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Practical Guide for Scenario Analysis in Line with the TCFD Recommendations (Banking Sector)

March, 2021

Environmental and Economy Division, Minister's Secretariat, The Ministry of Environment

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1-1. Purpose of this practical guide

1-2. Positioning of scenario analysis in line with TCFD recommendations

1. Introduction

1-1. Purpose of this practical guide

1-2. Positioning of scenario analysis in line with TCFD recommendations

[Challenges faced by financial institutions in implementing scenario analysis] Climate Change Related Challenges Facing Domestic Financial Institutions

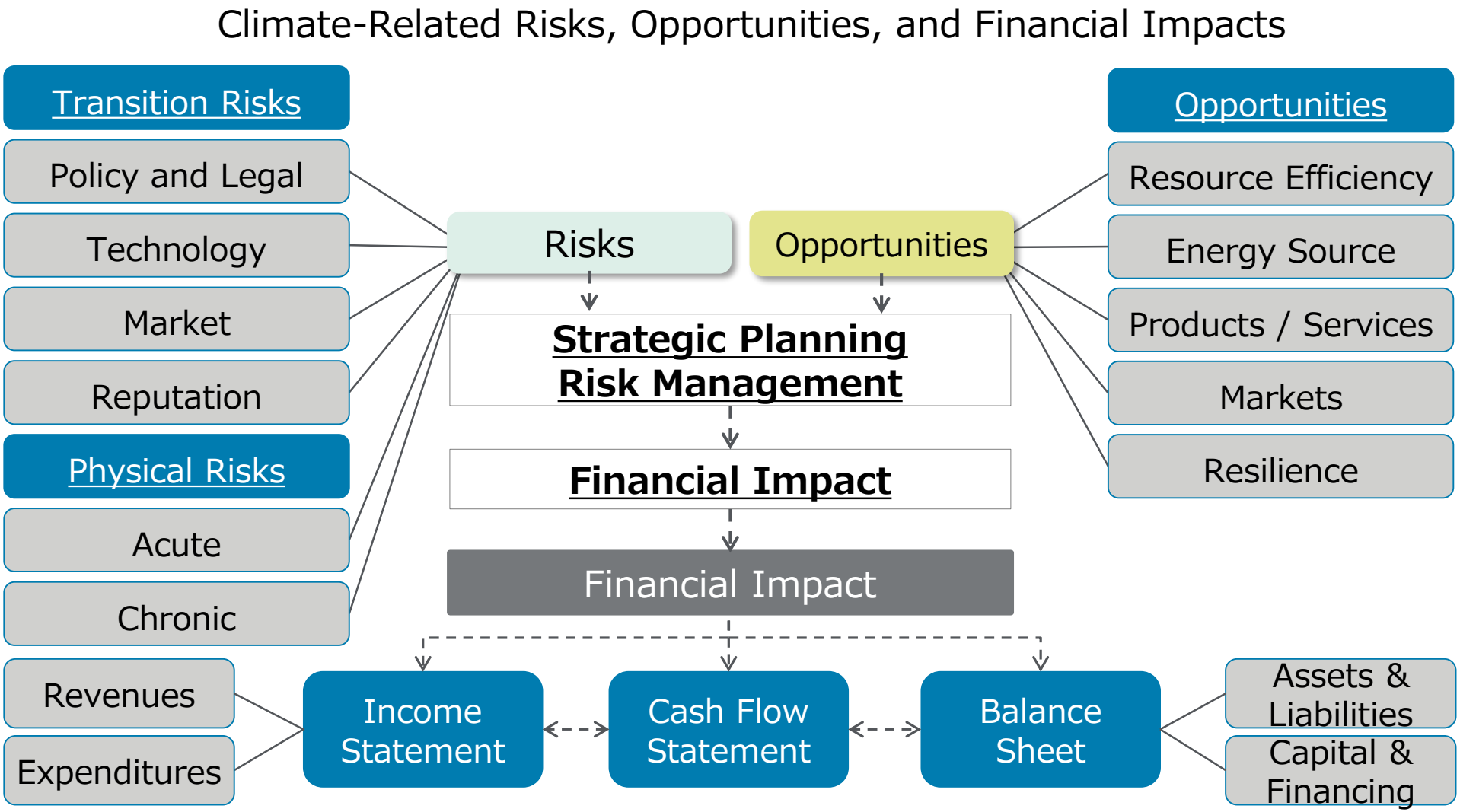
- TCFD has published a status report to show the progress of climate-related information disclosure based on the TCFD recommendations and to promote the sophistication of disclosure. The status report points out the need to clarify potential climate-related financial impacts, disclose strategic resilience assessments using scenario analysis, and involve other sectors to bring climate-related issues mainstream. ing. This issue also applies to the banking sector, which accounts for a large proportion of the financial intermediary function of indirect finance in Japan's financial sector.
- This guide covers the risk of transition to a decarbonized economy in scenario analysis, which is a particular hurdle for TCFD disclosure by financial institutions from October 2020 to March 2021 with the participation of three regional financial institutions. Focusing on quantification and evaluation methods for physical risk due to climate change, we evaluated financial impact through collaboration with multiple departments including risk management of financial institutions using a reliable evaluation method that can withstand information disclosure. We will publish it as a guide based on the results.

1. Introduction

1-1. Purpose of this practical guide

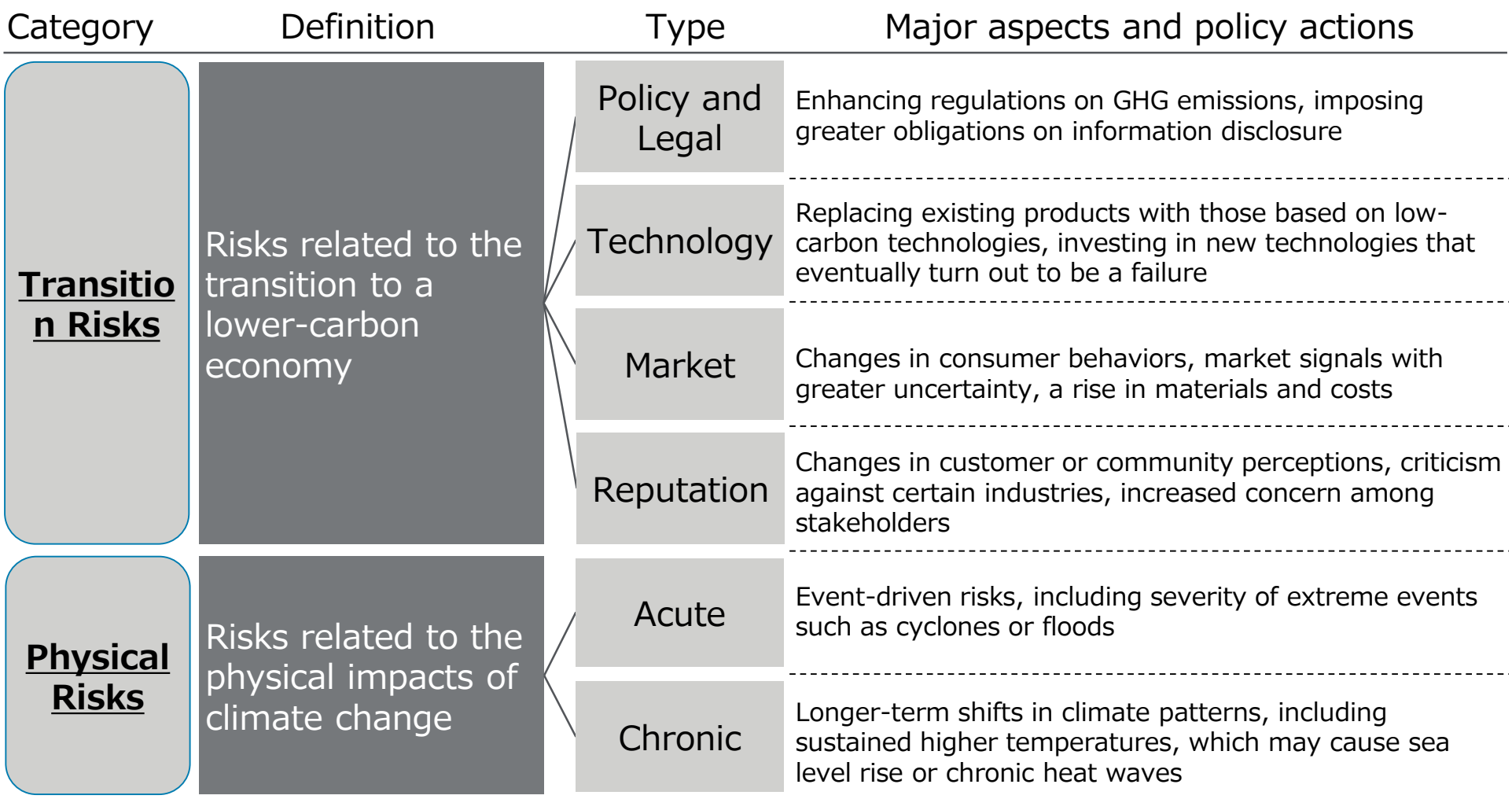
1-2. Positioning of scenario analysis in line with TCFD recommendations

[Financial Impact]
The TCFD recommendations present the scope of climate-related risks and opportunities, and financial impacts to be disclosed



Source: prepared by the Ministry of Environment based on the Task Force on Climate-related Financial Disclosures, “Final Report - Recommendations of the Task Force on Climate-related Financial Disclosures”, 2017. p.8

[Climate-related Risks]
The TCFD Recommendations divided climate-related risks into two major categories: (1) risks related to the transition to a lower-carbon economy and (2) risks related to the physical impacts of climate change



Source: prepared by the Ministry of Environment based on the Task Force on Climate-related Financial Disclosures, “Final Report - Recommendations of the Task Force on Climate-related Financial Disclosures”, 2017. p.10

[Climate-related Opportunities]
The TCFD recommendations identified the following five areas of climate-related opportunities that organizations can produce in the course of their efforts to mitigate and adapt to climate change

Opportunities

Area	Policy actions	Financial impact
Resource Efficiency	■ Use of more efficient models of transport ■ Use of more efficient production and distribution processes ■ Use of Recycling ■ Move to more efficient buildings ■ Reduced water usage and consumption	■ Reduced operating costs (e.g., through efficiency gains and cost reductions) ■ Increased production capacity, resulting in increased revenues ■ Increased value of fixed assets (e.g., highly rated energy-efficient buildings) ■ Benefits to workforce management and planning (e.g., improved health and safety, employee satisfaction) resulting in lower costs
Energy Source	■ Use of lower-emission sources of energy ■ Use of supportive policy incentives ■ Use of new technologies ■ Participation in carbon market ■ Shift toward decentralized energy generation	■ Reduced operational costs (e.g., through use of lowest cost abatement) ■ Reduced exposure to future fossil fuel price increases ■ Reduced exposure to GHG emissions and therefore less sensitivity to changes in cost of carbon ■ Returns on investment in low-emissions technology ■ Increased capital availability (e.g., as more investors favor lower-emissions producers) ■ Reputational benefits resulting in increased demand for goods/services
Products and Services	■ Development and/or expansion of low emission goods and services ■ Development of climate adaptation and insurance risk solutions ■ Development of new products or services through R&D and innovation ■ Ability to diversify business activities	■ Increased revenue through demand for lower emissions products and services ■ Increased revenue through new solutions to adaptation needs (e.g., insurance risk transfer products and services) ■ Better competitive position to reflect shifting consumer preferences, resulting in increased revenues
Markets	■ Access to new markets ■ Use of public-sector incentives ■ Access to new assets and locations needing insurance coverage	■ Increased revenues through access to new and emerging markets (e.g., partnerships with governments, development banks) ■ Increased diversification of financial assets (e.g., green bonds and infrastructure)
Resilience	■ Participation in renewable energy programs and adaptation of energy-efficiency measures ■ Resource substitutes/diversification	■ Increased market valuation through resilience planning ■ Increased reliability of supply chain and ability to operate under various conditions ■ Increased revenue through new products and services

Source: prepared by the Ministry of Environment based on the Task Force on Climate-related Financial Disclosures, “Final Report - Recommendations of the Task Force on Climate-related Financial Disclosures”, 2017. p.11

[Guidance for Specific Sectors]
The TCFD supplemental guidance provides additional context and suggestions for implementing the recommended disclosures for four non-financial sectors (Energy; Materials and Buildings; Transportation; and Agriculture, Food, and Forest Products) potentially most affected by climate change

Sector	Industry	Recommended disclosure
Energy	■ Oil and Gas ■ Coal ■ Electric Utilities	Assessment and potential impacts of legal compliance, operating costs, changes in risks and opportunities; changes in regulations and shift in consumer and investor preferences; and changes in investment strategy
Transportation	■ Air Transport, Maritime Transportation ■ Land Transportation (Rail Transportation, Tracking Services) ■ Automobiles	Assessment and potential impacts of financial risks of enhanced regulations and new technology on existing factories and equipment; R&D investment in new technologies; opportunities for use of new technologies to lower emissions standards and regulations on higher fuel efficiency
Materials and Buildings	■ Metals and Mining ■ Chemicals ■ Construction Materials, Capital Goods ■ Real Estate Management and Development	Assessment and potential impacts of enhanced regulations on GHG emissions and carbon pricing; risk assessment of increased severity of extreme weather events on construction materials and property; and opportunities for products to improve energy efficiency or reduce energy consumption
Agriculture, Food, and Forest Products	■ Beverages, Foods ■ Agriculture ■ Paper and Forest Products	Assessment and potential impacts of GHG emissions reductions; recycling and waste management; business of food and textile products with lower GHG emissions, and shifts in consumer preferences

Source: prepared by the Ministry of Environment based on the Task Force on Climate-related Financial Disclosures, “Final Report - Recommendations of the Task Force on Climate-related Financial Disclosures”, 2017. p.52-65

[The TCFD recommendations]
The TCFD recommendations are structured around four thematic areas: Governance, strategy, risk management, and metrics and targets

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

Source: prepared by the Ministry of Environment based on the Task Force on Climate-related Financial Disclosures, "Final Report - Recommendations of the Task Force on Climate-related Financial Disclosures", 2017. p.14

2. Scenario Analysis - Key Points of Practice

- 2-1. For starting scenario analysis
- 2-2. Assess materiality of climate-related risks
- 2-3. Identify and define range of scenarios
- 2-4. Evaluate Qualitative Business Impact
- 2-5. Quantitative assessment of transition risk
- 2-6. Quantitative assessment of physical risk
- 2-7. Documentation and Disclosure

Points to consider when implementing scenario analysis in line with the TCFD recommendations were mapped out for 18 companies, forming the basis of the trial

TCFD

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

Scope of this guide

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.

2. Scenario Analysis - Key Points of Practice

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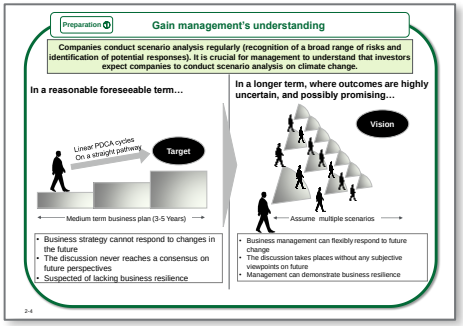
2-7. Documentation and Disclosure

[When starting a Scenario Analysis ①]
Gaining understanding from management on the materiality of scenario analysis is important. Establishing a team, scope and time horizon is necessary when starting scenario analysis.

