation formula for risks that can be estimated, then estimate the financial impact based on internal information

Stage 3
Be aware of the gap between future outlook and financial indicators in the business as usual
Based on the estimated results, be aware of the scale of impact on the future outlook



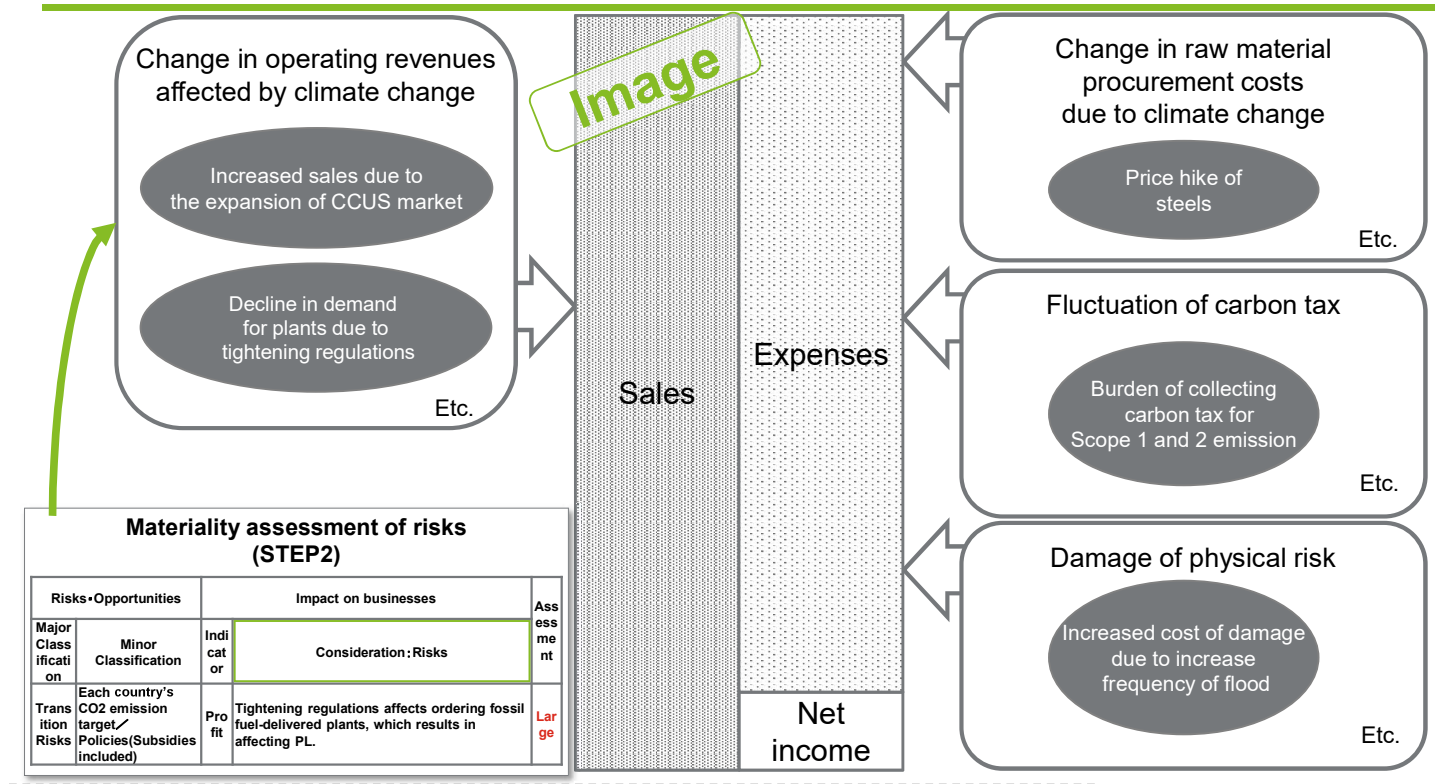




Source: This Practical Guide (Nishi-Nippon Railroad example: 3-61, Maruha Nichiro example: 3-148, ORIX Asset Management example: 3-24)

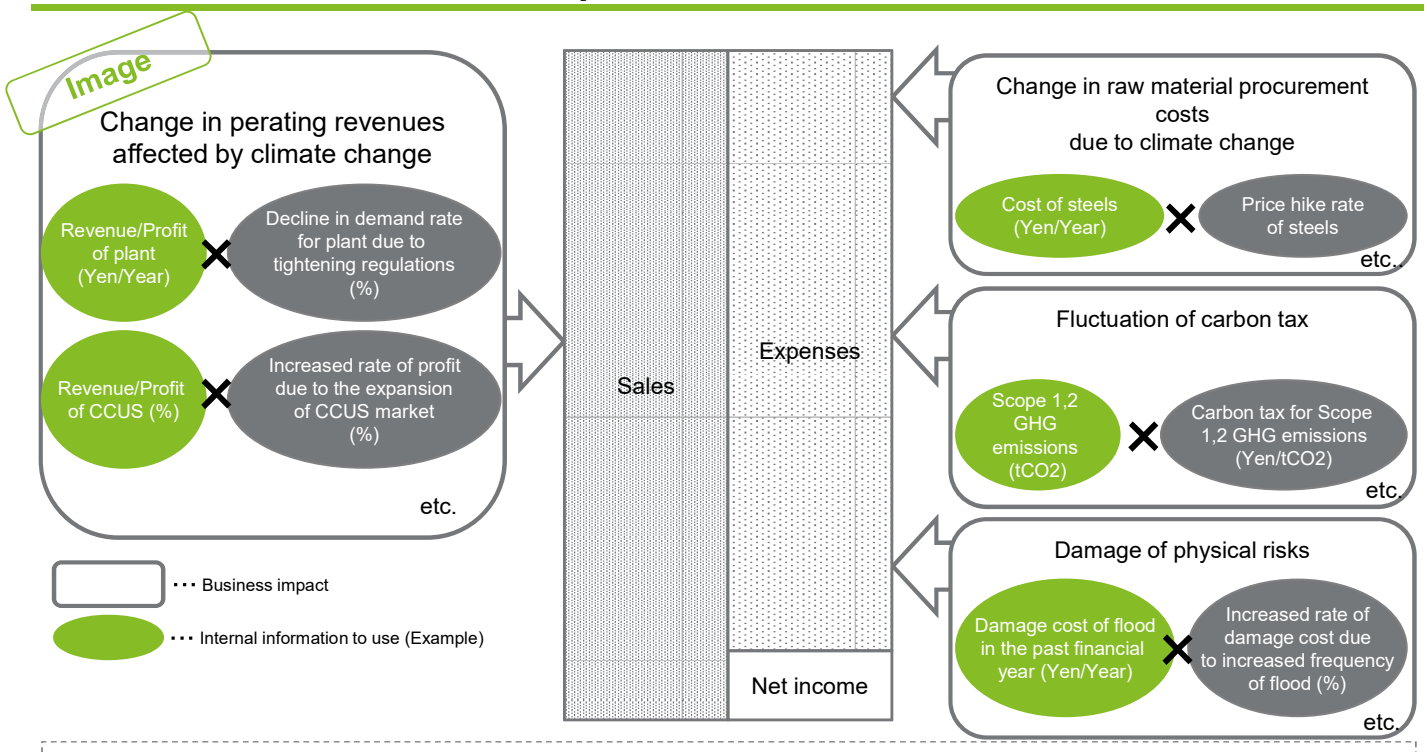
【Stage1: Identify potential financial items affected by risks and opportunities】

Identify which financial items of P/L and B/S are affected by risks and opportunities



【Stage2: Consider calculation formula and estimate financial impact】

Consider calculation formula for financial indicator that can be estimated, then estimate the financial impact based on internal information

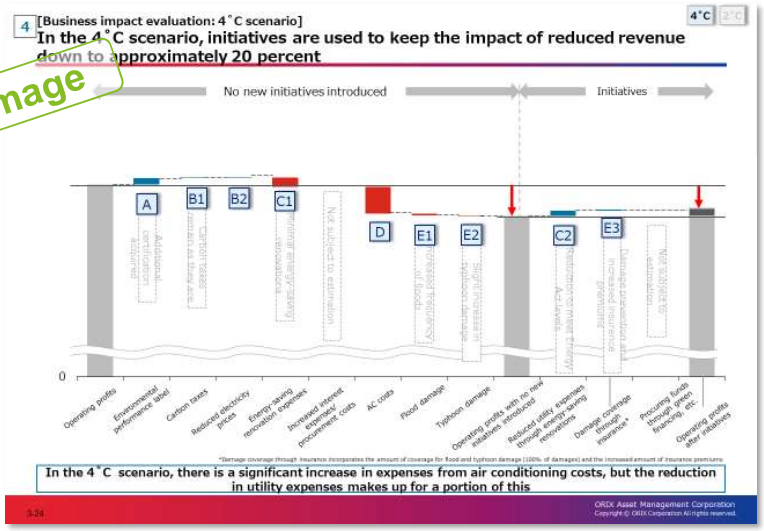


✓**For sectors in which climate change has a significant impact, it will also be effective to conduct analysis as of 2030 in addition to 2050**

✓**It is also important to align operation divisions' awareness of the calculation formula (as well as management, etc., for the second round and after)**

【Stage3: Be aware of the gap between outlook and financial indicators in the business as usual】

Based on the estimated results, be aware of the scale of impact on the outlook



Understand the impact of climate change on business prospects (future management targets and plans)

- ✓ What risks and opportunities have a greater impact?
- ✓ It is possible to understand the extent to which climate change threatens the business prospects for future management and targets. In some sectors and industries, the impact may be smaller than anticipated.