Preparation①

Gain management's understanding

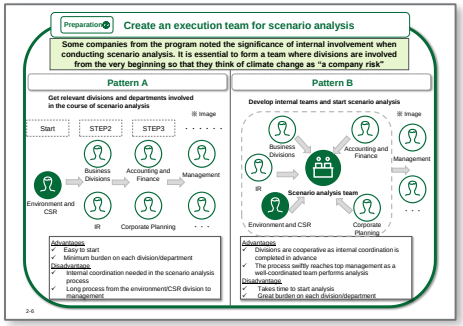
Make sure management understands the materiality of TCFD (Recognizes the recommendations and instructions that they must comply with)



Preparation ②

Establish execution team

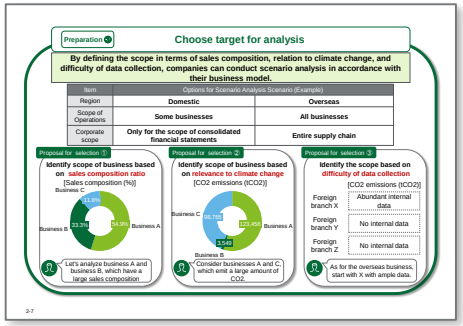
Create an execution team for scenario analysis



Preparation ③

Choose target for analysis

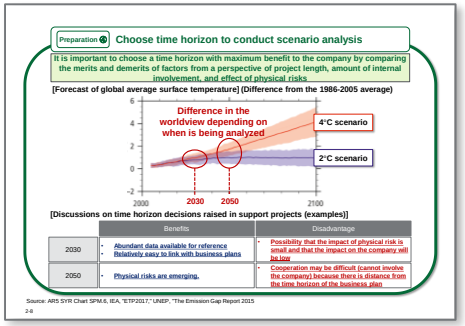
Set a target scope for the scenario analysis



Preparation ④

Setting the analysis time axis

Choose time horizon to conduct scenario analysis that looks beyond X years in the future



Point

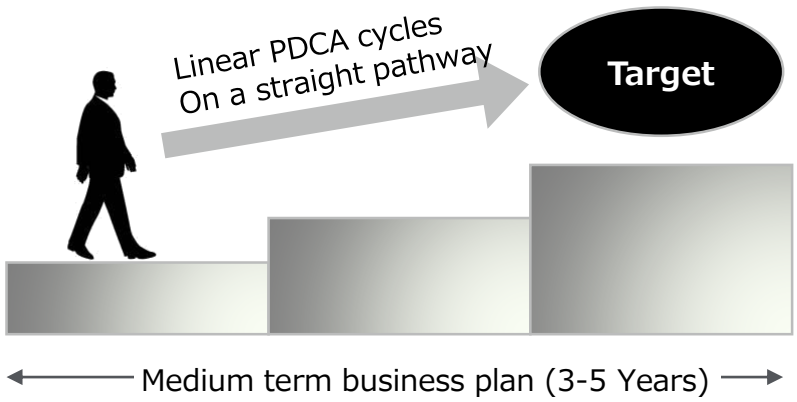
How to provide input to management in terms of climate change

Preparation ①

Gain management's understanding

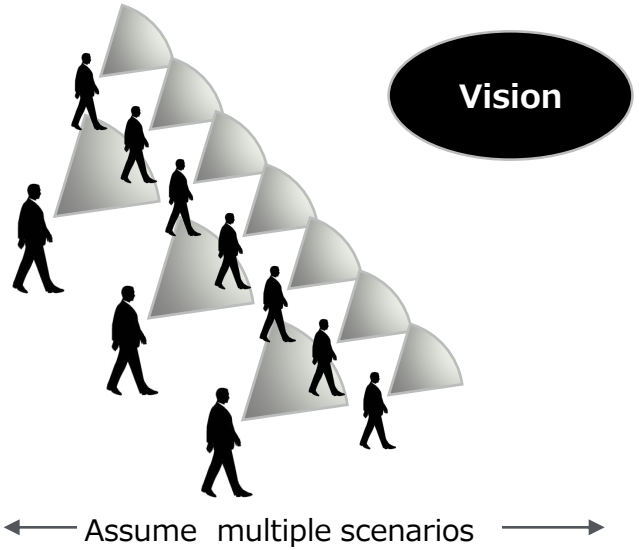
Companies conduct scenario analysis regularly (recognition of a broad range of risks and identification of potential responses). It is crucial for management to understand that investors expect companies to conduct scenario analysis on climate change.

In a reasonable 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

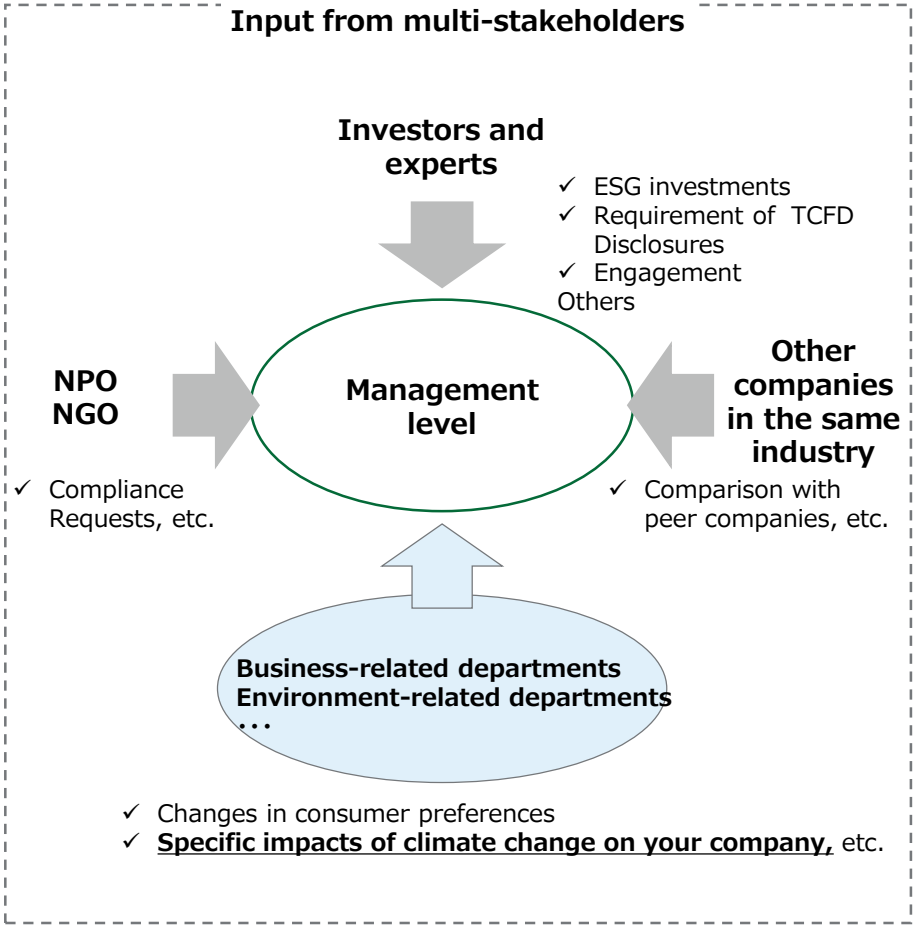
In a longer term, where outcomes are highly uncertain, and possibly promising…



- Business management can flexibly respond to future change
- The discussion takes places without any subjective viewpoints on the 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. As part of the Ministry of the Environment's support programs, selected companies held scenario analysis report meetings for management.
These meetings are effective in gaining and deepening management's understanding.**



- Requests from multi-stakeholders for climate change response accelerated
- There are some cases in which top management is directly informed of climate change solutions, but there are also cases in which there is still a significant gap in understanding.
- In such a case, it is important to compile **the status of requests from multi-stakeholders** and provide to management **through study groups with experts and other means that respond to climate change which can affect corporate value**.
- As an input source for support projects by the Ministry of the Environment
  It is essential **to hold briefings on the impact of climate change (results of scenario analysis) for management, and** these briefings have been proven to be highly effective.

[Results of the FY2018 Ministry of the Environment Scenario Analysis Support Project]

Company A: Established a new department specializing in the integration of IR/Sustainability as the understanding of management progressed. Periodic discussions with executives on TCFD held at the Sustainability Committee

Company B: Improved understanding of management and **launched a team for climate change management. Executive Vice President assumes chairmanship**

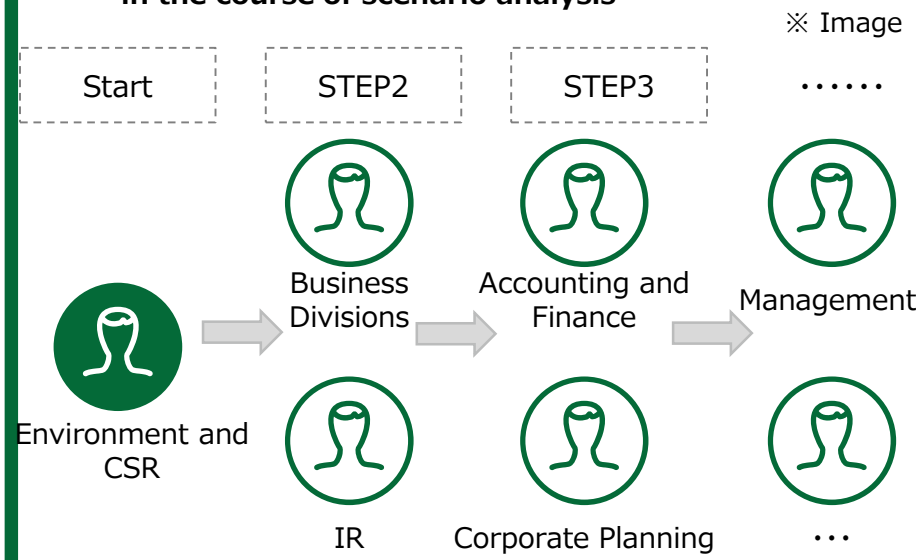
Preparation②

Create an execution team for scenario analysis

Some companies from the program noted the significance of internal involvement when conducting scenario analysis. It is essential to form a team where divisions are involved from the very beginning so that they think of climate change as “a company risk"

Pattern A

Get relevant divisions and departments involved in the course of scenario analysis

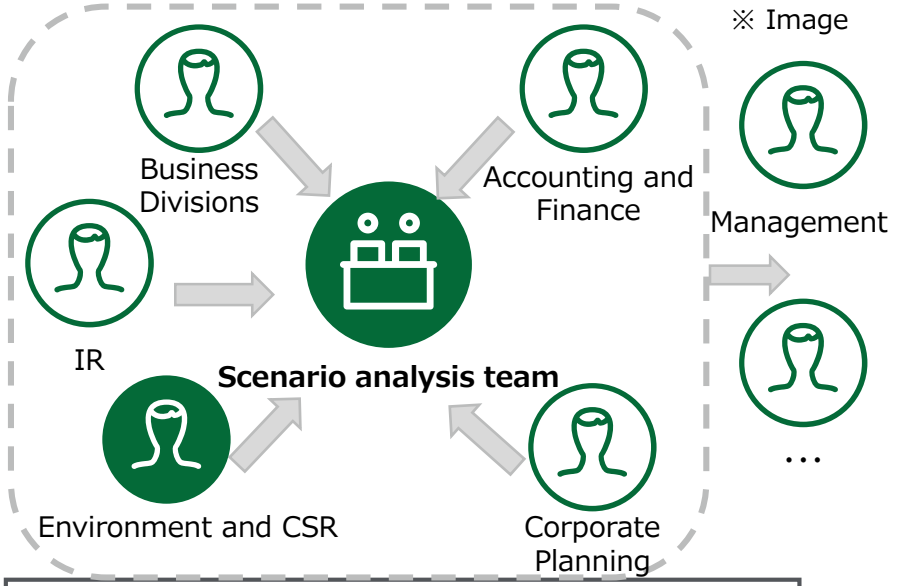


Advantages
- ✓ Easy to start
- ✓ Minimum burden on each division/department

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

Preparation ③

Choose target for analysis

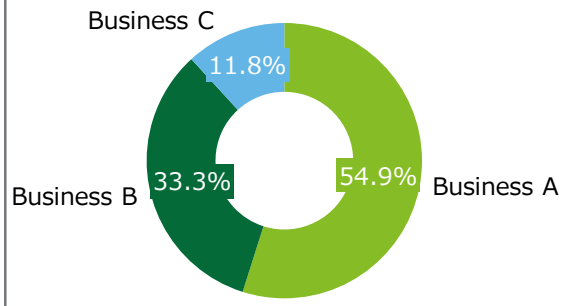
By defining the scope in terms of sales composition, relation to climate change, and difficulty of data collection, companies can conduct scenario analysis in accordance with their business model.

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 (%)]

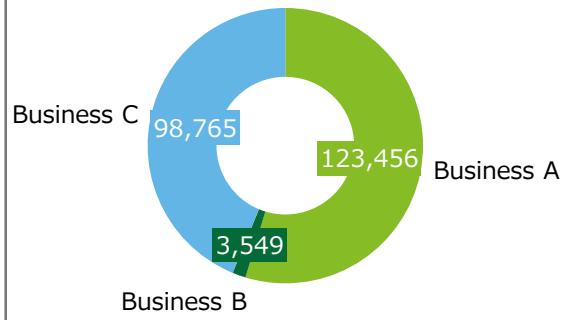


Let's analyze business A and business B, which have a large sales composition

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

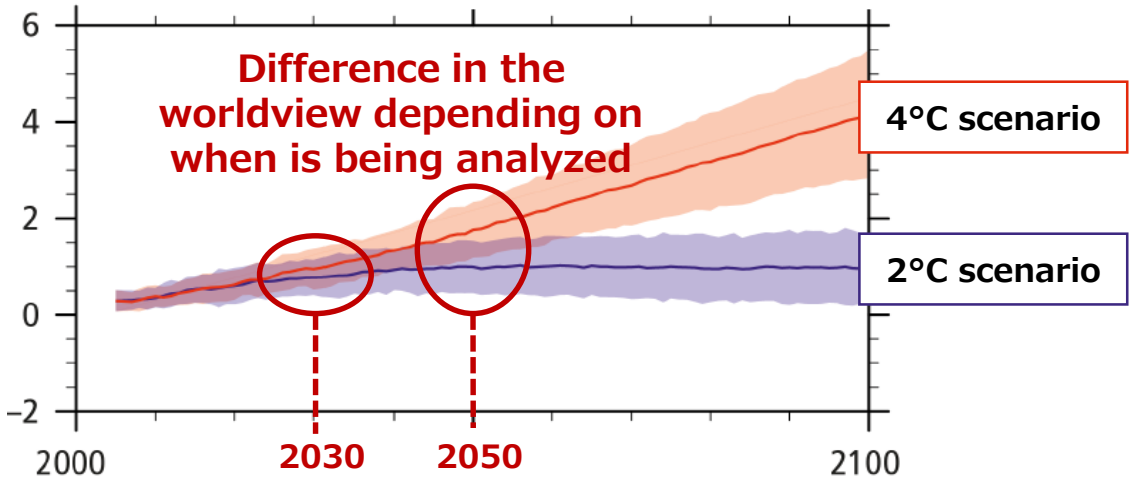
As for the overseas business, start with X with ample data.

Preparation ④

Choose time horizon to conduct scenario analysis

It is important to choose a time horizon with maximum benefit to the company by comparing the merits and demerits of factors from the perspective of project length, amount of internal involvement, and effect of physical risks

[Forecast of global average surface temperature] (Difference from the 1986-2005 average)



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

	Benefits	Disadvantage
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
2050	• Physical risks are emerging.	• Cooperation may be difficult (cannot involve the company) because the time horizon is significantly longer than the business plan

Source: AR5 SYR Chart SPM.6, IEA, "ETP2017," UNEP, "The Emission Gap Report 2015

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2-6. Quantitative assessment of physical risk

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

TCFD

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

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[Flow of risk importance assessment]
Use of draft prepared based on external information and materials provided

Flow of risk importance assessment

① literature search

Collect climate change risks / opportunities in the financial industry and the magnitude of risks by sector (investment and lender) from reliable sources

- ✓ Climate Change Initiative (TCFD)
- ✓ Specialized Agencies (SASB, EBRD, etc.)
- ✓ United Nations (UNEP-FI, etc.)
- ✓ think tanks, etc.

② Reflection of the portfolio

Examining your bank's own climate change impacts

- ✓ Extracting Sectors with a Large Credit Balance from your bank's Portfolio Composition
- ✓ Adding high-risk major lending sectors as borrower risks (Closer Look at Next Steps)

((3) Benchmark survey)

Recognition by other banks

- ✓ Identify risk and opportunity perceptions of other companies from CDP responses and disclosure information

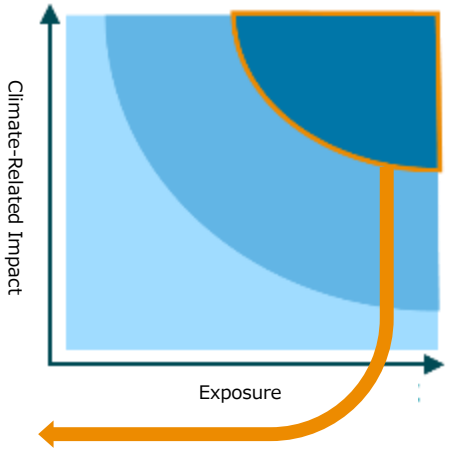
④ With the use of long lists Preparation of draft importance evaluation

List risks and opportunities and tentatively assess their importance

- ✓ ① Longer listing of risk and opportunity items in (3)
- ✓ After classifying and aggregating, temporarily place the importance in 3 stages ("Large", "Medium", "Small")

By considering the importance of the medium- to long-term transition / physical risk (eg, climate change will progress and countermeasures will be strengthened in 2030 / 2050), the evaluation of "large", "medium", and "small" is assumed.