Source: This Practical Guide (example of ORIX Asset Management Corporation: 3-24)

【Questions that Company's have on calculating the Business Impact】

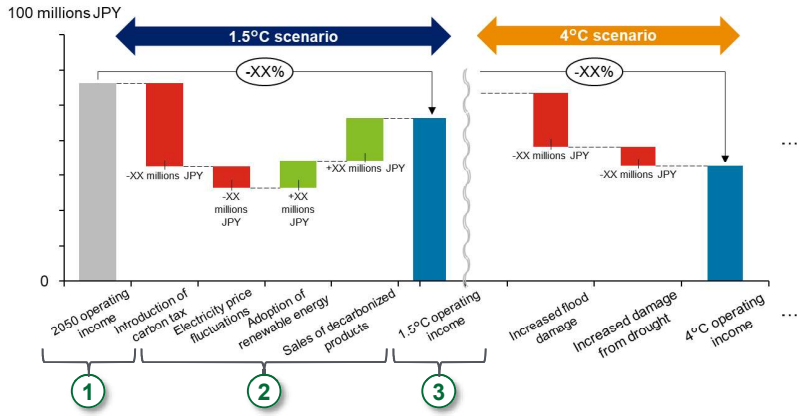
Many company`s are unclear on the assumptions, data collecting methods, and the formulas for calculating the business impact

	Response to assess the impact
Doubt① What should be included in the business impact	✓ First, compare the company`s scenario **with and without climate change`s affect** ✓ For each scenario, **calculate the impact that the main risks and opportunities have on the business**
Doubt② How to determine the business- as-usual situation	✓ First, consider the company`s **"financial situation (revenue/profit) "**and the **"GHG emission"** • Revenue・Profit: refer to your company`s long-term goals and business plan • GHG emissions: calculate the emissions for when decarbonization goals are achieved and when they are not achieved
Doubt③ What kind of data should be collected	✓ Collect data`s regarding the company's **revenue and cost of sales**. By collecting these data within the company, the calculation becomes more convincing • Revenue: Current／future business revenue, future revenue by business, operating profit, revenue targets and forecasts for related products • Cost of sales: Operating cost of electricity, fuels, etc., information on cost of sales, GHG emissions ✓ **If the risks for raw materials differs with regions,** it would be better to have **data on the country that the materials are source in, volume, price of the materials**
Doubt④ What kind of formulas are there	✓ In this practical guide, an example of the **"cost increase from carbon tax introduction"** and the **"damage due to extreme weather"** will be introduced ✓ The latest parameters that can be used for calculations are introduced in chapter 5
Doubt⑤ How to handle those that can not be quantitatively calculated	✓ First sort the risks and opportunities **as whether or not it is possible to calculate the impact (if there are little to no scientific basis or if it is qualitative, it is not possible to estimate the impact)** ✓ If it is **an important risk that can not be estimated at this time**, continue to monitor the situation and conduct interviews with outside experts

Doubt①

How to determine the business- as-usual situation

First, compare "your company's situation in a business-as-usual scenario" with "your company's situation in a climate change-affected scenario (= in line with each climate scenario)" based on "the impact of each risk and opportunity as it occurs"



① **Company`s situation in a climate neutral business-as-usual scenario:**
Examine the level of sales/operating income in the year of analysis (e.g., '30, '50, etc.) **if climate change is not considered**

② **Impact of each risk and opportunity as it occurs:**
Calculate **the impact of each climate-related risk/opportunity on sales, costs, and operating income** under the scenarios set in STEP3.

By calculating the total value of ① - ②, it is possible to calculate ③ the situation of the company in the scenario affected by climate change. By comparing ① and ③, the business impact of climate change (i.e., the gap between what is possible and what is not possible) can be determined.

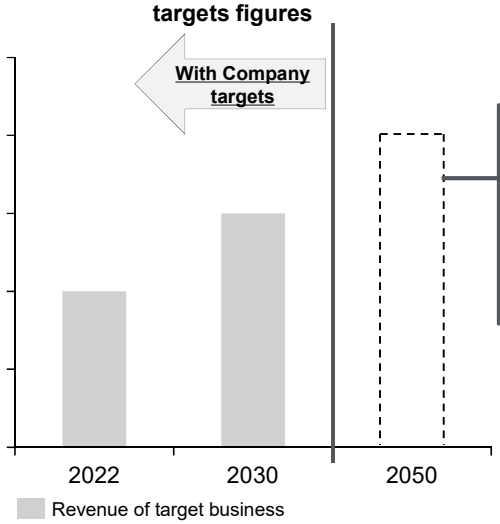
Doubt②

How to determine the business-as-usual situation: Financial Position

If the company has a target set for the year analyzed, financial performance should be based on the targets. When analyzing a year without a set financial target, it can be assumed that the financial performance remains flat or external information can be used.

【Example of setting a business-as-usual situation：when targets are set till the year 2030】

If targets are set for the analyzing year in the medium-term management plans, utilize the targets figures



Pattern① :
Assume that after the company`s target is met the financial performance will remain flat

✓ A conservative outlook pattern that assumes that the company`s growth will be flat after the target year

Pattern② :
Set using projected GDP growth rates

✓ A moderate outlook pattern that assume the company will grow at the same rate as the Japanese/global economy

✓ Using the company`s business areas/regions and the economic growth data that are referenced to determine whether to use Japanese/global/other figures

By reaching out to the department in charge of the developing the management plan or business plan when choosing the pattern, a more convincing analysis can be done

【Example of setting the business-as-usual financial situation：Pattern②, use projected GDP growth rates】

Whether to use Japan or the Global GDP growth rate data should be determined by the Company's business development outlook

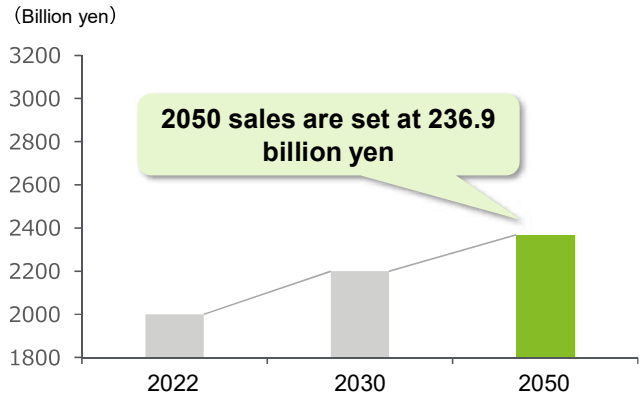
【Assumption for estimation（tentative）】

- Net sales and operating income related to the target business in 2022 were 200 billion yen and 20 billion yen, respectively.
- The Medium-Term Management Plan sets 2030 targets for the target businesses, with sales of 220 billion yen and operating income of 22 billion yen.

Pattern②-1：Set in line with Japan's GDP growth rate
(with growth comparable to that of the Japanese economy)

OECD`s predicted values for the Japanese GDP are
2030：$5.631 million
2050：$6.060 million

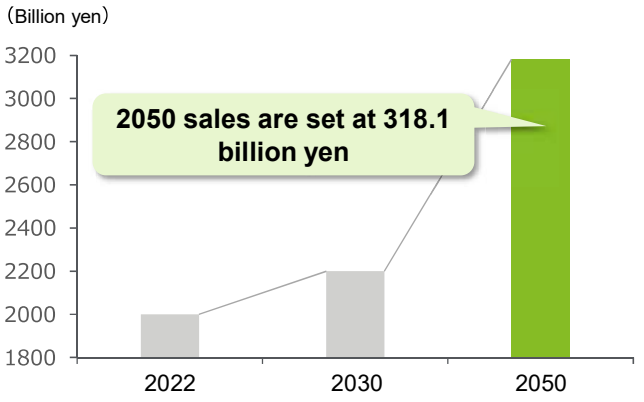
2030～2050, **Japan`s CAGR is expected to be 0.37%**



Pattern②-2：Set in line with global GDP growth
(with growth comparable to that of the global economy)

OECD`s predicted values for the global GDP are
2030：$141.996 million
2050：$205.429 million

2030～2050, **Global CAGR is expected to be 1.86%**



2-47 Source：Used the OECD Website（https://data.oecd.org/gdp/gdp-long-term-forecast.htm）to calculate

Doubt② How to determine the business-as-usual situation: CO2 Emissions

CO2 emissions are set separately with whether the company`s target are achieved or not. Changes in emission factors may be considered as well.
By setting patterns for both the highest and lowest impact, detailed impact can be analyzed

【Example of setting the business-as-usual CO2 emission】

Achieved company targets	**Achieved** emission targets × **Change** in the emission factor	✓ A **pattern with the most decarbonized outlook**, in which the company's CO2 emission targets are met and the emission factor changes (improves) ✓ Calculate based on **"the company`s CO2 emission targets – the amount of reduction resulting from changes in the emission factor"** ⇒See 2-52 for the calculation method
	Achieved emission targets × **No change** in the emission factor	✓ A pattern in which the company's CO2 emissions target is met, but the emission factor does not change ✓ Calculated with the **"company's CO2 emissions target"**
Company targets **are not met**	Emission targets are **not met** × **Change** in the emission factor	✓ A pattern in which the company's CO2 emission target **varies linearly with the number of emissions in previous years**, and the emission factor also changes (improves) ✓ Calculated based on **"CO2 emissions by the company based on previous years' data - reductions due to changes in emission factors"**
	Emission targets are **not met** × **No change** in the emission factor	✓ A **pattern of the least decarbonized outlook**, with the company's **CO2 emissions targets changing linearly with previous years' emissions**, with no change in the emission factor ✓ Calculated based on **"the company's own CO2 emissions based on historical data"**

By setting both scenarios, it is possible to determine the maximum/ minimum impact