On a draft evaluation Review Validity

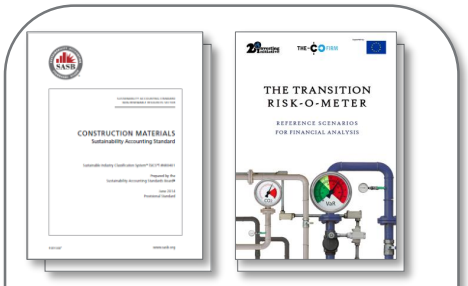


Long list of climate change risks and opportunities

risk opportunity type			risks and opportunities	Source
major group	intermediate classification	subclassification		
Transition	policy	carbon tax	Due to the introduction of an extreme carbon tax,	Literature A CDP
Transition	regulation	Energy Conservation Law	Due to stricter regulations under the Energy Conservation Law,	CDP
Transition	Technology	Development of low carbon technologies	Due to the increased number of renewable energy power generation, × × is △ △	Bibliography B
Transition	market	Credit Risk	Changes in customer behavior increase the credit risk of borrowers	Literature C
Transition	reputation	reputation from investors	Due to expansion of divestment, × × became △ △	CDP
Physical	acute	intensification of extreme weather	Extreme disasters have become more frequent and serious.	Literature C CDP

ILLUSTRATIVE

[Stage1: List risk items]
List risk and opportunity categories for targeted business areas



External reports
(Industry-specific reports, 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	Policy Regulation	Carbon price
		Carbon emissions targets/policies 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	Chronic	Increase in average temperature
		Changes in rainfall and weather patterns
		Rising sea level
	Acute	Increasing severity of extreme weather conditions

Image

High-Level assessment of the impact of climate change on each of GICS'69 industries

Excerpt from the evaluation matrix

*See Appendix for details

Source of information / Sector	Sectoral assessment (Up to 34)	investor						ESG Assessment Bodies		Initiatives, etc.			
		TCFD Final Report (*)	2 ii (*)	EBRD	427	Calvert	GPIF	DJSI	FTSE	SASB	Climate Wise (* *)	GA Institute	Finch & Beak
Construction materials	**30**	3	3	3	3	2	3	1	3	3	0	3	3
Metals and mining	**28**	3	3	3	3	2	3						
Chemistry	**27**	3	0	3	3	2	3						
Paper products and forest products	**25**	3	0	3	3	2	3						
Electric power	**25**	3	3	3	3	2	3						
Gas	**22**	3	0	3	3	2	3						
Oil, gas and consumable fuel	**22**	3	0	2	2	2	3						
Automotive parts	**21**	3	3	2	1	1	1						
			3	2	1	1	1						

GICS is used for sector classification.

. . .

. . .

Sources covering only specific sectors

The source of information for the '*' mark is 3 for those with sector references (Key sources of TCFD information), 0 for those without sector references;

The source of the "* *" mark is rated as 1 point (Minor sources of TCFD information) for those with sector references and 0 points for those without sector references.

Sources covering a wide range of sectors

For information sources without a mark such as "*", the top 30% received 3 points, 31 ~ 60% received 2 points, and the rest received 1 point. Roughness points rated on 3 levels (High/Medium/Low, etc.) are evaluated as is.

[Examination of the business sector to be analyzed]
Identifying business segments based on the magnitude of risks to climate change by bank portfolio and business sector

Climate-Related risks by business segment

		Sectoral evaluation	Investor						ESG rating agency		Initiatives, etc.			
			TCFD Final Report	2ii	EBRD	427	Calvert	GPIF	DJSI	FTSE	SASB	Climate Wise	GA Institute	Finch & Beak
Code	Industry		Specific sector	Specific sector	Broad sector	Broad sector	Broad sector	Broad sector	Broad sector	Broad sector	Broad sector	Specific sector	Broad sector	Broad sector
151020	Construction Materials	30	3	3	3	3	2	3	1	3	3	0	3	3
151040	Metals & Mining	28	3	3	3	3	2	3	1	3	3	0	1	3
151010	Chemicals	27	3	0	3	3	2	3	1	3	3	0	3	3
151050	Paper & Forest Products	25	3	0	3	3	2	3	1	3	2	0	2	3
551010	Electric Utilities	25	3	3	3	3	2	3	1	1	2	0	2	2
551020	Gas Utilities	22	3	0	3	3	2	3	1	3	0	1	1	2
101020	Oil, Gas & Consumable Fuels	22	3	0	2	2	2	3	2	3	2	0	1	2
251010	Auto Components	21	3	3	2	1	1	1	3	2	1	0	3	1
251020	Automobiles	21	3	3	2	1	1	1	3	3	0	0	3	1
151030	Containers & Packaging	21	0	0	3	3	2	3	1	1	3	0	2	3
302010	Beverages	20	3	0	2	2	2	2	2	1	2	0	2	2
101010	Energy Equipment & Services	20	3	3	2	2	2	3	0	0	2	1	0	2
302020	Food Products	19	3	0	2	2	2	2	2	1	2	0	1	2
203020	Airlines	19	3	3	1	1	1	2	1	3	1	0	2	1
551040	Water Utilities	19	0	0	3	3	2	3	0	1	3	1	1	2
201010	Aerospace & Defense	18	0	0	2	1	1	2	3	2	1	0	3	3
551030	Multi-Utilities	18	0	0	3	3	2	3	1	3	0	0	1	2
203030	Marine	18	3	3	1	1	1	2	0	3	1	0	2	1
601020	Real Estate Management & Development	18	3	0	1	1	2	2	1	1	3	1	1	2
551050	Independent Power and Renewable Electricity Producers	17	0	0	3	3	2	3	0	1	0	0	3	2
203010	Air Freight & Logistics	17	3	3	1	1	1	2	1	1	1	0	2	1
203040	Road & Rail	17	3	3	1	1	1	2	0	2	1	0	2	1
201040	Electrical Equipment	16	0	0	2	1	1	2	2	1	1	0	3	3
401010	Banks	15	3	0	1	1	2	1	2	1	0	0	1	3
201060	Machinery	14	0	0	2	1	1	2	2	2	1	0	0	3
302030	Tobacco	14	0	0	2	2	2	2	2	1	0	0	1	2
401020	Thrifts & Mortgage Finance	14	3	0	1	1	2	1	2	0	1	0	0	3
201020	Building Products	13	0	0	2	1	1	2	3	0	1	0	0	3
201030	Construction & Engineering	13	0	0	2	1	1	2	3	0	0	0	1	3
301010	Food & Staples Retailing	13	0	0	1	1	1	2	2	1	2	0	2	1
403010	Insurance	13	3	0	1	1	2	1	1	1	1	0	1	1

Source: Deloitte touche Tohmatsu LLC

[Determination of risk severity]
Determine materiality based on the magnitude of the business impact of a risk or opportunity

Type	Evaluation item		Business Impact Analysis (qualitative information)		Proposal of importance
	Major group	Subclassification	Risk	Opportunity	
Migration	Policy / Regulation	Carbon tax and price	**Introduction of a carbon tax (rising operating costs)** • The introduction of a carbon tax would require the payment of a tax on GHG emissions from corporate activities	**Shift to alternatives through the introduction of a carbon tax (increase in sales)** • Modal shifts (Shift from automobile to rail transport) may accelerate as a carbon tax is introduced	Large
		Addressing GHG emission regulations	**Strengthening of GHG emission regulations (rising operating costs)** • Fuel efficiency regulations will become stricter, requiring the payment of fines for unmet emissions.	NA	Medium
		Fossil fuel subsidy	**Abolition of fossil fuel subsidies (rising R & D costs)** • If fossil fuel subsidies are eliminated, support projects for the development of low-carbon technologies may be terminated, resulting in high R & D costs.	NA	Small
	Market	Increase or decrease in the price of important products	**Rising demand for raw materials (rising operating costs)** • If the price of materials and parts (Batteries, etc.) rises due to the progress of EV shift, the manufacturing cost will rise.	NA	Medium
		Energy price	**Higher energy prices (rising operating costs)** • Higher energy prices lead to higher electricity and fuel costs in transport, resulting in higher transport and overhead costs	**Increased use due to changes in modes of transport (increase in sales)** • May choose rail or other transportation over trucks during periods of high gasoline prices	Large
	Technology	Dissemination of electric vehicles (Dissemination of next-generation technologies)	**Conversion to electric vehicles (increase in capital investment)** • Conversion cost from internal combustion trucks to EV trucks is high due to the spread of EVs throughout the market and requests from customers.	**Expansion of electric vehicles and low-carbon technologies (higher sales and lower operating costs)** • Advances in technology will lower the cost of introducing EVs • The development of transportation technologies will increase the maximum load per vehicle and the spread of low-carbon technologies will reduce transportation costs. **Lower energy costs (lower operating costs)**	Large
		Spread of renewable and energy-saving technologies	NA		
	Reputation	Changes in customer behavior	**Changing customer preferences (decline in sales)** • Increased customer awareness of environmental c result in less companies being chosen for their env		
		Changing investor reputation	**Poor investor reputation (higher funding costs)** • The divestment trend accelerates, which becomes managing against environmental factors. As a resul		
Physical	Chronic	Changes in precipitation and weather patterns	**Lower demand for existing products (decline in sales)** • Changes in weather patterns and increased freque amphibious vehicles in some areas, which will impa		
		Increase in mean temperature	**Thermal expansion of lines (increase in capital investr** • Thermal waves cause thermal expansion and break transport and higher response costs		
	Acute	Intensification of extreme weather	**Damage to operations due to severe disaster (increas** • When abnormal weather occurs frequently and ma damaged, operations are suspended or restoration are damaged.		

Type	Evaluation item		Business	Proposal of importance
	Major group	Subclassification	Risk	
Migration	Reputation	Changes in customer behavior	**Raising environmental awareness (Decrease in sales and increase in c** • Increased demand for non-fossil fuels reduces sales of conve • Sales volume decreases due to energy conversion and • there is a growing trend to avoid procuring energy fro • It is difficult to secure land for new development projects	arge
		Reputation from investors	**Investor Diversification (Decline in asset value and increase in ba** • accelerated divestment from oil and coal, reduce the value assets funds • divestment undermines company valuations and undermines share pr	dium
		litigation risk	**Increased operating costs** • Lack of information disclosure on climate change and investment in hi litigation by investors and surrounding communities, resulting in resp	dium
Physical	Chronic	Water shortages and drought	**Tight water supply and demand (increased operating costs)** • Additional installation of water-saving equipment at sites is required • swater and groundwater prices at production sites soar • production is stopped due to water shortages and restrictions on water	mall
		Temperature variation	**Declining Utilization and Worsening Labor Environment (Decrease in sal** • Extremely high or low temperatures will result in loss due to facility clo • a rise in average temperature would reduce the energy demand for he • Higher temperatures will worsen working conditions for outdoor work measures against heat stroke • In order to maintain comfort levels in plants and offices, it is necessary increase the number of facilities	mall
		Sea level rise	**Disaster prevention measures (increased operating costs)** • Costs will be added for equipment investment in response to storm surge	edium
	Acute	Intensification of extreme weather	**Strengthening disaster prevention measures (increased operating costs)** • Requires capital investment to improve disaster prevention performance • It is necessary to double-track the supply chain in order to improve the resilience against the interruption of physical distribution. **Occurrence of property damage (increased operating costs)** • Receiving bases and power plants in coastal areas are damaged by storm surges and floods, and operations are suspended • Rising raw material procurement costs due to adverse sea conditions • Higher premiums and additional costs due to increased natural disasters	–	Large

For each risk and opportunity category
"magnitude of business impact"
comparison in terms of

Example:Increase the size of risks and opportunities with a large scope of impact, or increase the size of risks and opportunities related to business
"Small" for risks and opportunities that have no impact on the borrower's business and "Medium" for others

[Risk Severity Assessment Flow (1/2)]
Identify potential future climate change risks and opportunities in key investment sectors

Considerations

What are the risks and opportunities for climate change organizations are expected to face?

Will they become significant in the future?

Are the organization's stakeholders actively engaged on these issues?

Point

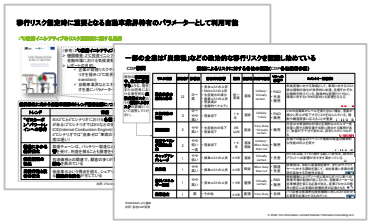
- ✓ Build on external views on climate change risks and opportunities, including TCFD
- ✓ Based on risk recognition by other companies (Responses to CDP, etc.)
- ✓ Supplement with information about critical factors to be analyzed (Major Portfolios, etc.)

Risk Severity Assessment Process

Example of TCFD Supplement

Classification	TCFD Risk and Opportunity Items	
Transition	Policy / regulation	Carbon price
		Carbon emissions targets/policies in each country
		Energy conservation policy
		Fossil fuel subsidy
		Subsidies for renewable energy, etc.
	Industry / market	Changes in the energy mix
		Trends in energy demand
		Increase or decrease in the price of important products/products
	Technology	Dissemination of low-carbon technologies
		Spread of renewable and energy-saving technologies
		Progress in next-generation technologies
	Reputation	Changing customer reputation
		Changing investor reputation
Physical	Chronic	Increase in mean temperature
		Changes in precipitation and weather patterns
		Sea level rise
	Acute	Intensification of extreme weather

External/Other Views



- ✓ Government system
- ✓ United Nations
- ✓ Specialized agency
- ✓ Trade association
- ✓ Climate Change Initiative
- ✓ Competitors
- ✓ NGO
- ✓ Financial industry

Examples of Risk Items in the Investment Finance Sector

Classification	Your bank's Risk and Opportunity Items (updated version)		Importance
Transition	Policy / regulation	Carbon tax and price	Large
		Addressing GHG emission regulations	Medium
		Compliance with Disclosure Rules	Small
	Industry / Market	Investment, Loan and Insurance Policies	-
	Technology	Dissemination of low-carbon technologies	-
	Reputation	Changes in customer behavior	-
		Reputation from investors	-
		litigation risk	-
Physical	Chronic	Water shortages and drought	-
		Temperature variation	-
		Sea level rise	-
	Acute	Intensification of extreme weather	-
		Larger scale forest fires	-

[Risk Severity Assessment Flow (2/2)]
Discuss the major risks and opportunities to be analyzed (High Importance) for each sector

2 Risk Importance Assessment Procedure

Step1
Target sector decisions
The bank Portfolio is narrowed down to the major high-risk loan sectors.

Step2 -1
Literature search
Collects climate change risks and opportunities in each sector from reliable sources

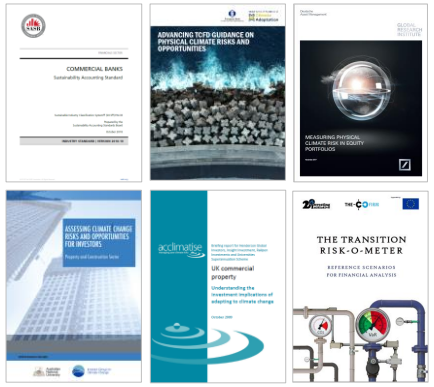
Step2 -2
Benchmark survey
Identify risk and opportunity perceptions of leading companies from CDP responses

Step2 -3
Importance assessment (draft)
Classify and aggregate risk and opportunity categories, and assess their importance on a 3-point scale (Large, Medium, and Small)

Step2 -4
Validity examination
The importance of risk presented by the bank is adjusted based on its view, and the importance level "Large" is decided for the next.

3
Definition of scenario groups

See TCFD, SASB, EBRD and other external reports by sector



Identifying risks and opportunities from CDP responses from leading companies in each sector

Summarize the risks and opportunities of each sector and prepare a draft of the importance.

risk opportunity type			risks and opportunities	Source
major group	intermediate classification	subclassification		
Transition	policy	carbon tax	Due to the introduction of an extreme carbon tax,	Literature A CDP
Transition	regulation	Energy Conservation Law	Due to stricter regulations under the Energy Conservation Law,	CDP
Transition	Technology	Decrease in unit cost of new technologies	Due to the decrease in unit cost of new energy power generation, ×	Bibliography B
Transition	market	Credit Risk	Changes in customer behavior increase the credit risk of borrowers	Literature C
Transition	reputation	reputation from investors	Due to expansion of divestment, × × became △ △	CDP
Physical	acute	intensification of extreme weather	Extreme disasters have become more frequent and serious.	Literature C CDP
			⋮	

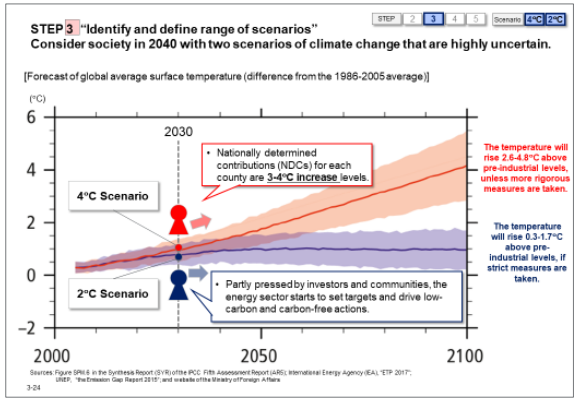
ILLUSTRATIVE

2. Scenario Analysis - Key Points of Practice
2-1. For starting scenario analysis
2-2. Assess materiality of climate-related risks
2-3. Identify and define range of scenarios
2-4. Evaluate Qualitative Business Impact
2-5. Quantitative assessment of transition risk
2-6. Quantitative assessment of physical risk
2-7. Documentation and Disclosure

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

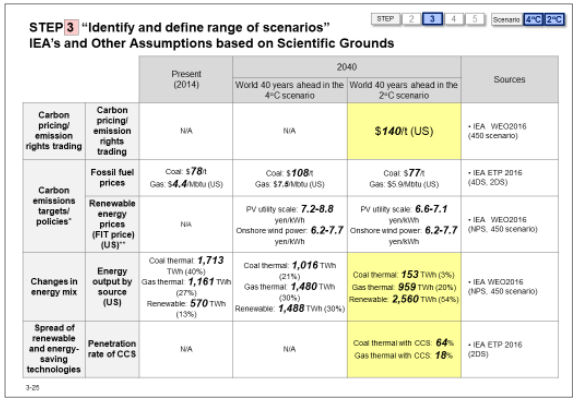
Stage1
Choose scenarios

Choose a number of scenarios with different temperature targets, including "lower than 2°C".



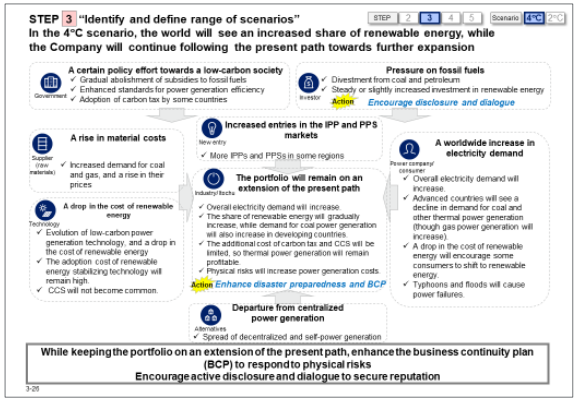
Stage 2
Obtain forecast information on relevant parameters (variables)

Obtain objective forecast information of relevant parameters on each risk and opportunity item, and identify the impacts on the company in further detail.



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).



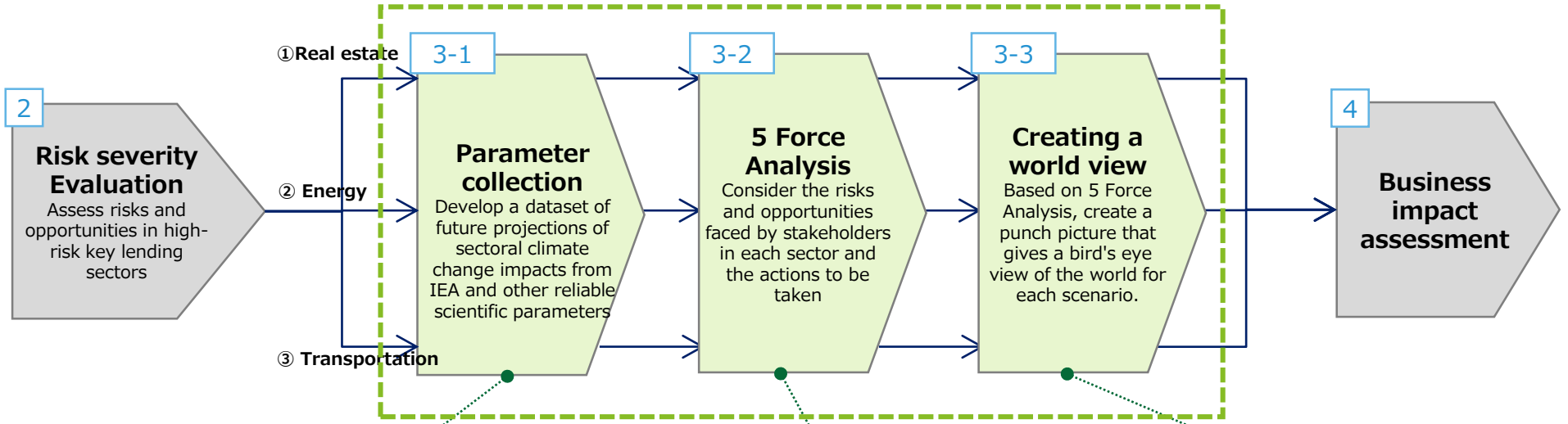
Note

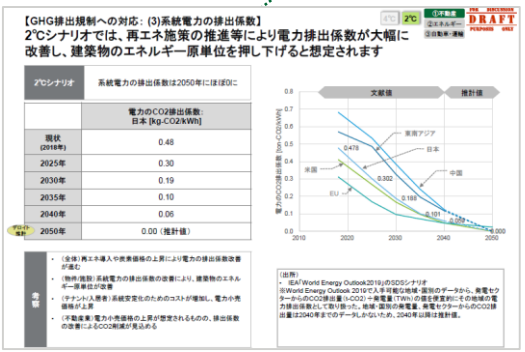
What kind of scenarios should be chosen?

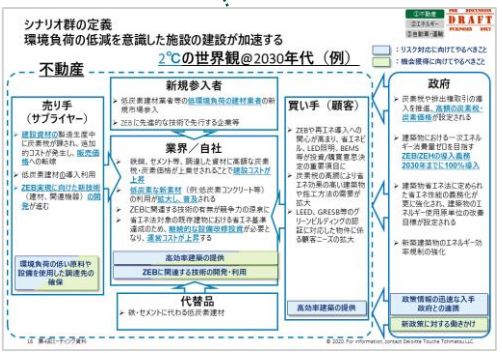
Source: Practical guide for Scenario Analysis in line with the TCFD recommendations 2nd edition (example of ITOCHU Corporation)

[How to Define Scenario Groups]
Analyze the business impact of high-risk key lending by sector

3 How to Define Scenario Groups

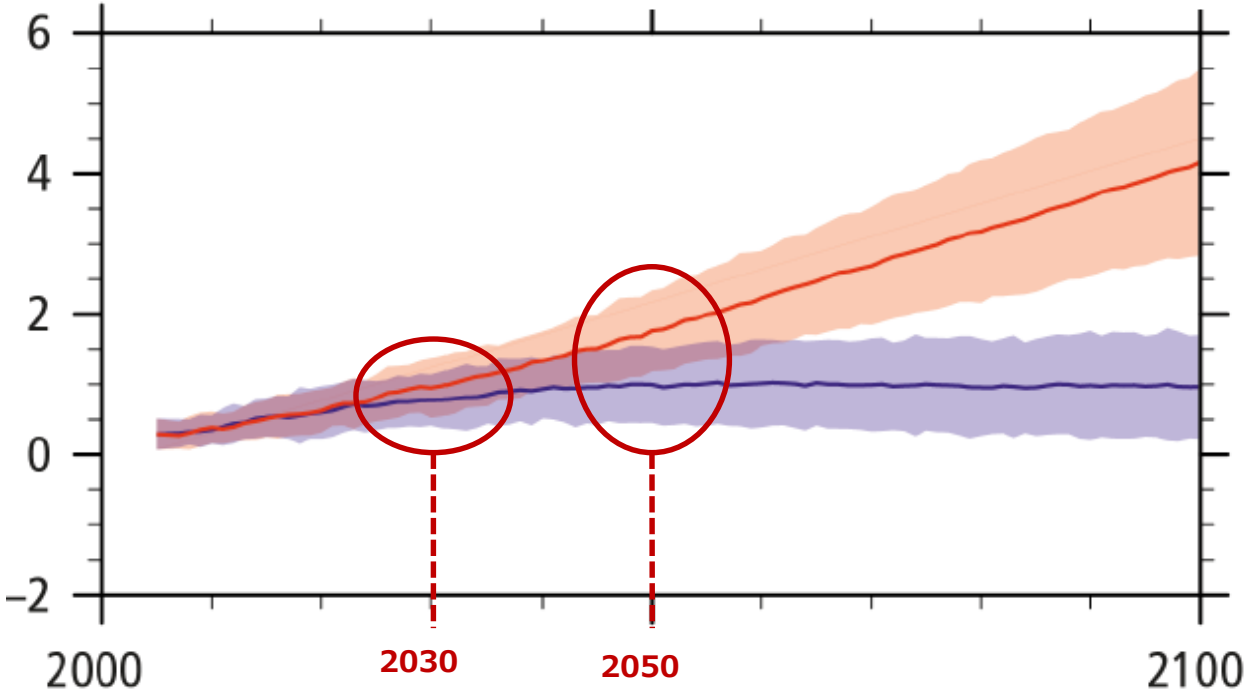






[Stage1: Choose scenarios]
Choose a number of scenarios with different temperature targets, including “lower than 2oC”

[Forecast of global averages surface temperature]
(Difference from the 1986-2005 average)



4°C scenario:
The temperature will rise 3.2-5.4°C above pre-industrial levels, unless more rigorous measures are taken.

2°C scenario:
The temperature will rise 0.9-2.3°C above pre-industrial levels, if strict measures are taken.

(Reference) 1.5°C scenario:
The temperature will rise less than 1.5°C above pre-industrial levels with high probability, if fundamental system Transition is achieved

Almost the same temperature changes would occur in the 2°C and 4°C scenarios by 2030.
Differences between scenarios widen in the years after 2030.

Scenario analysis in the TCFD recommendations indicates applying multiple temperature scenarios including under 2℃ scenario

Sources: AR5 SYR Chart SPM.6, "ETP2017," UNEP, "The Emission Gap Report 2015, Global Warming of 1.5°C (IPCC).

[Step 2: Obtain forecast information on parameters (variables)]
Obtain forecast information on parameters and identify the effects to the company in further detail

List of Risks and Opportunities

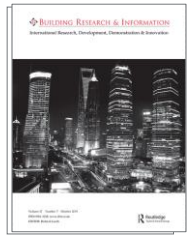
Type	Evaluation item: Major group	Evaluation item: Subclassification	Business Impact Analysis (qualitative information): Risk	Business Impact Analysis (qualitative information): Opportunity	Proposal of importance
Migration	Reputation	Changes in customer behavior	**Raising environmental awareness (Decrease in sales and increase in operating costs)** ・Increased demand for non-fossil fuels reduces sales of conventional energy to individuals ・Sales volume decreases due to energy conversion and re-eneration shift (RE 100, etc.) by corporate customers ・there is a growing trend to avoid procuring energy from utilities with high grid power emission factors ・It is difficult to secure land for new development projects from the viewpoint of adverse effects on the ecosystem	**Raising environmental awareness (Increase in sales)** ・Sales of low-carbon energy will increase due to increased demand for renewable energy and distributed energy and increased environmental awareness.	Large
		Reputation from investors	**Investor Diversification (Decline in asset value and increase in procurement costs)** ・accelerated divestment from oil and coal, reduce the value assets held, and rising interest rates make it difficult to raise new funds ・divestment undermines company valuations and undermines share prices	**Improved Assessment** ・Investor appreciation of advanced climate change disclosures	Medium
		litigation risk	**Increased operating costs** ・Lack of information disclosure on climate change and investment in high GHG emissions projects are met with opposition and litigation by investors and surrounding communities, resulting in response costs	–	Medium
Physical	Chronic	Water shortages and drought	**Tight water supply and demand (Increased operating costs)** ・Additional installation of water-saving equipment at sites is required ・swater and groundwater prices at production sites soar ・production is stopped due to water shortages and restrictions on water intake	–	Small
		Temperature variation	**Declining Utilization and Worsening Labor Environment (Decrease in sales and increase in operating costs)** ・Extremely high or low temperatures will result in loss due to facility closures and a reduction in production utilisation. ・a rise in average temperature would reduce the energy demand for heating ・Higher temperatures will worsen working conditions for outdoor workers, resulting in shorter working hours and costs for measures against heat stroke ・In order to maintain comfort levels in plants and offices, it is necessary to strengthen the operation of air conditioners and increase the number of facilities	**Increased demand for cooling due to rising temperatures (Increase in sales)** ・demand for air conditioning in summer increases and power consumption increases	Small
		Sea level rise	**Disaster prevention measures (Increased operating costs)** ・Costs will be added for equipment investment in response to storm surges and sealevel rises at storage facilities	–	Medium
	Acute	Intensification of extreme weather	**Strengthening disaster prevention measures (Increased operating costs)** ・Requires capital investment to improve disaster prevention performance ・It is necessary to double-track the supply chain in order to improve the resilience against the interruption of physical distribution. **Occurrence of property damage (Increased operating costs)** ・Receiving bases and power plants in coastal areas are damaged by storm surges and floods, and operations are suspended ・Rising raw material procurement costs due to adverse sea conditions ・Higher premiums and additional costs due to increased natural disasters	–	Large

Parameters list

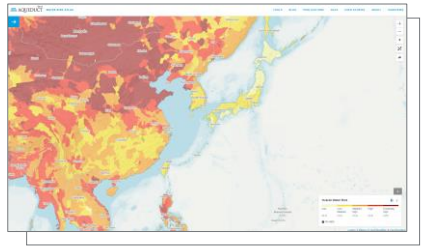
Important Items (object of analysis)	Configured Parameter	Current	4 °C: Before 2030	4 °C: 2040 and later	2 °C: Before 2030	2 °C: 2040 and later
Carbon tax and price	(1) Carbon tax	Japan: None Overseas: Some	(2030) Japan: N/A EU: 33 USD/t	(2040) Japan: N/A EU: 43 USD/t	(2030) Developed Countries: 100 USD/t Developing countries: 75 USD/t	(2040) **Developed Countries: 140 USD/t** Developing countries: 75 USD/t
Addressing GHG emission regulations	(2) Energy consumption per unit of building	(base year) Global 2014	(2030) Improvement rate of 6%	(2040) Improvement rate of 21%	(2030) Improvement rate of 7%	(2040) **Improvement rate of 34%**
	(3) Grid power emission factor	(base year) Japan: 2018 0.48 kg CO2/kWh	(2030) 0.31 kg CO2/kWh	(2040) 0.29 kg CO2/kWh	(2030) 0.19 kg CO2/kWh	(2040) **0.06 kg CO2/kWh**
	(4) Mandatory implementation of ZEB/ZEH (government target)	(base year) 2014	(2020) Total floor area of ZEB 0 Billion m2	(2040) Total floor area of ZEB 5 Billion m2	(2020) Total floor area of ZEB 1 Billion m2	(2040) Total floor area of ZEB **32 Billion m2**
Changes in customer behavior	(5) Rent increase or decrease due to environmental performance	4.4% increase in rent	N/A	N/A	N/A	N/A
Intensification of extreme weather	(6) Flood damage amount	(base year) Japan: 2010	(2030) +121%	N/A	N/A	N/A
	(7) Changes in flood frequency	(base year) 2019	N/A	(2040) Flood occurrence frequency of about 4 times	N/A	(2040) Flood occurrence frequency of about 2 times
	(8) Occurrence of typhoons and cyclones	(base year) Japan: 2016	N/A	(2100) Observations are highly uncertain and the number of typhoons per year is uncertain	N/A	N/A
	(9) Sea level rise	(base year) 2015	(2030) 0.18 m	(2040) 0.25 m	(2030) 0.1 m	(2040) 0.15 m