【Example of setting the future CO2 emission in a business-as-usual scenario】

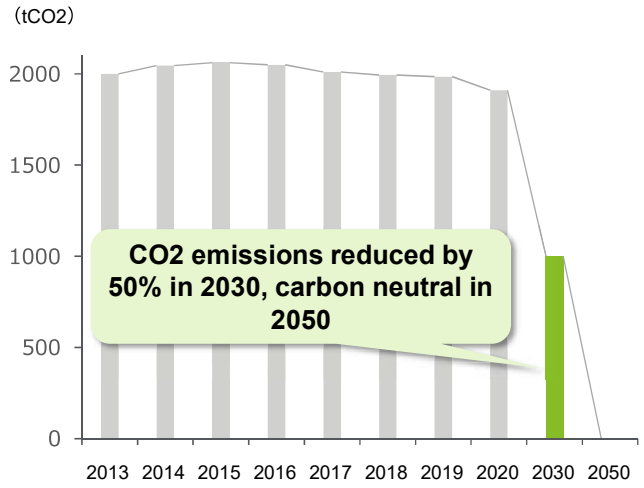
Set target achievement pattern with target values; and set the non-target achievement pattern using linear estimate of the past year emissions. Assess both the best and worst impacts to understand the specific impact on your company

【Assumption for estimation（tentative）】

- Aim to reduce emissions by 50% in 2030 (compared to fiscal 2013) and achieve carbon neutrality by 2050 as long-term reduction targets
- 1,000 tCO2 emissions in FY 2013, then a slight decrease until 2020

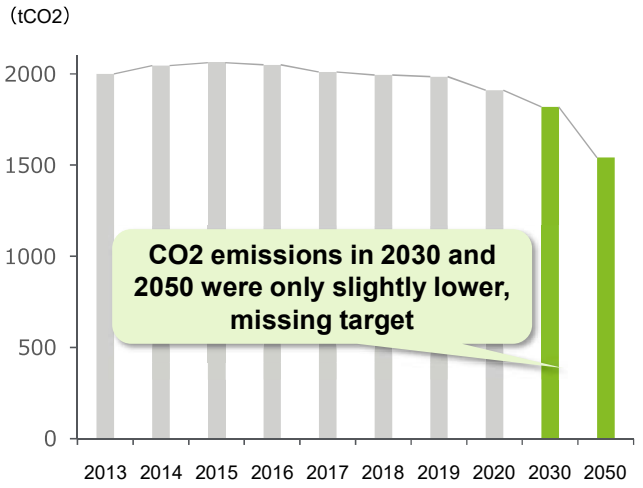
Pattern where the company's targets are achieved (without any change in the emission factor)

Set emissions projections **in line with company targets**



Pattern where the company's targets are not met (without any change in the emission factor)

Set emissions projections **with past CO2 emissions using a linear fashion**



Doubt③

What kind of data should be collected ①

By using data that is commonly used by business divisions (e.g., sales information by business/products, operational costs, cost structure, greenhouse gas emissions), it is possible to create estimations close to actual company conditions

	Information available for consideration	Methods for collecting information
Sales Structure	**Current and future sales and operating income by business segment** (Targets for net sales and operating income)	✓ Refer to the company's long-term management targets, etc. ✓ In the absence of relevant information, it is possible to calculate the current value using CAGR (annual growth rate), etc.
Sales Structure	**Sales forecasts and targets for related products in the future** (By product)	✓ Hearings from business divisions, corporate planning, etc. ✓ If owned, also collect information on future market conditions normally used by relevant departments.
Cost Structure	**Current operating costs** (Electricity and fuel prices, electricity and fuel consumption, etc.)	✓ Hearings from business divisions, corporate planning, etc.
Cost Structure	**Information on the cost structure of raw materials** (Number of raw materials used, procurement cost, etc.)	✓ Hearings from business divisions, procurement divisions, corporate planning, etc. ✓ If owned, also collect information on future market conditions normally used by relevant departments. ✓ Obtain information on the origin of raw materials that are affected by the origin of agriculture, forestry, fisheries, fossil fuels, forest resources, etc.
Cost Structure	**Current and future GHG emissions** (Scope 1 and 2, Scope3 if needed)	✓ Refer to the company's environment-related targets, etc.

Doubt③

What kind of data should be collected②: Data on Raw Materials

Due to varying regulations and impact of climate change depending on the region, raw materials related to agricultural, forestry and fishery products/fossil fuels/forest resources can be analyzed in detail by obtaining information on their place of origin

List raw materials with different risks depending on their origin and source, such as agricultural, forestry and fishery products/fossil fuels/forest resources

✓ For the business risks and opportunities that are subjected to scenario analysis, list the related **raw materials derived from agriculture, forestry and fisheries, fossil fuels, forest resources**

Of the listed raw materials, extract key raw materials

✓ Of of the listed raw materials, select those that are "**high in cost** (high procurement cost or procurement amount)", "**irreplaceable with other raw materials if there is a supply-chain disruption or if there is a change in the yield**" as a material raw material

Asses the impact based on the origin and source of identified raw materials

✓ Raw materials are identified. If there are too many places of origins, start the scenario analysis with the area with a **higher procurement cost/ more procurement amount**. **If finding the origin is challenging, one option would be to analyze the areas that are generally considered major.**

✓ An impact assessment is conducted after obtaining information on regulations and physical risks at the place of origin of the raw material

Doubt④

What kind of formulas are there: Increase in Cost due to Carbon Tax

Calculate the increase in the cost from carbon taxes by multiplying carbon tax with CO2 emissions. It is possible to include the change in emission factors for the assumptions of the emissions.

Increased expenses from introduction of a carbon tax (100 millions JPY) (1.5°C / 4°C) = Scope1 and 2 * CO2 emissions (tCO2) for the target year × Carbon tax on CO2 emissions (JPY/tCO2)

*Currently Scope1 and 2; it will be effective for sectors significantly impacted by climate change to consider Scope 3, too

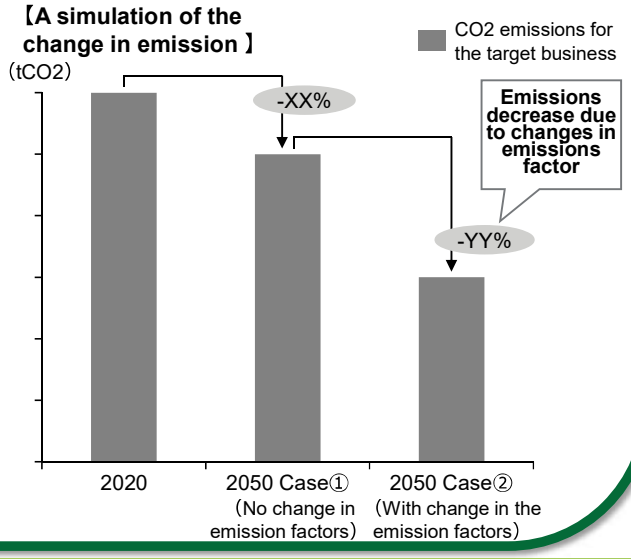
Case① No change in the CO2 emission factor for Scope2

(Assumptions)
- Emissions are expected to decline by XX% compared to 2020 levels by 2050
- As there will be no change in the emission factor, the expected CO2 emission reduction will remain as XX%

Case② With change in the CO2 emission factor for Scope2

(Assumptions)
- Emissions are expected to decline by XX% 2050 compared to 2020 levels by 2050 (same as Case①)
- As the emission factor for 2050 will decline, the emission factor reduction of YY% will be added to the expected CO2 reduction. Therefore, the CO2 emission reduction will be (XX%+YY%)

【A simulation of the change in emission 】



⇒See p2-32 for parameters for carbon tax and emission factors

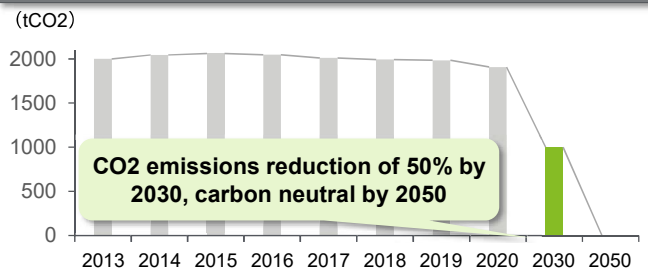
【Example calculation of the cost increase due to carbon tax】

Assess the impact by calculating each target achievement/non-achievement pattern

【Calculation assumptions (tentative) 】

- For businesses that are subjected to the analysis, the revenue was 200 billion yen, and the operating profit was 20 billion yen for 2022
- In the medium-term management plan, targets for the businesses that are subjected to the analysis were set as revenue of 220 billion yen and operating profit of 22 billion

Pattern where the company`s targets are achieved (no change in the emission factor)

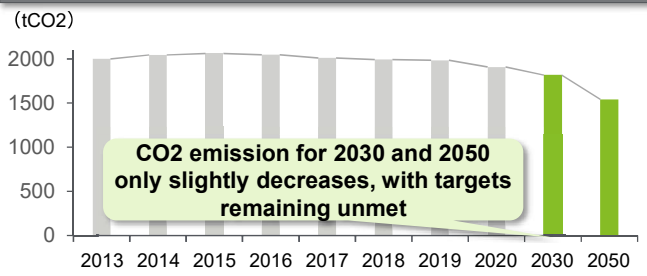


【Parameters used】
Using values from IEA WEO 2022 (NZE scenario)
- 2030：1.5°C **18,260 yen/tCO2**
- 2050：1.5°C **32,608 yen/tCO2**

※Calculated using 1 dollar＝130.43 yen（Exchange rate on 2023/1/31）

【Formula】
- 2030：1,000tCO2 × 18,260（yen/tCO2） ＝ **18.26 million yen**
- 2050：（No impact since emission is 0）

Pattern where the company`s targets are not met (with change in the emission factor)