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

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



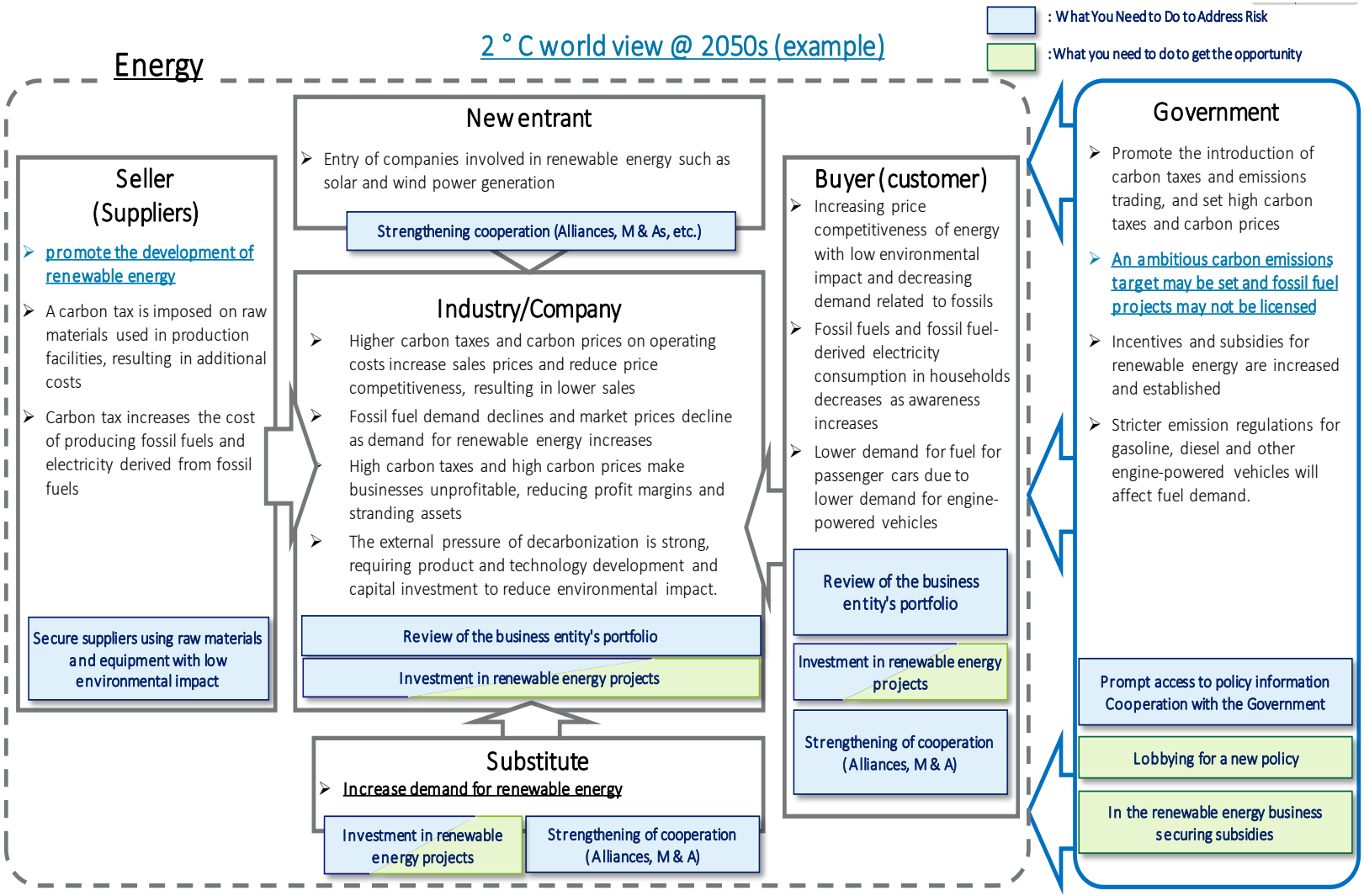
External reports
(Industry-specific reports, academic papers, etc.)



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

Source: Practical guide for Scenario Analysis in line with the TCFD recommendations 2nd edition (example of Chiyoda Corporation)

[Organizing the world view with stakeholder awareness]
Based on future information, clarify the world view surrounding the company



2. Scenario Analysis - Key Points of Practice

- 2-1. For starting scenario analysis
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[business impact assessment]
Presenting the 2 ° C and 4 °C world views of priority sectors and analyzing their impacts from both a risk and opportunity perspective

World View and Impact Analysis by Scenario

[2 ° C/4 ° C world view]

Set up a world view

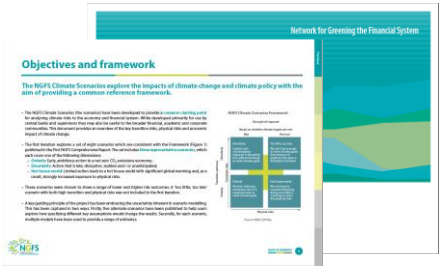
Analyzing the impact of key segments based on the world view of each parameter

[Sectoral impact analysis]

Qualitatively describe the magnitude of risks and opportunities in key sectors

Note: Specific cases are introduced in scenario analysis practice cases.

Ensuring consistency with macroeconomic scenarios published by authorities

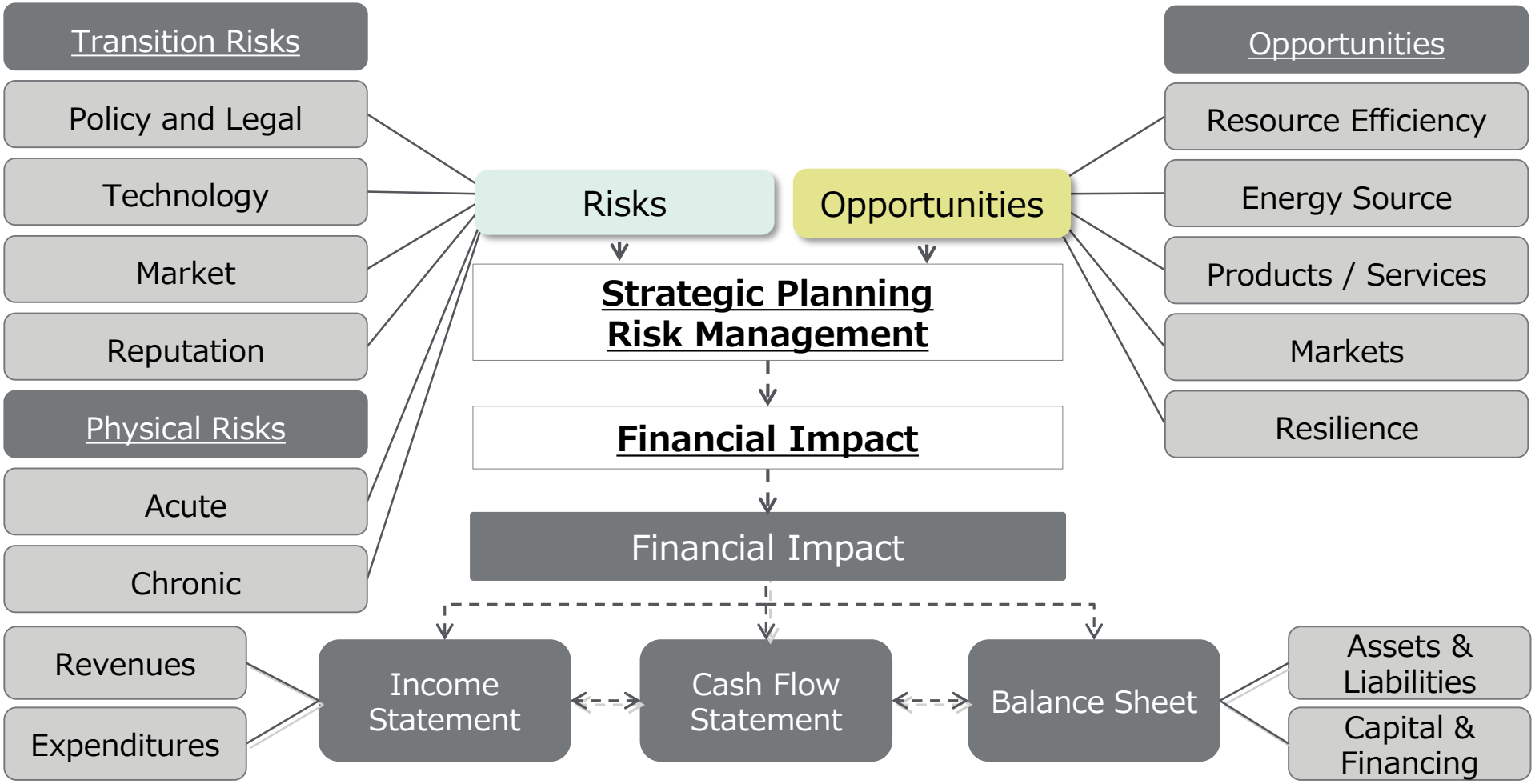


NGFS CLIMATE SCENARIOS for central banks and supervisors (June 2020)

[Financial Impact]

The TCFD recommendations present the scope of climate-related risks and opportunities, and the financial impacts to be disclosed

Climate-Related Risks, Opportunities, and Financial Impacts



Source: prepared by the Ministry of Environment based on the Task Force on Climate-related Financial Disclosures, "Final Report - Recommendations of the Task Force on Climate-related Financial Disclosures", 2017. p.8

[assessment of business impact]
Assess how changes in each scenario will affect suppliers

Matter to be discussed

Each of these scenarios represents the strategic and financial position of an organization and evaluation of potential impacts

Point of discussion

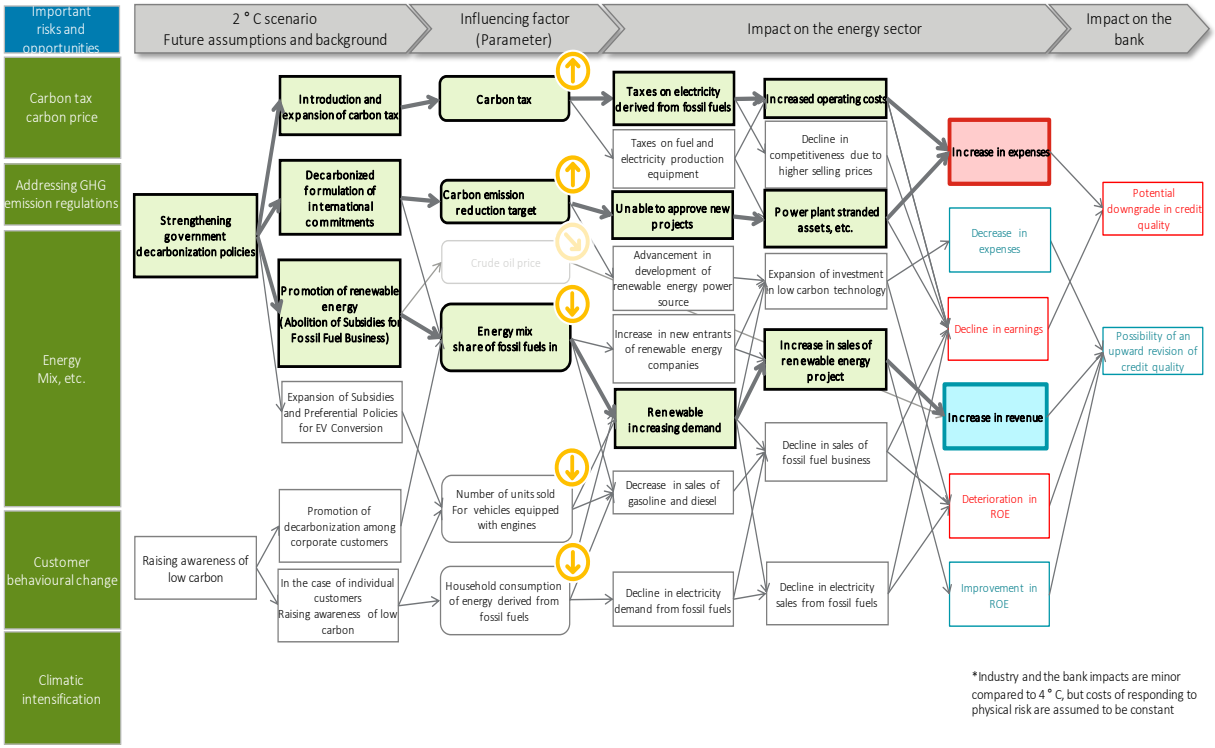
- ✓ Consider strategic options for your company based on a scenario view of the world
  (In some cases, the relative comparison of multiple adaptation strategies in each scenario)

Output image

<Qualitative assessment of Transition/physical risk>

- ✓ Parameter changes in the 2 ° C/4 ° C scenarios are identified and the associated project impact on the sector from which loans and investments are made.
- ✓ Formulate a flow chart of the effects of investments and loans on your bank businesses (qualitative assessment).

Note: Specific cases are introduced in scenario analysis practice cases.



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2-6. Quantitative assessment of physical risk
2-7. Documentation and Disclosure

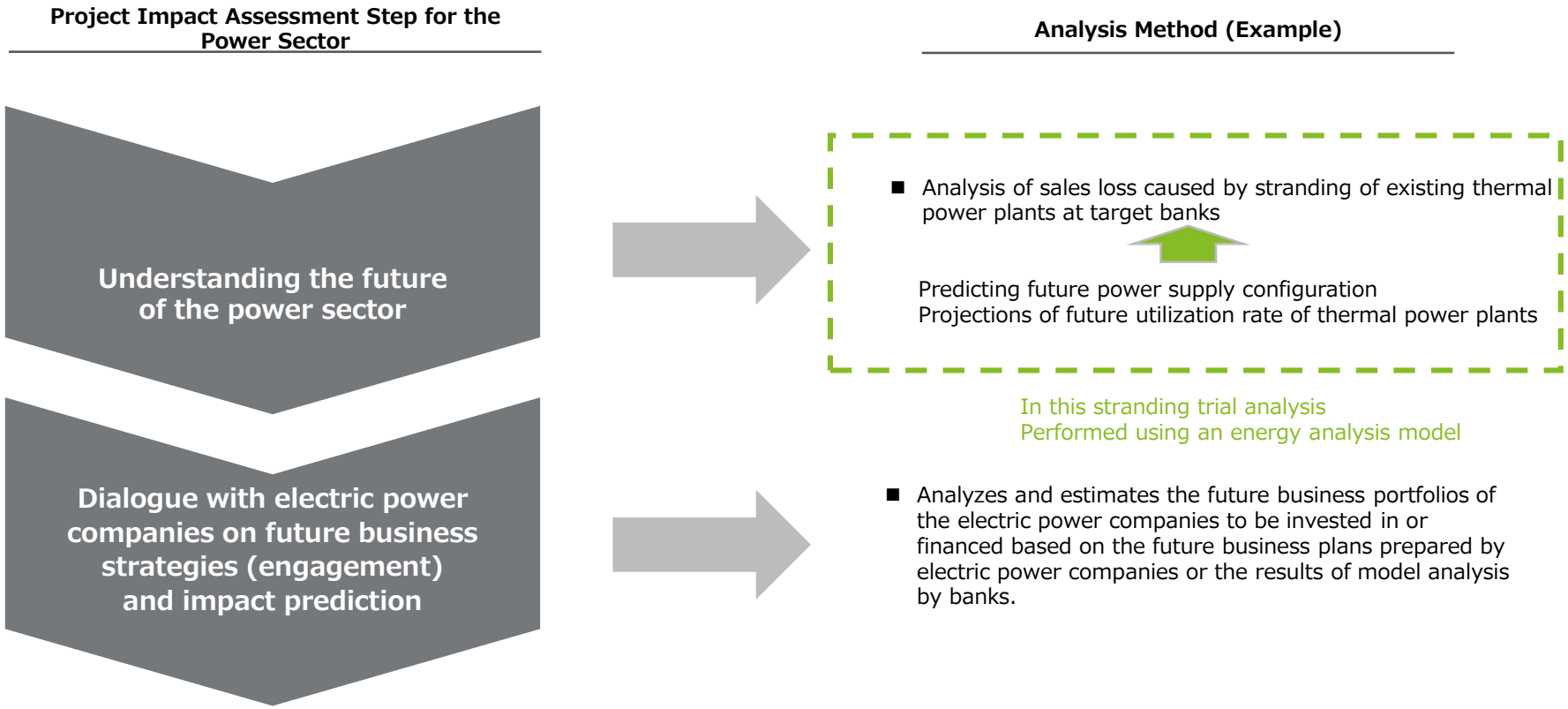
Analysis of Stranded Asset

[Positioning of stranding trial calculation analysis]

In this analysis, future power supply composition, etc. were quantified using an analytical model.

The results of the analysis can be used as interactive material for electric power companies future business models.