【Parameters used】
Using values from IEA WEO 2022 (NZE scenario)
- 2030：1.5°C **18,260 yen/tCO2**
- 2050：1.5°C **32,608 yen/tCO2**

※Calculated using 1 dollar＝130.43 yen（Exchange rate on 2023/1/31）

【Formula】
- 2030：1,818tCO2 × 18,260（yen/tCO2） ＝ **33.2 million yen**
- 2050：1,540tCO2 × 32,608（yen/tCO2） ＝ **50.22 million yen**

※CO2 emissions are tentatively set for calculation

2-53 Source：Used IEA World Energy Outlook 2022 to calculate

Doubt ④

What kind of formulas are there: Damage due to extreme weather

For increased costs due to increased incidence of severe weather, it is possible to calculate the amounts of damages using the percentage of increased frequency and the probability of occurrence after calculating the amounts of damages per day from operations being suspended

Amount of damages due to flooding (100 millions JPY) (1.5°C / 4°C) = Increase in frequency (times) × Probability of occurrence (times) × Total amount of damages due to flooding (**YY** millions JPY)

Amount of damages per day (**XX** millions JPY) = Sales (100 millions JPY) × Operating margin (%) ÷ Number of business days (days) ÷ Number of target sites (sites)

Estimated amount of damages due to flooding for each level

[Example for calculating damages]

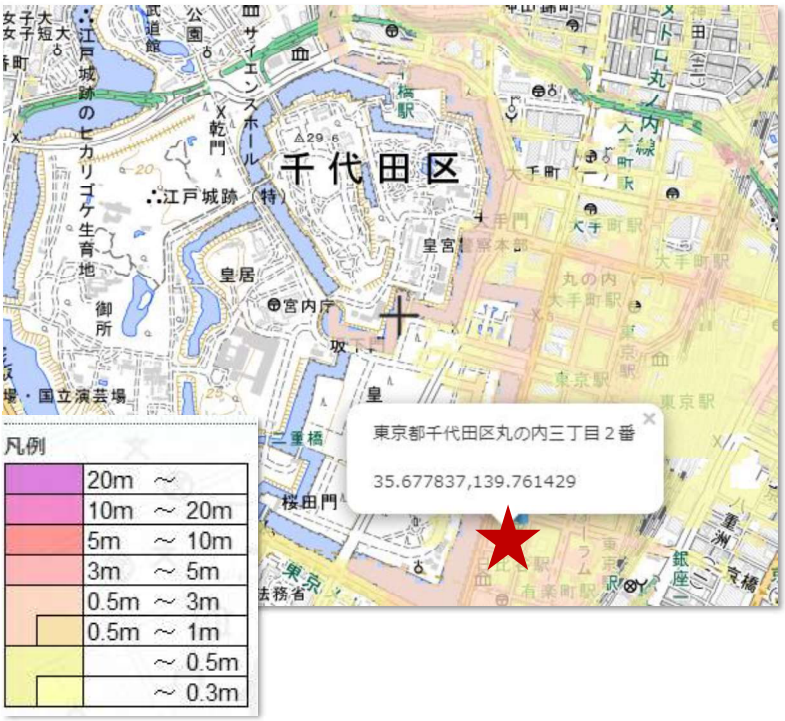
Flood depth level (Hazard map)	# of company sites	Maximum # of days operations are suspended	Amount of damages at time of occurrence
5m–10m	1 site	45 days	1 site × amount of damages per day (**XX** millions JPY) × 45 days
3m–5m	2 sites	32 days	2 sites × amount of damages per day (**XX** millions JPY) × 32 days
0.5m–3m	0 sites	20 days	0 sites × amount of damages per day (**XX** millions JPY) × 20 days
0.5–1m	2 sites	12 days	2 sites × amount of damages per day (**XX** millions JPY) × 12 days
Under 0.5m	4 sites	6 days	4 sites × amount of damages per day (**XX** millions JPY) × 6 days

Total the amount of damages due to flooding and calculate the total amount of damages, **YY** millions JPY

⇒See p2-35 for the parameters of the frequency in floods, and see chapter 5 for examples of a hazard map tool

【Data acquisition method for flood depth level (example)】

Using the hazard map portal site, understand the company's operating sites flood depth level, as well as past levels of damages



When searching Chiyoda-ku, Marunouchi, 3-chome, 2・・・
the hazard map portal site indicates that the **Flood level is ~0.5**

By understanding the **"flood level of the operating sites"** and **"the past levels of damage and flood levels"**, it is possible to determine the maximum total damage for each flood risk level

Source：Hazard Map portal site（https://disaportal.gsi.go.jp/）

Doubt④

What kind of formulas are there: Increase in Cost Related to Raw Materials

With regards to the increase in the cost of raw material procurement as the climate changes and the yield decreases, it is possible to calculate the increase in the cost by grasping the change in the yield of raw materials in the procurement area

Increase in raw material procurement cost due to climate change（100 million yen）1.5℃ 4℃ = Procurement cost of the raw material in the business-as-usual scenario of the year subjected to analysis（100 million yen）× Rate of change in costs due to reduced yields in the procurement area（%）

Rate of cost change in each procurement region

【Example calculation of the impact due to the increase in cost】

Procurement region	Procurement amount (2050)	Procurement cost (2050)	Rate of change in yield	Cost change rate	Cost increase when incurred
Region A	1,000t	XX million yen	▲5%	▲2%	XX million yen × cost change rate (2%)
Region B	2,000t	YY million yen	▲3%	▲1.2%	YY million yen × cost change rate (1.2%)
Region C	1,500t	ZZ million yen	+2%	-	No increase or decrease in cost due to climate change

If possible, **identify cost changes in each procurement region** and calculate cost increases

If there is only data on changes in crop yields, it may be a good idea to calculate the rate of change in cost using price elasticity, etc.

Doubt⑤

How to handle those that can not be quantitatively calculated

Regarding qualitative information or information with little scientific basis, measures such as continuous monitoring and interviews with external experts could be methods for evaluation. It is important to identify evaluated/unevaluated risks and clarify the next action

Image

Risk Item	Validity of quantitative estimation of business impact	Review Status
Risk A	**Possible**	**Considered**
Risk B	**Possible**	**Considered**
Risk C	**Impossible** (Qualitative information only)	Considered (qualitative)
Opportunity A	**Impossible** (No scientific data for evidence)	Not Considered
Opportunity B	**Possible**	**Considered**

[Examples of actions for risks that cannot be quantified]

Interview with external experts

- ✓ Interview external experts (ex: from research institutions) for risks and opportunities that could not be calculated experts
- ✓ Store interview as a qualitative information

Continuous internal monitoring

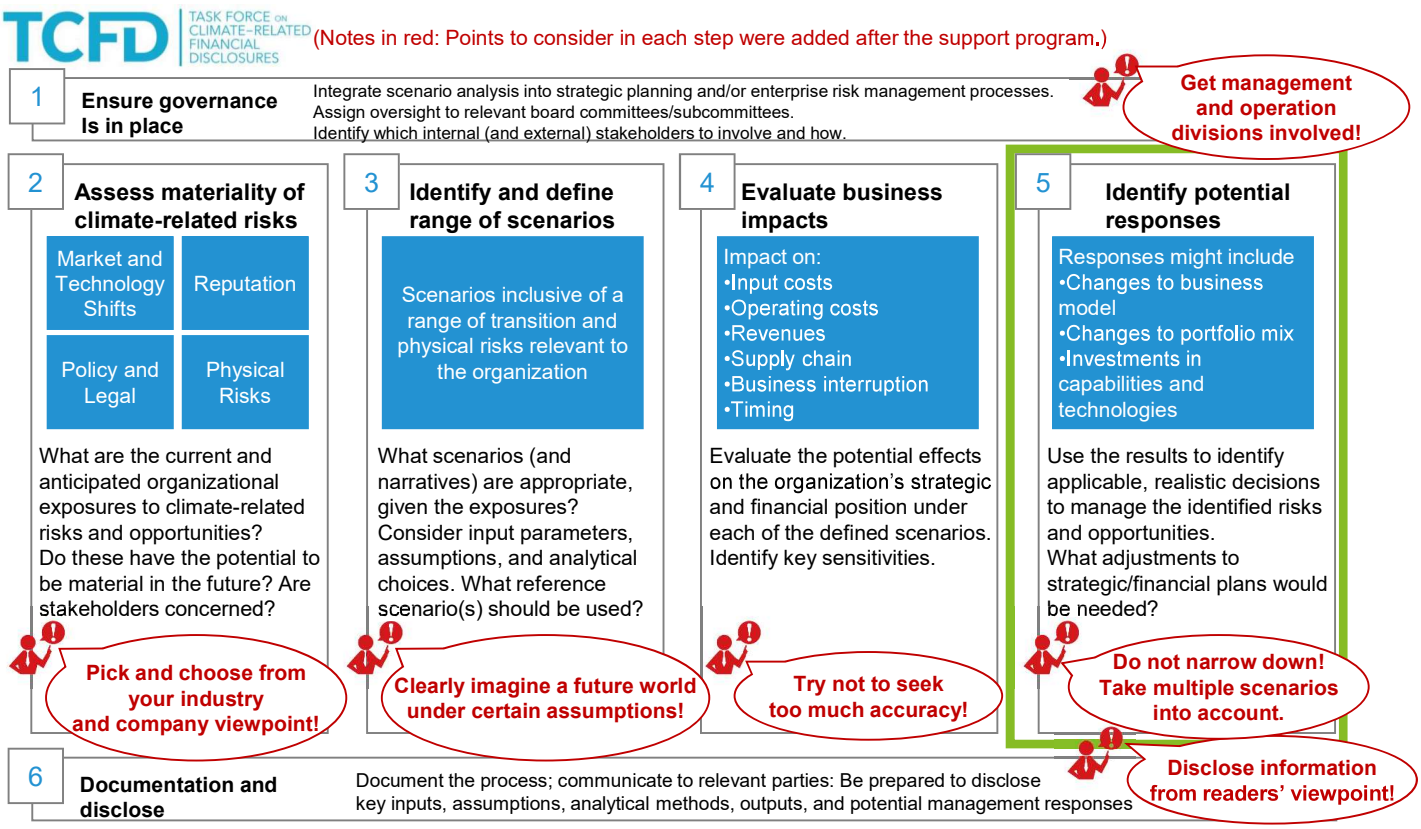
- ✓ Continuously monitor to obtain up-to-date information on risks.

2. Scenario Analysis - Key Points of Practice

Chapter 2. Scenario Analysis - Key Points of Practice

This chapter explains how to practically undertake scenario analysis and describes key points of its practice, based on use cases performed by companies under the support program of the Ministry of the Environment.

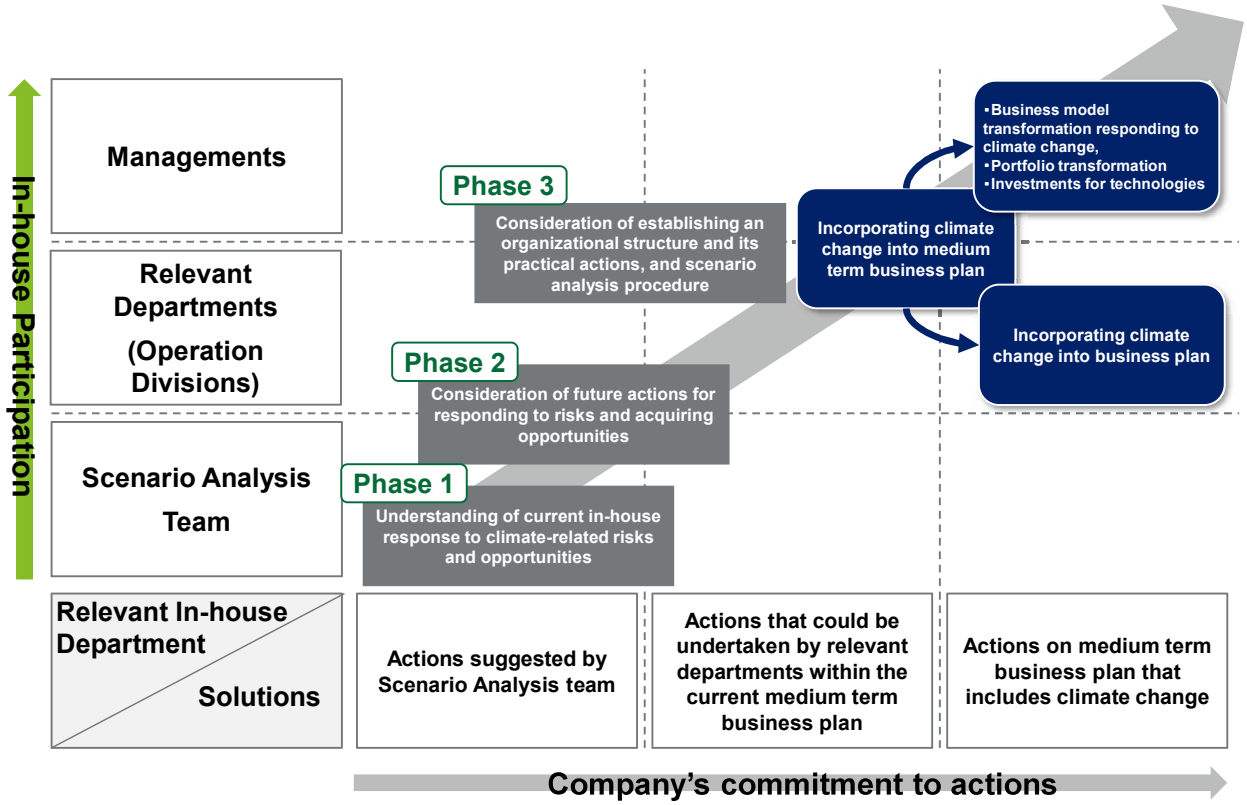
Identify potential responses:
Use the results to identify applicable, realistic decisions to manage the identified risks and opportunities



Sources: The Task Force on Climate-related Financial Disclosures, "Technical Supplement: The Use of Scenario Analysis in Disclosure of Climate Related Risks and Opportunities", June 2017.

【STEP5. Definitions of Actions / Target of Practical Guide】

Practical Guide demonstrates flows for "integration of climate change into business management (inclusion of climate change into medium term business plan)" as it is crucial for countermeasures involving business model transformation



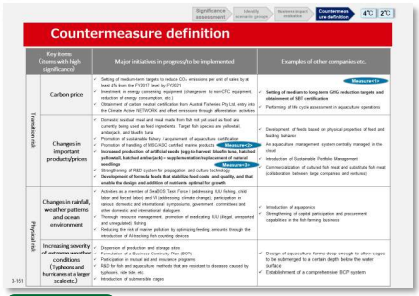
【Overview】

Understand company's current status on risk management, consider countermeasures, and establish practical action plans and an organizational structure

Stage1

Understand company's current status on risk management

Regarding climate-related risks with great financial impact, it is important to understand the company's current status for risk management. If necessary, confirm the current status of rival companies



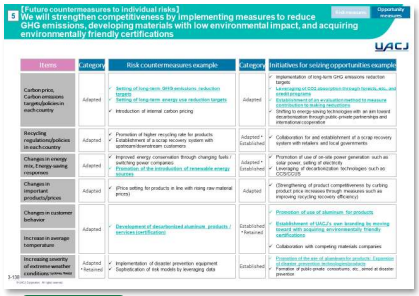
Note

How will scenario analysis results be used in management?

Stage2

Consider future countermeasures for climate-related risk management and seizing opportunities

Consider practical countermeasures for risks and opportunities with great financial impact



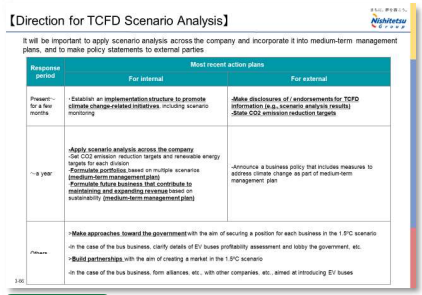
Note

What kind of organizational structures are suitable after conducting scenario analysis?

Stage3

Establish an organizational structure and consider practical countermeasures and how to proceed scenario analysis

Establish an organizational structure in order to promote countermeasures and take practical actions cooperating with relevant department. And also consider how to proceed with scenario analysis



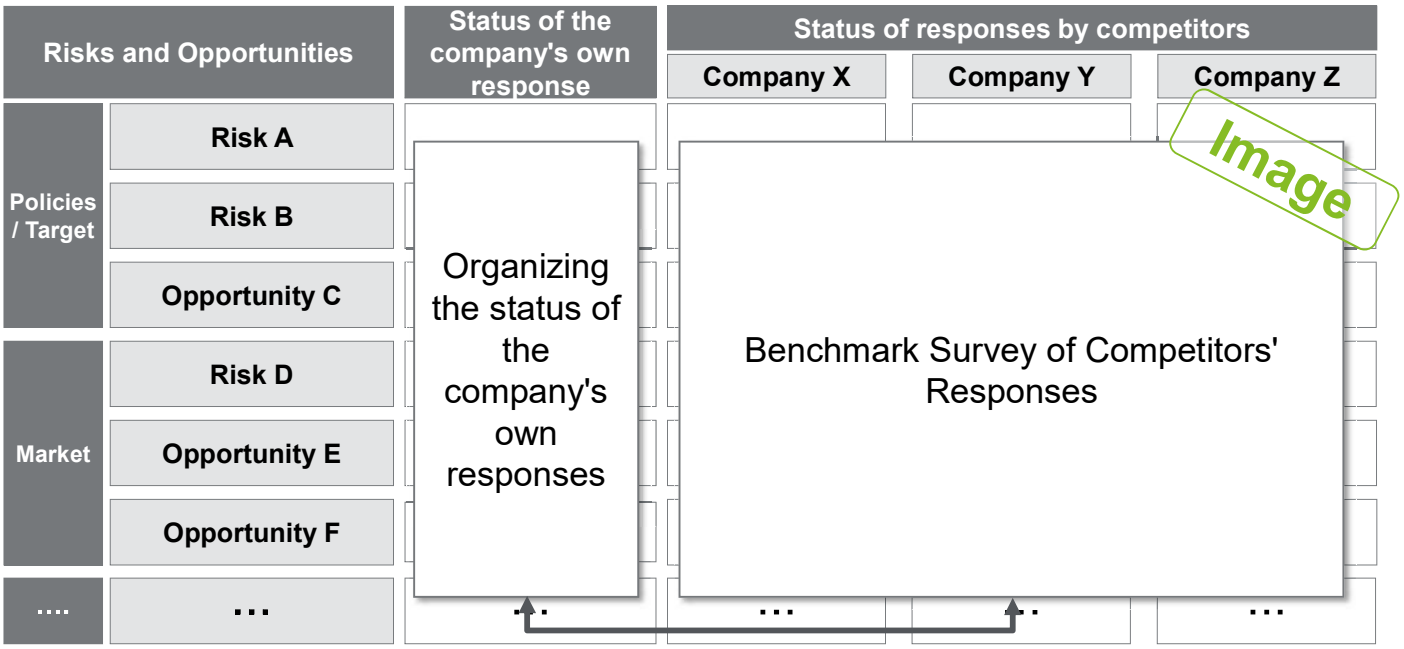
Note

What steps should be taken in the future?