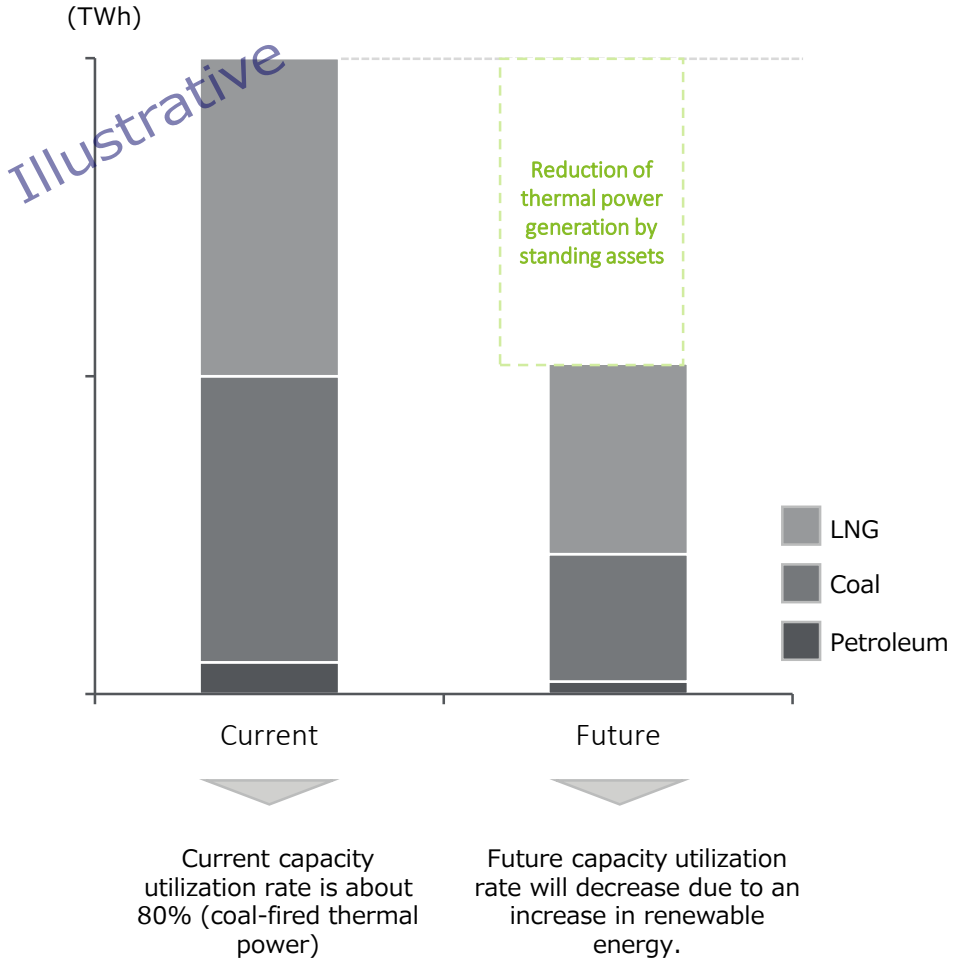
Positioning of stranding trial calculation analysis



[Method for analysis of stranding calculation]

The transition risk in the power sector includes stranding assets in thermal power generation. Perform a trial run analysis using the future operating rates optimized by the energy analysis model

Conversion of thermal power generation facilities to stranded assets



Method for analyzing stranded assets

■ Based on the following concept, we calculated the business impact of reduced operating rates of stranded power generation facilities at each electric power company, and conducted an analysis of stranded power generation facilities.

Δ Power generation for stranding * 1 * Power price * 2

*1: (1) Future energy analysis model
Estimate the amount of electricity generated
② The baseline power generation is based on the operating rate of (1).
(coal: 80%, LNG: 80%, petroleum: 50%)
*2: Current thermal power generation price (coal: 12.3 yen/kWh,
LNG: ¥13.7/kWh, Oil: ¥37.0/kWh)

Source: Agency for Natural Resources and Energy (2015) "Report on verification of power generation costs, etc. to the long-term energy supply-demand outlook subcommittee"

[energy analysis models: about]

The tool leverages the "TIMES" being developed at the IEA's ETSAP. It is possible to calculate the most economically rational future power supply structure, etc., taking into account the reenergy potential and system constraints.

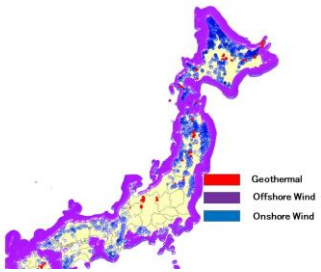
TIMES Overview

TIMES * 1 What is	■ A program to analyze the long-term energy situation under development at ETSAP * 3 of IEA * 2 ➢ Used in analysis of long-term energy scenarios of the IEA and governments ➢ By inputting future energy demand and technical data on energy supply and transportation facilities, the most economically rational combination of technologies (Power supply configuration, etc.) is output as a solution.

What do you input?

Input of various energy-related information

- renewable energy potential information
  - CAPEX/OPEX
  - sunshine and wind conditions
- Information on existing thermal and nuclear power plants
- Cost and technical specifications of systems, storage and hydrogen
- Demographic trends, passenger and logistics information, etc.

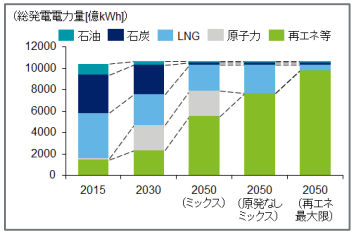


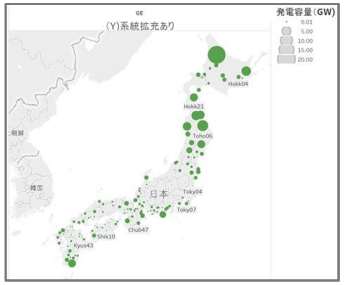
Optimized calculation with constraints
(GHG reductions, cost minimization, etc.)

What can you analyze?

quantitatively predict and analyze the world view of the future energy structure (From 2030)

- Power supply composition ratio
- Demand for system maintenance
- Power Cost Benefit Orders
- Demand for storage batteries and hydrogen
- Penetration rate of ZEV, etc.





*1: The Integrated MARKAL EFOM System *2: International Energy Agency (International Energy Agency) *3: Energy Technology System Analysis Program (Energy Technology Systems Analysis Programme)

[Energy Analysis Model: Input Information]
Input based on various published values

Prerequisites for Analytical Models (Examples)

	Prerequisites	
Electric power generation	Generation cost	Figures published by the Ministry of Economy, Trade and Industry are used.
	Cost of fuel procurement	Figures published by the IEA, the Ministry of Economy, Trade and Industry, and NEDO are used.
	Equipment capacity	Expansion of optimal power sources in response to increased energy demand, based on a comparison of cost effectiveness up to 2050
	Capacity utilisation rate	Historical figures of the Agency for Natural Resources and Energy "power survey statistics" are used, and seasonal variations are taken into consideration.
	CCS Cost	Use IEA Published Values
	Prerequisites for decommissioning nuclear reactors	Assuming decommissioning after 60 years of operation (No New)
Transmission line	System capacity	Considering the system capacity of the substation to the primary substation
	System expansion cost	Use Published Values for OCCTO
	Storage battery introduction cost	Figures published by the Ministry of Economy, Trade and Industry are used.
Electric power demand	Electric power demand	Industry: Proposed at 1% per annum; Business, Assumptions, Transport: Calculated by simulation

[energy analysis models: configuration scenarios]
There are two scenarios for analyzing stranded assets.

4 ° C

Greenhouse gas reduction rate *	80%	90%	95%	26% (2030)
Line expansion	Yes	None		
Vehicle charging pattern * *	optimisation	Current situation		

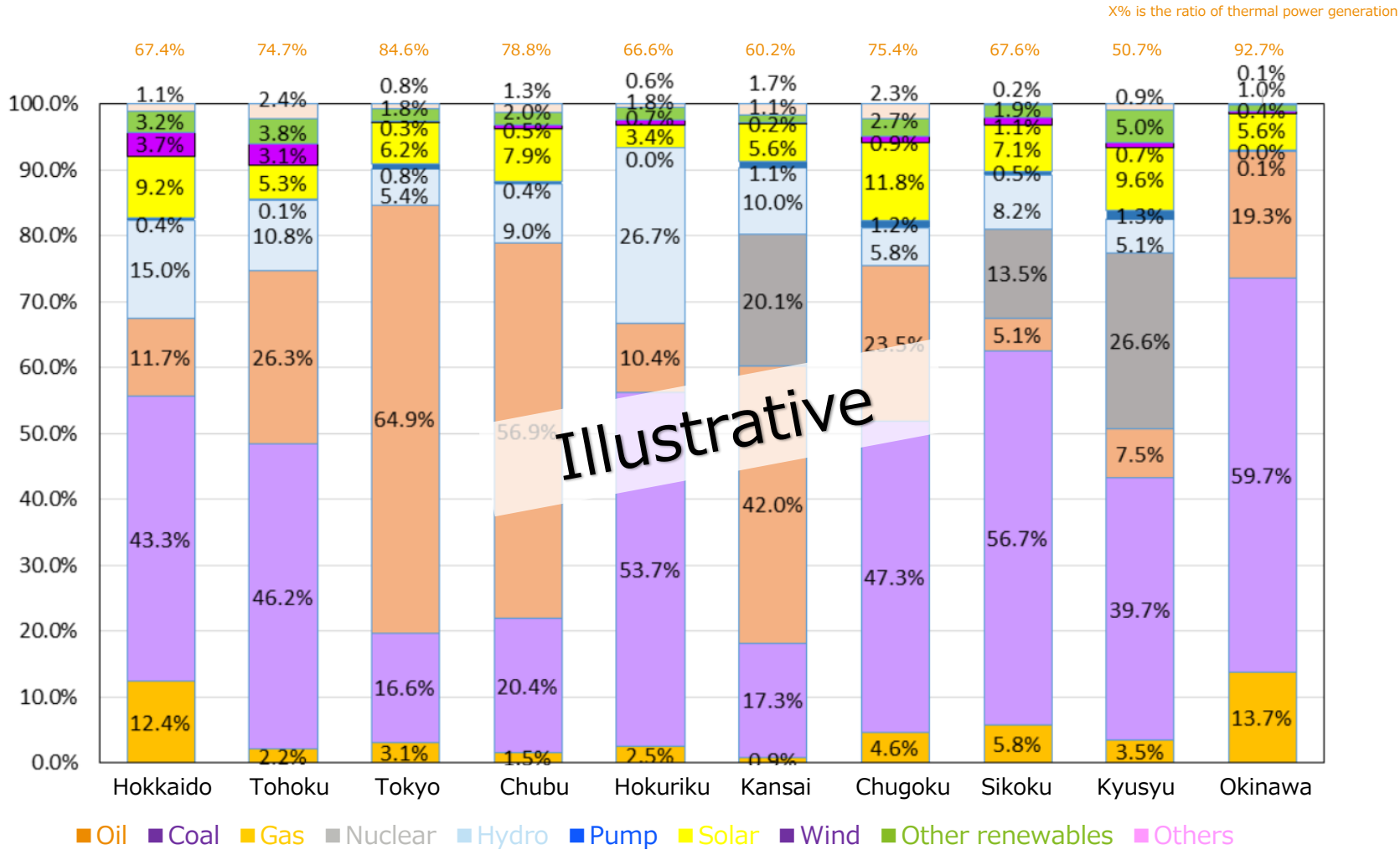
2 ° C

Greenhouse gas reduction rate *	80%	90%	95%	26% (2030)
Line expansion	Yes	None		
Vehicle charging pattern * *	Optimisation	Current situation		

*By 2050 compared to 2013

[(Reference) Current power configuration]
Current Power Supply Configurations by Power Company

Current power configuration (Amount of power generated)



Source: OCCTO (2020) "Annual Report of Organization Promoting Wide-Area Operations"

Analysis Approach of the Financial Impact of transition risk

[Purpose of Financial Statement Analysis of transition risk]
Financial institutions' TCFD approach generally requires financial statement analysis of the impact on cost of credit through engagement with borrowers and use of scenarios

Purpose of Financial Statement Analysis of transition risk

Loan and investment partners engagement

- Quantitative analysis of business impacts in advance under certain scenarios, due to climate change and regulatory impacts
- Evaluating the strategies of the borrower based on the results of this analysis, and holding dialogues with the borrower based on this evaluation to mitigate the risk of climate change in the bank's portfolio and (By expanding opportunities for borrowers) increase the value of the bank's portfolio

Climate change scenario impact analysis on the cost of credit

- Assess the impact on the cost of credit (Accounting allowance for loan losses/EL, UL, etc. for risk management) of the bank's portfolio under different climate change scenarios
- Assess the bank's financial soundness (Amount of current assets held and capital adequacy) in response to the actualization of climate change risks, and reflect this in risk appetite → management plan

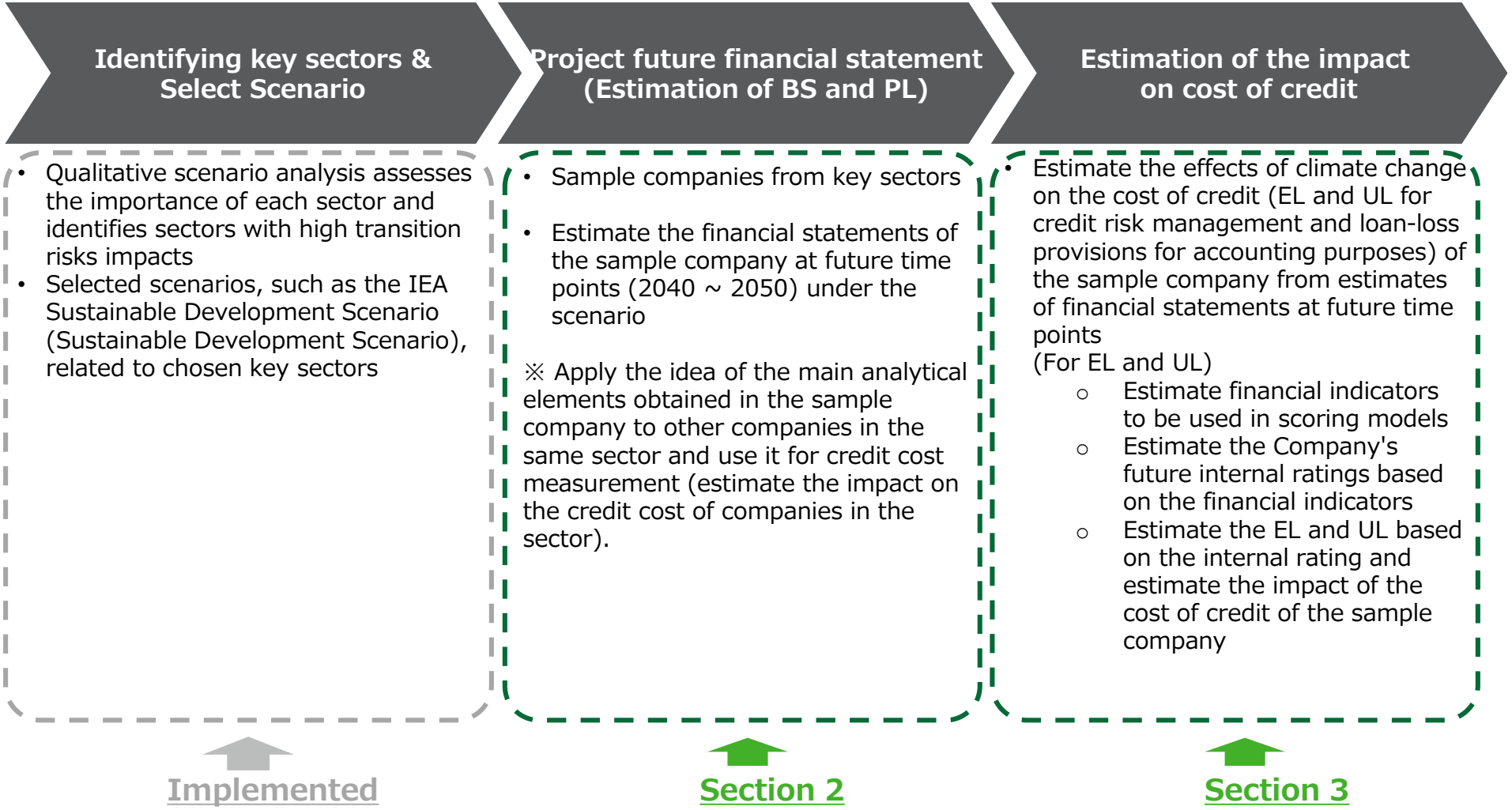
[Examples of Quantitative Analysis of transition risk] Disclosure by the three megabanks on transition risks

Examples of Quantitative Analysis of transition risk

	MUFG (HP October 2020 update)	MIZUHO (TCFD Report May 2020)	SMFG (TCFD Report August 2020)
Sector	Two sectors of energy and utilities defined as carbon-related assets in the TCFD recommendations are analyzed	"Power Utilities" and "Oil, gas and coal" sectors (Domestic operations)	Analyzed carbon-related assets as defined by TCFD (energy utility)
Scenario	Assuming "Sustainable Development Scenarios (2 ° C (Less than) Scenario)" and "New Policy Scenario (4 ° C Scenario)" published by the International Energy Agency (International Energy Agency IEA), the scenario is mainly 2 ° C (Less than).	• IEA SDS/NPS Scenario • Analysis is made in 2 ways: without changing the current business structure (Static Scenario) and with changing the business structure (Dynamic Scenario).	Policy scenario released by IEA (International Energy Agency) (Stated Policies Scenario), 2 ° C scenario (Sustainable Development Scenario), etc.
Main analytical methods	• Analyzes the impact of each scenario on credit ratings and the financial impact of the sector's overall credit portfolio • Reflecting costs such as investment in renewable energy and carbon tax necessary to realize a world below 2 ° C	1. Qualitative assessment and analysis of transition risk and physical risk for each sector 2. The analysis target was determined for transition risk and physical risk. 3. Analyze the impact on cost of credit by setting up scenarios according to what is being analyzed	By considering the impact on credit risk for each sector from changes in resource prices and demand, such as crude oil, natural gas, and power generation costs, which are expected under each scenario, and reflecting this in the stress test model, the total credit costs expected to be incurred by 2050 were estimated.
Quantitative analysis results	Transition risk (Total energy and utility sectors): approx. 1 billion yen ~ 9 billion yen per fiscal year	[Credit costs through 2050] Increase of approximately 120 billion yen (Dynamic Scenario) to 310 billion yen(Static Scenario)	[Total credit cost] In 2050, it is expected to increase by about 2 billion yen ~ 10 billion yen per fiscal year.