Source: This Practical Guide (Maruha Nichiro example: 3-151, UACJ example: 3-138, Nishi-Nippon Railroad: 3-66)

【Stage1: Understand company's current status on risks management and seizing opportunities】

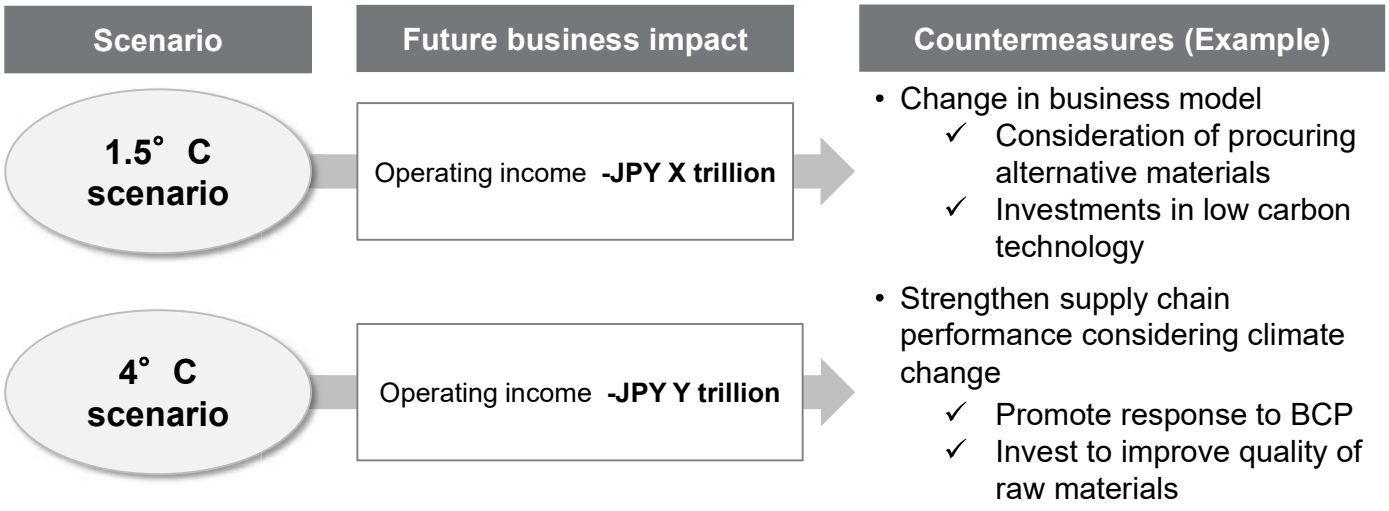
Regarding climate-related risks and opportunities with great financial impact, it is important to understand the company's current status for risk management. If necessary, confirm the current status of rival companies



It is a suggestion to conduct comparative analysis on the company and competitors regarding risk management

【Stage2: Consider countermeasures for climate-related risk management and seizing opportunities】

Consider practical countermeasures for risks and opportunities with great financial impact



It will become important to plan resilient countermeasures that can be used in any situation. Companies may also try deciding on a rough direction for countermeasures as a bare minimum before going on to consider specific countermeasures in the course of ongoing implementation

【Stage3: Establish practical action plans and an organizational structure】

Establish an organizational structure in order to implement countermeasures and take practical actions cooperating with relevant department. And also consider how to proceed with scenario analysis

Response implementation period (Example)	Future Actions (Example)		
	Establish an organizational structure	Taking practical actions cooperating with relevant department	How to proceed with scenario analysis
Currently or for a few months	✓ **Dissemination of the results of scenario analysis within the company** (including managements) ✓ **Gaining an agreement from managements on the needs for establishing an organizational structure** in order to promote countermeasures	-	✓ **Interviews with experts on important risks and opportunities** for which there is little information
– 1 year	✓ **Establishing an organizational structure in order to promote countermeasures through explaining to relevant department**	✓ Cooperating with relevant department **and take practical actions aligned with existing business plans that is relatively easy to implement** ✓ Beginning practical consideration with relevant department for new actions	✓ **Establishment of a monitoring system for scenario analysis** ✓ Monitoring
As needed (timings may differ for each company)	✓ **Incorporating climate change into medium term business plan** ✓ Encourage dialogue with stakeholders on climate change to create markets ✓ Introduction of internal carbon pricing as a mechanism to promote low-carbon investment		

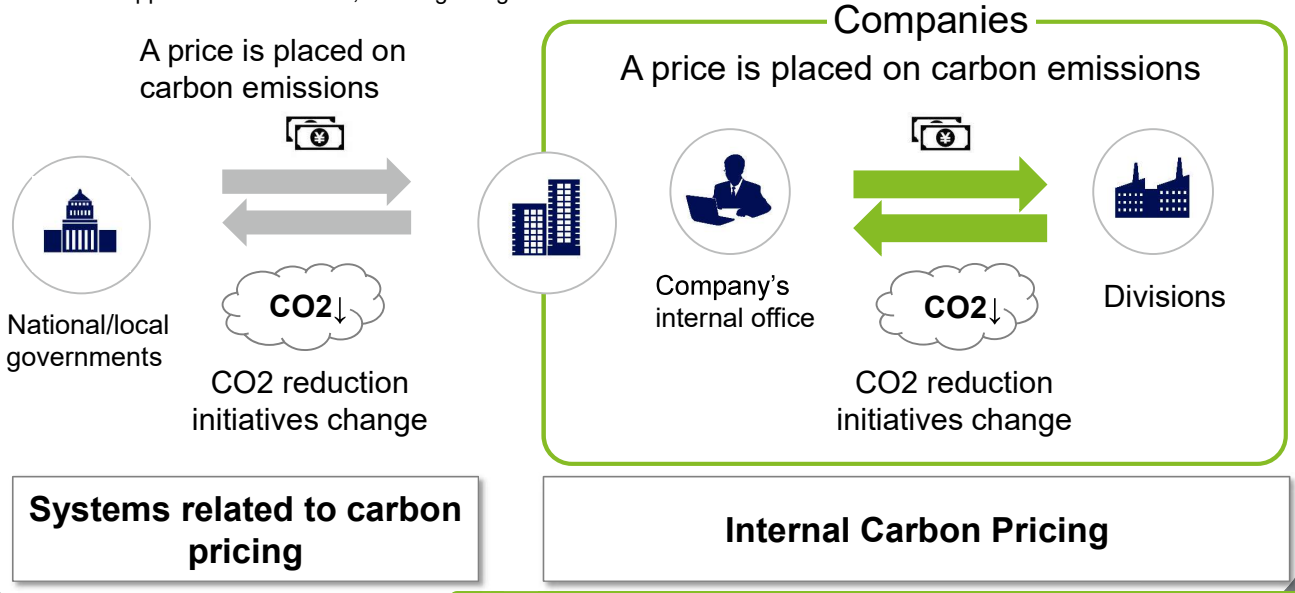
Image

Consider scenario analysis procedure, establishing an organizational structure , and getting relevant department involved in the course of scenario analysis, alongside with proceeding the incorporation of climate change into medium term business plan

(Column) What is Internal Carbon Pricing?

Internal Carbon Pricing is carbon prices set by companies and used within them.
It is one potential countermeasure and is a "mechanism" that promotes decarbonization

- **Internal Carbon Pricing is the price of carbon estimated internally by the company, and is a mechanism for promoting low-carbon investment by companies**
- It is a method used in corporate planning, and is leveraged in incentives for promoting energy efficiency, the identification of revenue opportunities and risks, and in guiding investment decisions

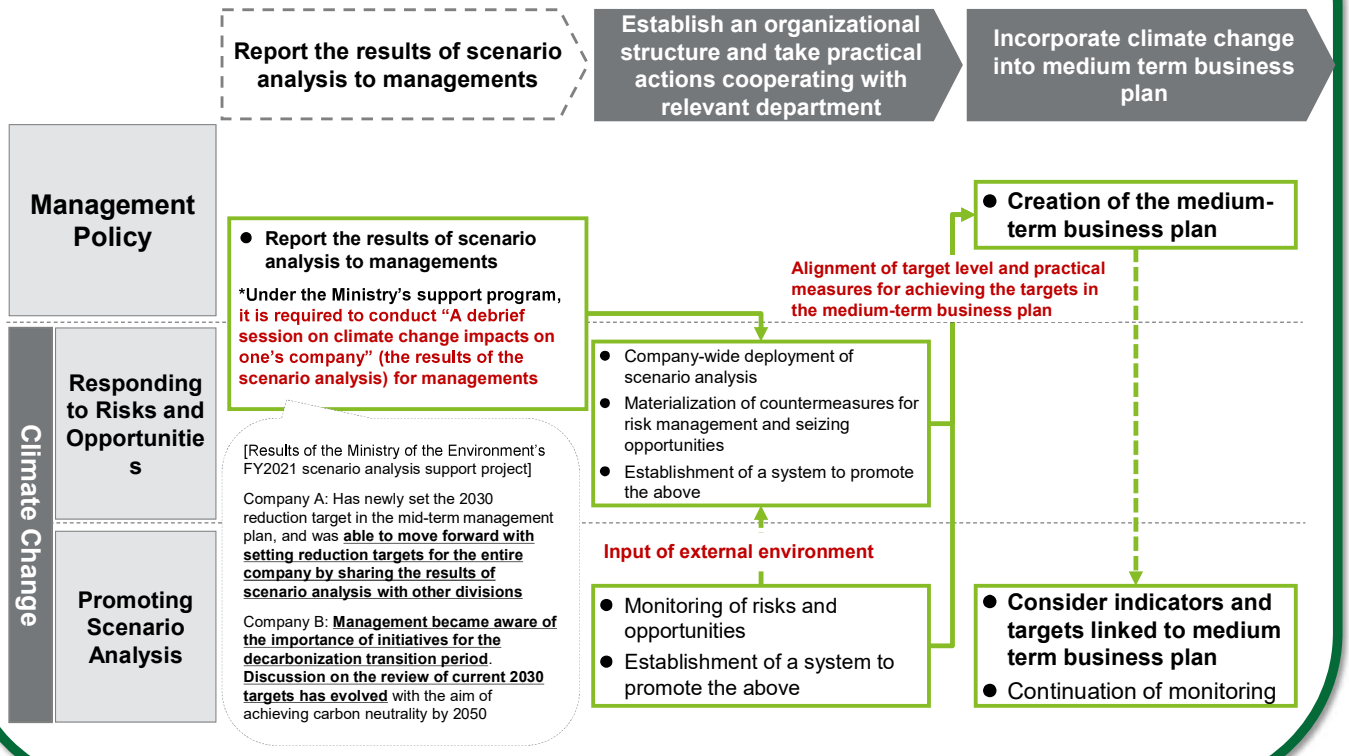


⇒See the "Utilization Guidelines for Internal Carbon Pricing ver. FY2022 (updated March 2023)" published by the Ministry of the Environment for information on ICP

2-65 Source：Utilization Guidelines for Internal Carbon Pricing ver. FY2022

How will scenario analysis results be used in management?

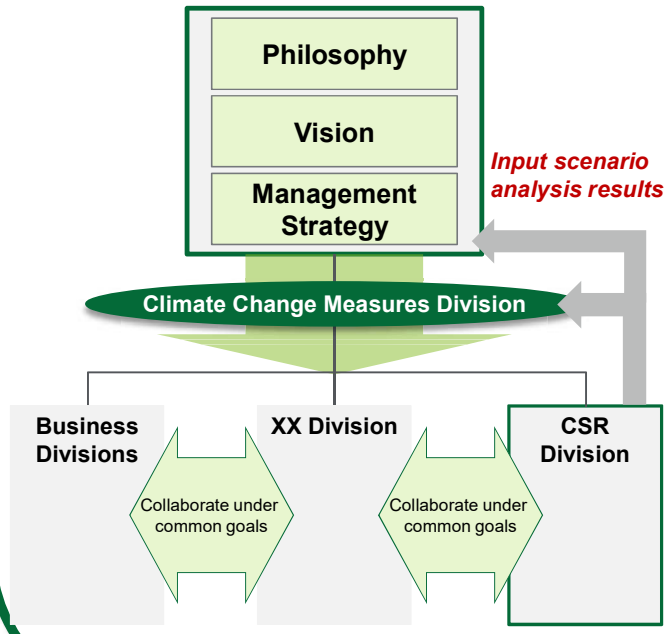
It is important that climate change be included in the process of business strategy planning.
One tip is to include climate change into the nearest midterm management plan



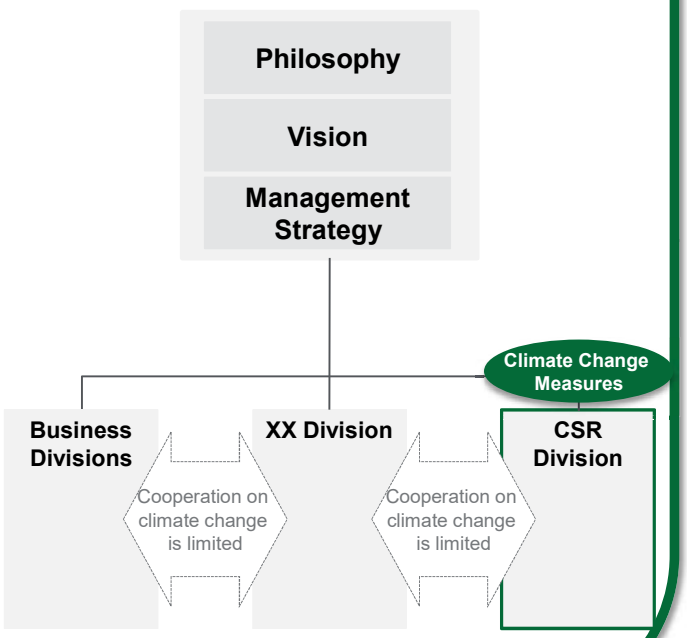
What kind of organizational structures are suitable after conducting scenario analysis?

It may be suggested to create a cross-sectional organization directly under the corporate planning department that deals with climate change to give effectiveness to the result of scenario analysis

As a cross-sectional organization with climate change as a company-wide theme



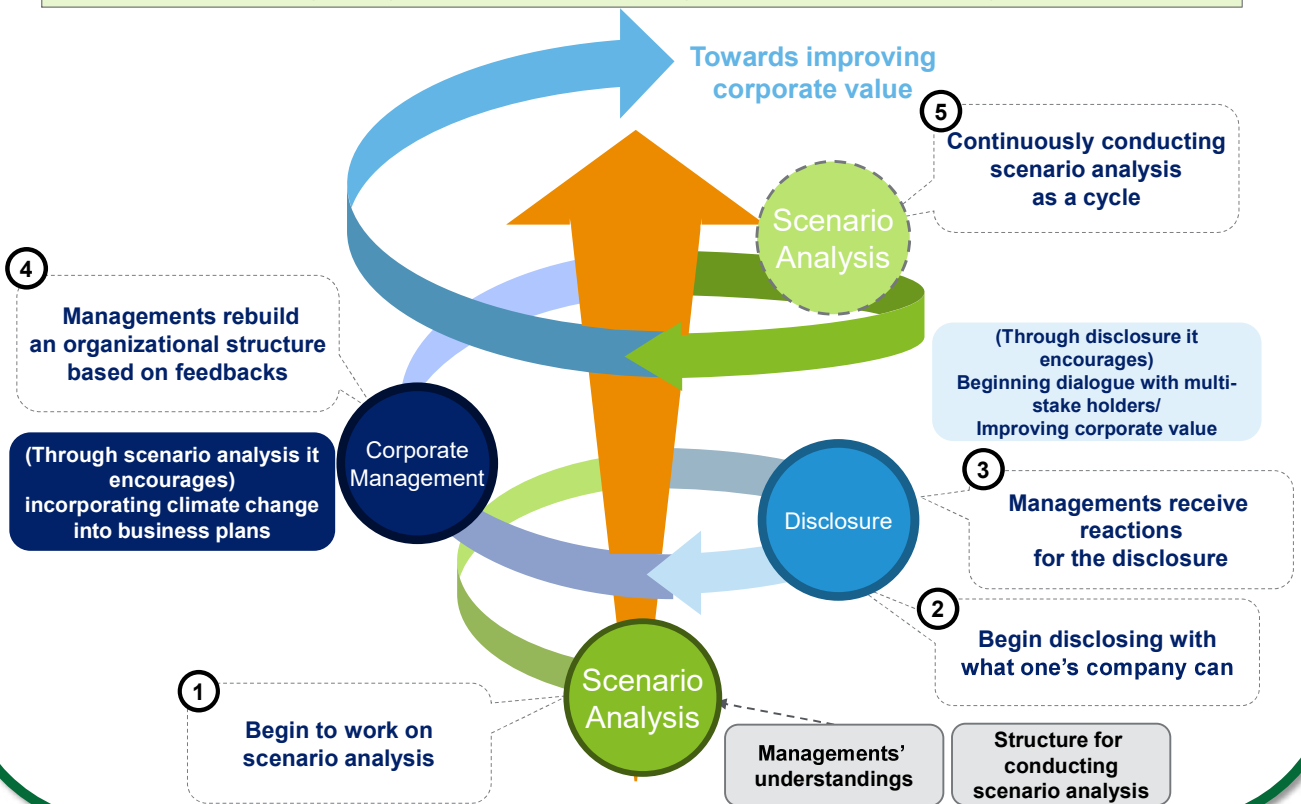
Remain as limited initiatives by some divisions



2-67

Actions to be taken for the next step?

The goal of scenario analysis is to integrate climate change with business management, and to enhance corporate value. With scenario analysis, it aims to continue the cycle of disclosing information and rebuilding an organizational structure (integration with business management)



2-68

2. Scenario Analysis - Key Points of Practice

Scenario Analysis Guide - Key Points of Practice

2-1. For beginning scenario analysis

2-2. STEP2. Assess materiality of climate-related risks

2-3. STEP3. Identify and define range of scenarios

2-4. STEP4. Evaluate business impacts

2-5. STEP5. Identify potential responses

2-6. STEP6. Document and disclose information

Chapter 2. Scenario Analysis - Key Points of Practice

This chapter explains how to practically undertake scenario analysis and describes key points of its practice, based on use cases performed by companies under the support program of the Ministry of the Environment.

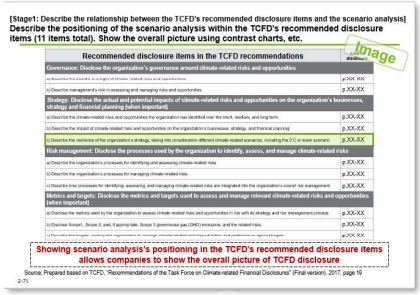
【Overview】

Describe the positioning of scenario analysis in the TCFD's recommended disclosure items and the results obtained from each step; use appropriate disclosure to achieve increased corporate value

Stage 1

Describe the relationship between the TCFD's recommended disclosure items and the scenario analysis

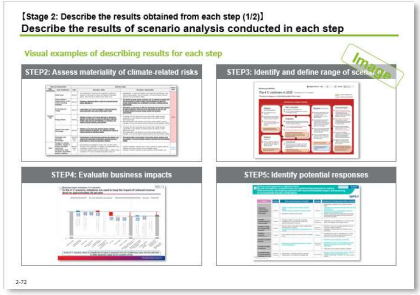
Describe the positioning of the scenario analysis within the TCFD's recommended disclosure items (11 items total). Show the overall picture using contrast charts, etc.