[Procedure for quantitative analysis of transition risk]
For important sectors with transition risk, the impact on cost of credit will be estimated based on the results of future financial statement analysis (Estimation of BS and PL)

Steps of quantitative analysis of transition risk



[Concept of Financial Impact of transition risk]
The EIOPA's 2020/12 publication "Sensitivity analysis of climate-change related transition risks" states that the concept of PL impact analysis is as follows

Example of the Financial Impact of transition risk (P/L) Concept (1) EIOPA

4 2 3 1

Net profits = (Production volume * Prices) – Costs of Goods Sold – OPex – (Taxes + Interests)

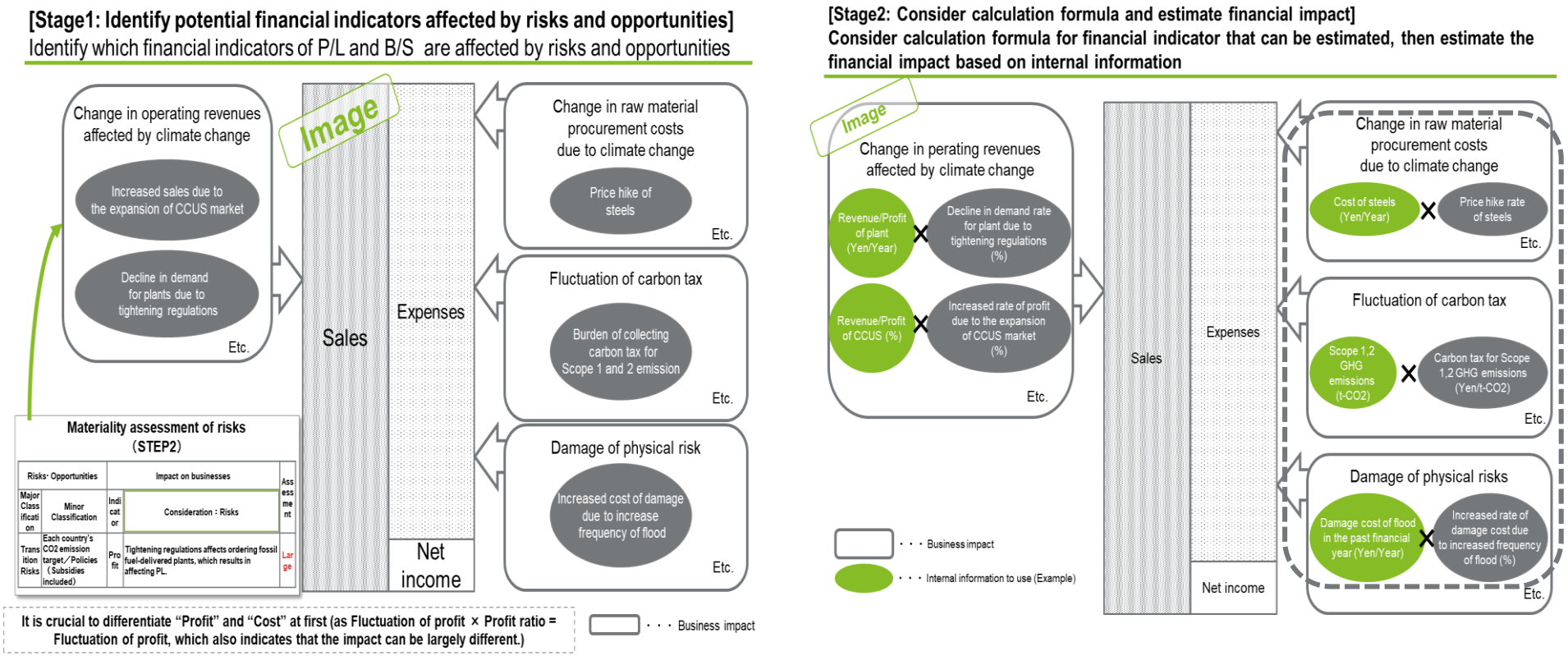
#	原文		要約	原文
	How could transition risks impact sectoral profits?			Indicators needed to quantify the impact
①	Increased cost of emitting CO2:	Under a transition scenario, the implementation of a carbon tax will cut the margin of carbon intensive industries proportionally to their emissions. Under a “too late, too sudden” scenario, carbon prices would need to be higher than under a “smooth” transition scenario, in order to foster a quick decrease in emissions.	移行リスクの検討シナリオでは、炭素集約型（炭素を使用する割合が高い）産業の利益は、炭素税の影響により排出量に比例して削減されます。 CO2削減を前提としたシナリオのうち “too late, too sudden”のシナリオでは、CO２排出量削減の遅れを取り戻す迅速な回収を促進するために、炭素価格（税）は"smooth”な移行シナリオよりも高くなることが想定されます。	- Production - Carbon intensity of production - Carbon tax
②	Increased cost of production inputs:	During a low carbon transition, carbon intensive goods will increase in prices due to pass-through of direct emissions costs. Industries using such carbon intensive goods as production inputs will thus be impacted.	低炭素への移行中、炭素集約型の商品は、直接排出コストのパススルーにより価格が上昇します。したがって、このような炭素集約型の商品を生産投入物として使用する産業は影響を受けます。	- Prices of production inputs
③	Additional depreciation costs and R&D expenditures:	Under a transition scenario, significant capital expenditures in low-carbon technologies will increase companies’ annual depreciation costs (included in Operating Expenses). R&D expenditures will also likely increase in the short-term as deployment of new technologies will have to be expedited to meet the unanticipated demand.	移行シナリオでは、低炭素技術への多額の設備投資により、企業の年間減価償却費（営業費用に含まれる）が増加します。予期せぬ需要を満たすために新技術の展開を促進する必要があるため、研究開発費も短期的には増加する可能性があります。	- CAPEX - R&D expenditures - All other OPEX
④	Changes in revenues:	Companies’ revenues will be affected through a change in prices and consumer demand: As they become increasingly costly to produce, prices of carbon intensive goods will likely increase, and consumers will, in turn, decrease their demand for such goods. A delayed transition, as it would increase the costs bared by carbon-intensive industries, would likely deepen this effect.	企業の収益は、価格と消費者の需要の変化によって影響を受けます。生産コストが高くなるにつれて、炭素集約型の商品の価格が上昇し、消費者はそのような商品の需要を減少させる可能性があります。移行が遅れると、炭素集約型産業が負担するコストが増加するため、この影響が深まる可能性があります。	- Production - Prices

Source: ACRN Journal of Finance and Risk Perspectives "Factoring transition risks into regulatory stress-tests" (2019/12)

[Concept of Financial Impact of transition risk]

The Ministry of the Environment guidelines consider the impact of income statements (PL), focusing on changes in the cost of raw materials procurement (fuel cost) due to climate change and changes in carbon taxes

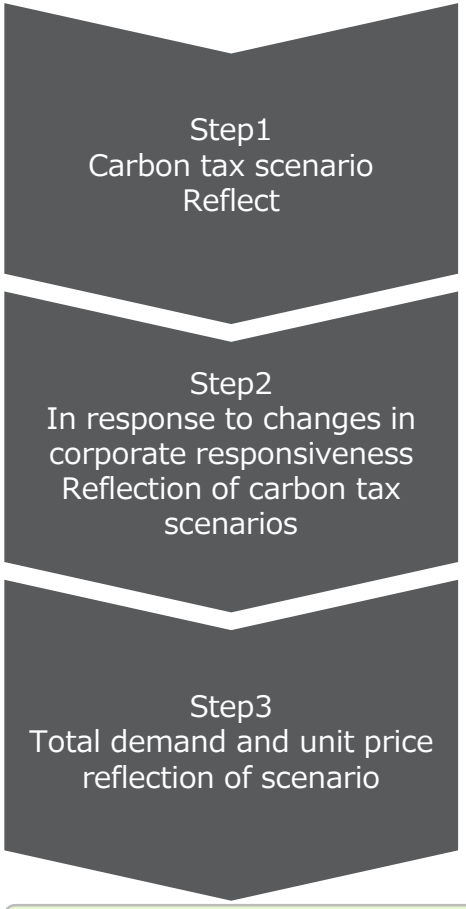
Example of the concept of financial impact (P/L) of transition risks (2) Ministry of the Environment guidelines



Source: Ministry of the Environment "Practical guide for Scenario Analysis in line with the TCFD recommendations 3rd edition"

[Estimation step of future financial statement impact]
Although there is no standerized approach at present, a phased analysis of financial statements based on public information, mainly on carbon tax scenarios, is assumed depending on the status of data held.

Estimation step of future financial statement impact



- Reflect only 2 ° C scenario carbon tax
- Calculated by multiplying the current CO2 emissions (Scope 1, 2) by the carbon tax scenario
- Assuming that only the burden of the carbon tax will change and that the amount of debt financing
  and cash outflow will increase accordingly
- PL items (income and expenses) and BS items (Assets and Liabilities) other than carbon tax are assumed to be constant

->Analyzing the financial impact of strengthened regulations under the assumption that the current situation will continue
(Unrealistic assumptions that do not take corporate responses into account)

- Reflects assumptions about changes in corporate responses to each scenario e.g., energy mix in the power industry, EV Ratio in the Automobile Industry etc.

->Analysis of changes in the financial impact of a decrease in the carbon tax
(Assuming no change in the market environment, such as total demand and unit costs of materials and fuel)

- Reflects assumptions for changes in sales (aggregate demand), material costs, etc. acc to each scenario
  (Example) Forecast of Electricity Demand and Crude Oil Prices in the Electric Power Industry auto sales forecasts for the auto industry etc.

->Financial impacts of changes in the market environment in response to climate c scenarios Analyze Changes

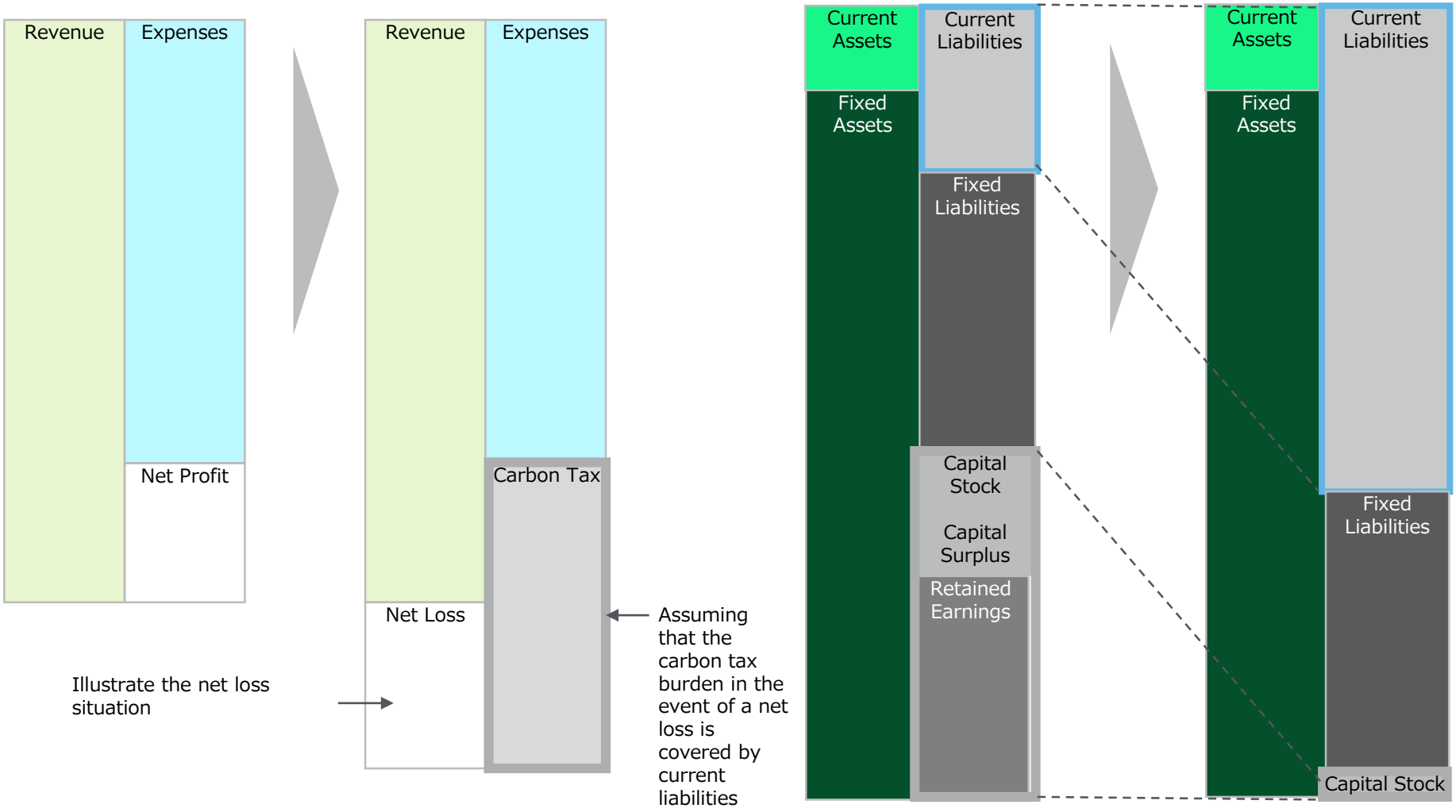
Largely based on public information
Assumed to be made by estimation

To enable discussions on the actual status of obligors by clarifying issues and interpreting and detailing publicly available information

[Step 1 Reflection of carbon tax scenario]

First, the impact introducting a carbon tax is calculated assuming that current revenues, costs, assets and CO2 (GHG) emissions remain the same

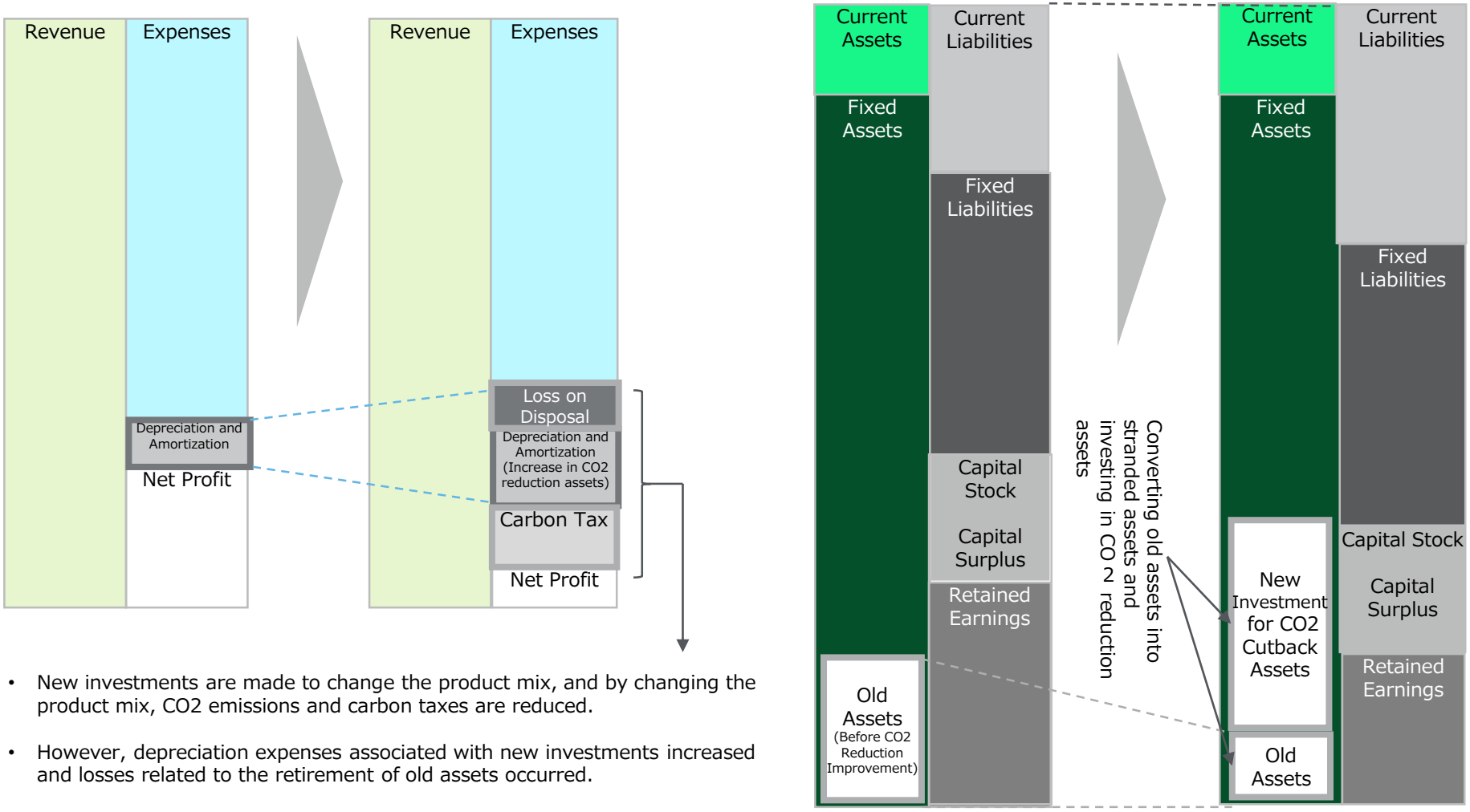
Reflection of Impact on Future Financial Statements Image
Step 1 Reflection of Carbon Tax Scenario



[Step 2 Reflecting carbon tax scenarios adjusted to changes in business structure]

Next, the impact of the carbon tax scenario is adjusted to changes in business structure (Renewable energy ratio in the electric power industry, EV ratio in the automobile industry, and new capital investment, etc.)