Stage 2

Describe the results obtained from each step

Described the results obtained from scenario analysis for each step



***It may also be helpful to reference TCFD Guidance 3.0**

Point

"What" and "how much" should be disclosed?

【Stage1: Describe the relationship between the TCFD's recommended disclosure items and the scenario analysis】

Describe the positioning of the scenario analysis within the TCFD's recommended disclosure items (11 items total). Show the overall picture using contrast charts, etc.

Image

Recommended disclosure items in the TCFD recommendations	Area of disclosure
Governance: Disclose the organization's governance around climate-related risks and opportunities	
a) Describe the board's oversight of climate-related risks and opportunities	p.XX-XX
b) Describe management's role in assessing and managing risks and opportunities	p.XX-XX
Strategy: Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy and financial planning (when important)	
a) Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term	p.XX-XX
b) Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning	p.XX-XX
c) Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including the 2°C or lower scenario	p.XX-XX
Risk management: Disclose the processes used by the organization to identify, assess, and manage climate-related risks	
a) Describe the organization's processes for identifying and assessing climate-related risks	p.XX-XX
b) Describe the organization's processes for managing climate-related risks	p.XX-XX
c) Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management	p.XX-XX
Metrics and targets: Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities (when important)	
a) Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process	p.XX-XX
b) Disclose Scope1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks	p.XX-XX
c) Describe the targets used by the organization to manage climate-related risks/opportunities and performance against targets	p.XX-XX

Showing scenario analysis's positioning in the TCFD's recommended disclosure items allows companies to show the overall picture of TCFD disclosure

Source: Prepared based on TCFD, "Recommendations of the Task Force on Climate-related Financial Disclosures" (Final version), 2017, page 19

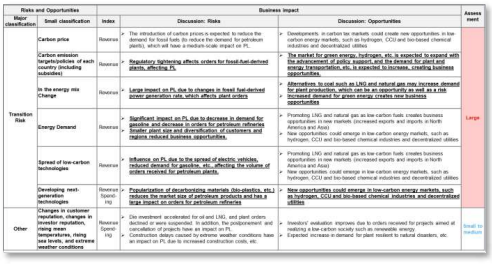
【Stage 2: Describe the results obtained from each step (1/2)】

Describe the results of scenario analysis conducted in each step

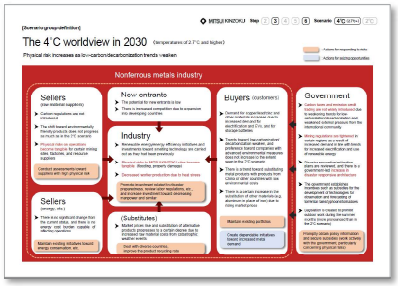
Visual examples of describing results for each step

Image

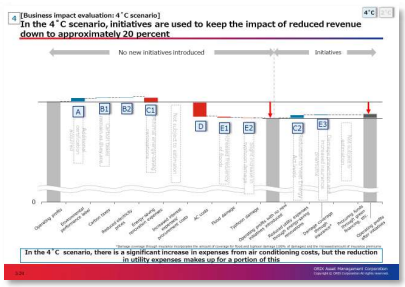
STEP2: Assess materiality of climate-related risks



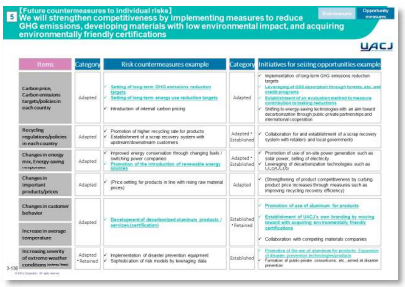
STEP3: Identify and define range of scenarios



STEP4: Evaluate business impacts



STEP5: Identify potential responses



【Stage 2: Describe the results obtained from each step (2/2)】

It is important to describe climate change-related governance, as well as what was understood from the scenario analysis results and how the company plans to respond

Results of interviews with investors/experts

It is not the disclosure itself that will be evaluated; showing the results of risk/opportunity identification and the effect scenario analysis results have on management strategy is the important thing

- ✓ It is not the disclosure itself that will be evaluated; **what is important is using qualitative terms to communicate the company's current initiatives/future initiatives.** Disclosures should be made on the assumption that dialogue will take place and **describe the scenario analysis in an easy-to-understand manner as a starting point for discussion.**
- ✓ For scenario analysis disclosures, **investors want to know how the results of the scenario analysis will affect management strategy**. They are concerned that there will be companies that make scenario analysis an end.
- ✓ The results of scenario analysis show that **aiming for carbon neutrality by 2050 is not enough; what is important is that this is reflected in the transition. It is meaningful to present interim targets for 2030, etc., and if they are not along the carbon neutrality by 2050 path,** it is **important to show in an easy-to-understand manner how transitions will be made.** Many investors are concerned about how to evaluate companies that are deviating from the ideal reduction path toward 2030, and it is important for investors to **evaluate individual strategies and encourage companies to plan to reduce emissions more.**

Disclosing the following will make it easier to describe the resilience of the organization's climate change-related strategies

- ✓ **Status of climate change-related governance structure** — STEP1 (p2-11~13)
- ✓ **Information of data used as the basis for each scenario analysis** — STEP3 (p2-27~35)
- ✓ **Explanation of the company's appropriate transition toward decarbonization by 2050**
  - ✓ **Current/future initiatives toward risks/opportunities identified from the scenario analysis** — STEP5 (p2-62~63) STEP6 Disclosure case studies (Chapter4)
  - ✓ **Narrative for climate change-related value creation based on scenario analysis results** — STEP5 (p2-61, p.2-68) STEP6 Disclosure case studies (Chapter4)
  - ✓ **(If necessary) 2030 interim targets and transition plans** — ⇒See Chapter4 for transition case studies
- ✓ **How the company will proceed with scenario analysis and achieve the goals** — STEP5 (p2-64)

2-73 Source: Prepared based on interviews conducted by the Ministry of the Environment in FY2020-2021 toward investors and experts

Page number

"What" and "how much" should be disclosed?

Investors are focused on the impact on operations, such as management's involvement and how scenario analysis results are leveraged in the company's business and management. Additionally, it is recommended to implement a scenario based on recent decarbonization trends (currently the 1.5°C scenario), and focus is also being put on disclosures made through a wide variety of media

Results of interviews with investors/experts

For beginning scenario analysis	**What is important is whether the company has a structure that allows it to proceed with scenario analysis, as well as management's understanding** ✓ Scenario analysis is an area which is not yet covered by mainstream discussions in company management. Because of this, many companies have outsourced the first round of scenario analysis to external consultants in their corporate planning and so on, and it is questionable whether the company has established a structure that enables it to tackle scenario analysis on its own ✓ While involving external experts is a good tactic, investors are more concerned about how the company's senior management understands sustainability risks and discusses them at board meetings
Assess materiality of climate-related risks	**This area is the core of scenario analysis, and risks/opportunities affecting businesses should be explained in detail** ✓ This area is the core of scenario analysis, and should be explained in detail
Identify and define range of scenarios	**Along with the reasons for selecting a wide variety of scenarios, it is also recommended to implement scenarios in line with current trends (currently the 1.5°C scenario)** ✓ The reasons for scenarios being selected are important, as opinions on scenarios may vary according to the industry ✓ If the company has added its own variables to the parameters, specific explanation is needed, as side-by-side comparisons with other companies cannot be made in such cases ✓ A 1.5°C scenario aimed at 2050 may be necessary for companies with a goal of carbon neutrality by 2050, or for sectors with high emissions
Evaluate business impacts	**Disclosure of quantitative information is also being considered in light of increased implementation of systems and recent trends toward strengthening disclosure of climate-related information** ✓ There is no international consensus on the methodology for impact evaluation, and at present, investors may be satisfied with qualitative information. It is expected that demand for quantitative information will be determined by the future actions of financial supervisory authorities and the influence those actions have on financial institutions and general business companies afterward ✓ Rather than providing figures, it may be better to disclose the process for internal discussions and have direct dialogue concerning impacts that cannot be publicly disclosed ✓ Investors want to know how climate change will affect business, so the company should put a theoretical image of this into figures, even if it is only a rough one ✓ As exemplified by disclosures in securities reports, deepening of the relationship between climate-related information and financial information is being called for ✓ ESG investors are also paying attention to financial impact disclosure, and the TCFD's metrics and targets guidance also includes the importance of disclosing financial impact
Identify potential responses	**Investors are focused on how the results of scenario analysis will be leveraged in the company's business and management** ✓ Investors are focused on how the results of scenario analysis will be leveraged in the company's business and management ✓ It is also important to express how climate change risks / sustainability issues will be addressed in strategies and which kinds of actions are insufficient ✓ At the same time, individual strategies need to be evaluated with respect to transition plans for high-emitting companies to reduce emissions, as greenwashing concerns and the Russia/Ukraine issue raise questions about the feasibility of post-2030 reduction plans.
Document and disclose information	**With the revision of the Corporate Governance Code, companies should focus on disclosure through various media such as reports and websites** ✓ With the revision of the Corporate Governance Code, investors will start to look at a wide range of disclosure media. In most cases, they will look at integrated reports and sustainability reports, but it is considered ideal if information related to the TCFD recommendations is summarized on the company's website so that investors can check the latest versions for later review ✓ The basic premise is governance disclosure, and whether management has declared its commitment ✓ The basic understanding is that TCFD disclosures listed in integrated reports, etc., will also be included in the Corporate Governance Code

2-74 Source: Prepared based on interviews conducted by the Ministry of the Environment in FY2020-2021 toward investors and experts