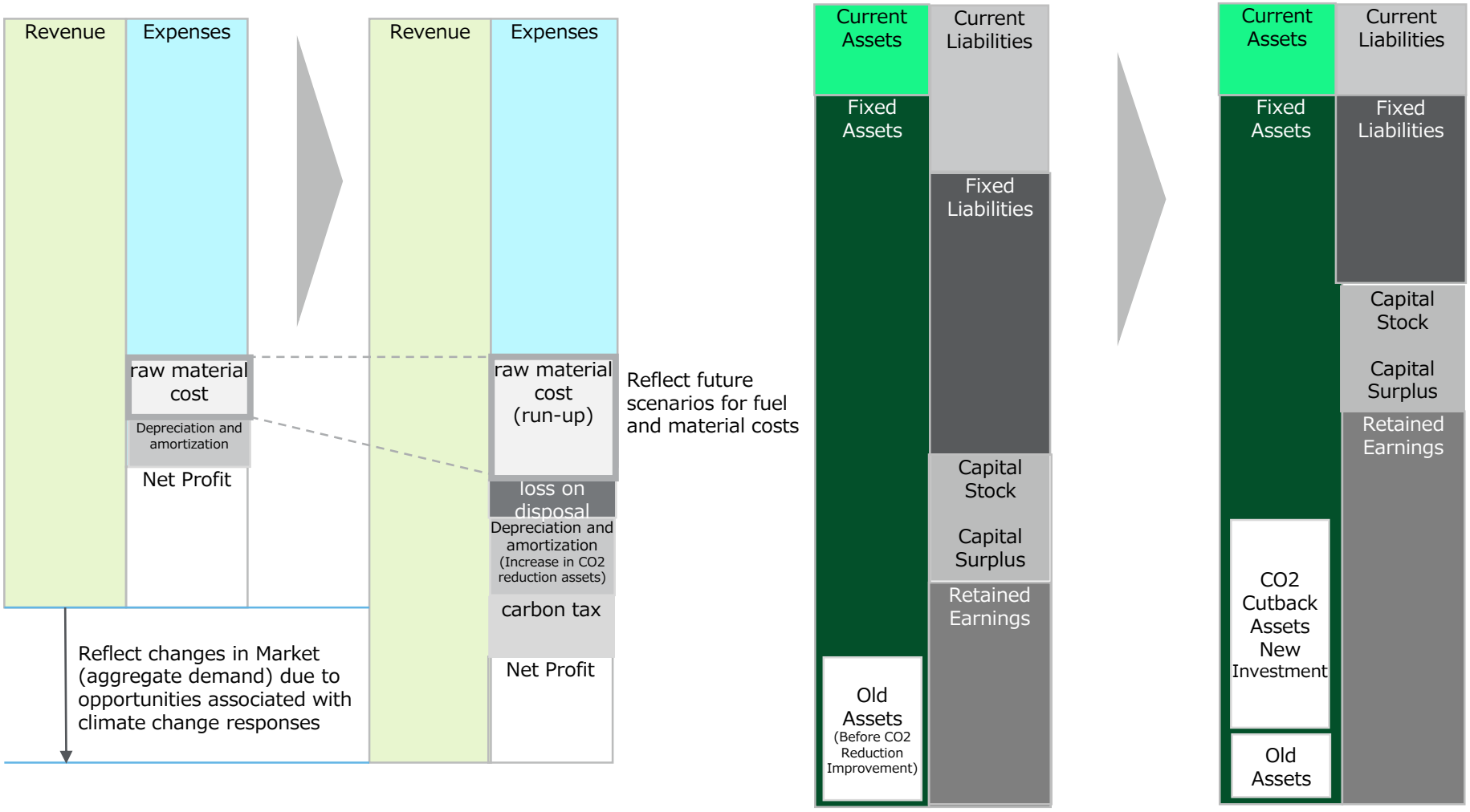
Image of Reflecting the Impact of Future Financial Statements
Step 2 Reflecting the Carbon Tax Scenario Adjusted to Changes in Business Structure



- New investments are made to change the product mix, and by changing the product mix, CO2 emissions and carbon taxes are reduced.
- However, depreciation expenses associated with new investments increased and losses related to the retirement of old assets occurred.

[Step 3 Reflect change in market (aggregate demand) and unit price scenario]
Finally, it is assumed that the impact on revenues/expenses will be analyzed based on future projections of market (aggregate demand) and material unit prices.

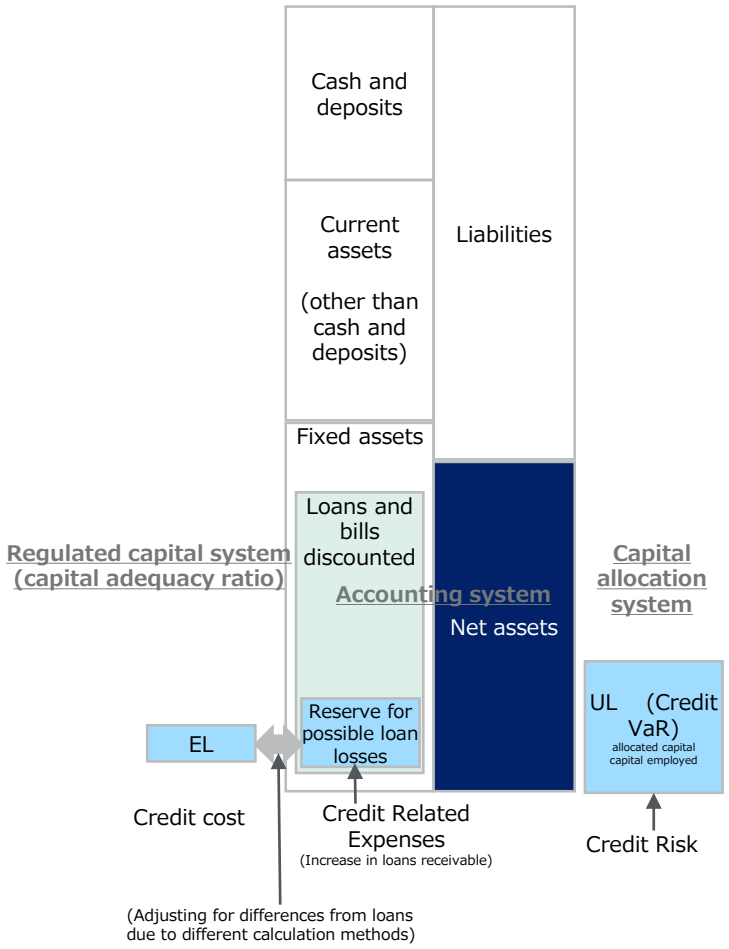
Reflection of Impact on Future Financial Statements Image
Step 3 Reflection of Change Market (Aggregate Demand) and Material Unit Price Scenario



[Factors for Estimating Credit-related Costs, Credit Costs, and Credit Risk]
Although there is no clear definition at this stage, it is necessary to clarify the meaning and calculation method of indicators of credit-related costs ≒ allowance for loan losses, credit costs ≒ EL, and credit risks ≒ UL (Credit VaR).

1. Factors for Estimating Credit-related Costs, Credit Costs, and Credit Risk

[image of the balance sheet]

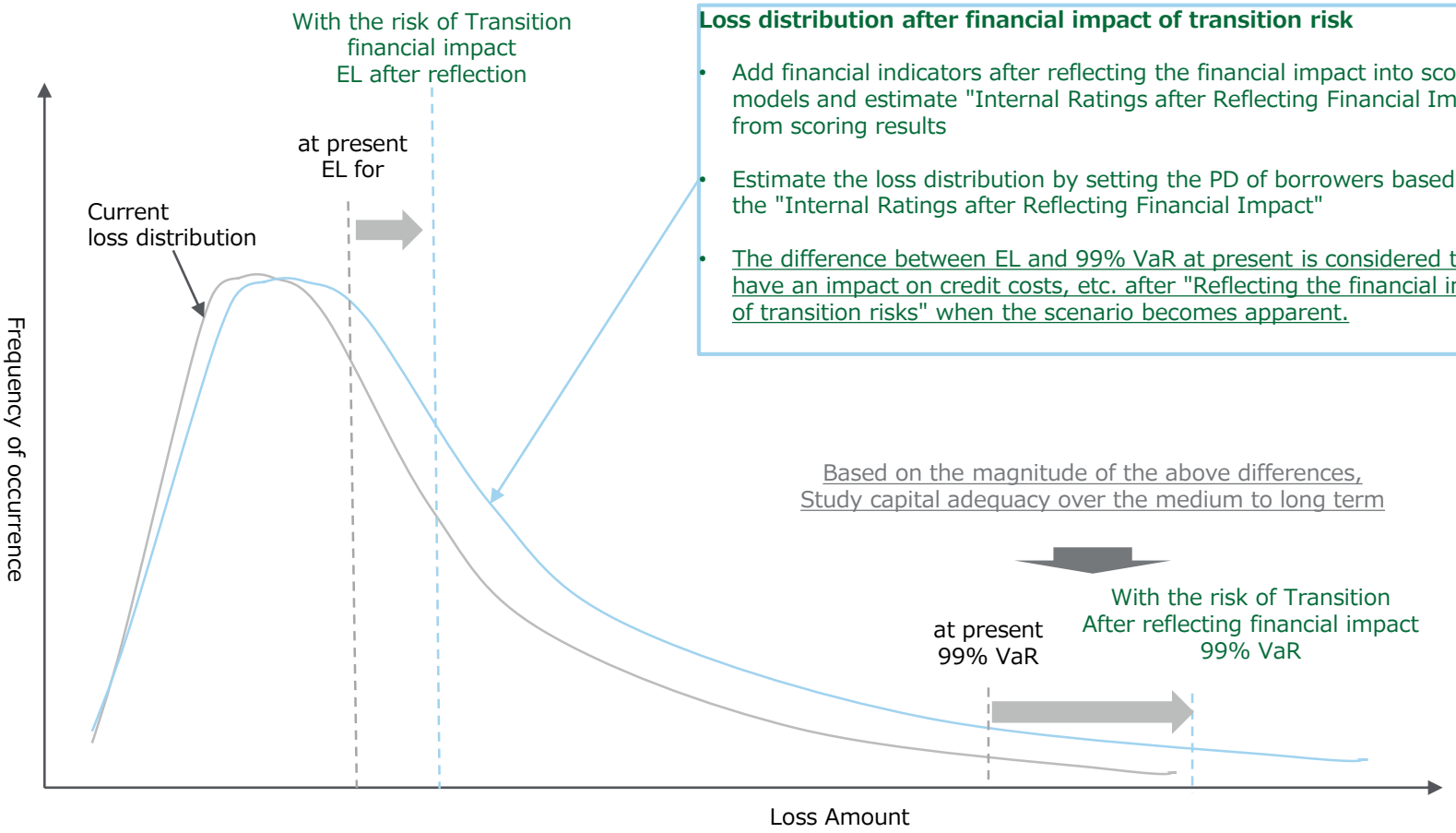


Items to be calculated	Calculation Method
Credit Related Expenses (Reserve for possible loan losses)	In accordance with the Manual for Determining Credit Classification, etc., determine the borrower categories that reflect the scenarios by ascertaining the following points to the extent possible, and estimate the changes in the allowance for loan losses applicable to each borrower category (accounting figure) (Obligor Classification Factor) • Changes in Internal Ratings • decrease in working capital • Long-term debt redemption period etc. (*)
Cost of Credit	<u>Step 1: Assigning Internal Ratings (Business Corporations) considering scenario impacts</u> • Internal ratings are determined by qualitative assessment (Reconcile) after quantitative assessment. • Quantitative assessment uses a scoring model that selects financial indicators by industry • Estimate and score financial measures after scenario impact • The internal rating is established based on the determined score <u>Step 2: Estimation of Credit Loss Distribution Based on Internal Ratings considering scenario impacts</u> • PD (probability of default) relating to internal ratings will not change, except for deterioration of internal ratings • Based on the above assumptions, credit risk is measured using the Merton Model to estimate the loss distribution after the scenario impact is reflected and EL and UL are calculated (*)
Credit Risk	

(*) In the case of physical risk, the LGD shall be deteriorated by the extent to which the collateral is impaired (Taking into consideration only damage to buildings.). The land shall not be damaged.)

[Approach to Estimating the Impact on Credit Costs, etc. Based on Financial Impact]
As a result of the scenario analysis, if the financial condition of companies in key sectors deteriorates, the impact on cost of credit, etc. is calculated based on a deterioration of internal ratings using the scoring model

2. Approach to Estimating the Impact of transition risk on the cost of credit using Financial Impact analysis



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[How to conduct quantitative assessment of physical risks (flood risk)]

1 Select objects to be analyzed

Select objects to be analyzed from the following viewpoints.

1)customer base
Major customers (loans)
Balances, etc.)
2)regional basis
Customers located in flood areas
3)sector based
key sector

*Own property (operational risk)
Local offices of the company

2 Data Collection

Collateral value analysis
buildings owned by the borrower (Books, branches, factories, stores, etc.)
・Address (block number)
・collateral value of the building

Loss on absence from work analysis
Each location of the borrower
・Annual gross profit (Or sales, product purchases, and raw material costs)
・Annual Business Days
・Annual ordinary expenses

3 Data Conversion Parameter Settings

Requires conversion of collected data for analysis

Converting the Latitude-Longitude Information of the Owned Building Address of the Company to Latitude-Longitude Information

Identify parameters for analysis
・Damage ratio by inundation depth
・Average days off by inundation depth

4 PML Analysis

By using Ministry of Land, Infrastructure and Transport GIS data Plot applicable properties (Layers) on the hazard map

↓

Based on the inundation depth on the hazard map, the loss rate and number of days off derived from the natural disaster model are calculated.

↓

Climate change correction (Assume 4 ° C scenario)

5 Credit risk measurement

Understanding LGD
・Estimated LGD from the amount of damage to buildings pledged as collateral

Understanding PD
- Gross profit per day is calculated from sales data, and the amount of loss on absence from work is calculated by multiplying by the number of days of absence from work.
- Estimate PD by reflecting loss profits in PL and assigning ratings, etc., based on each bank's risk assessment method

→ Estimate EL

6 Quantitative business impact assessment

- Understand the degree of impact of EL and its financial impact.
- Consider necessary measures such as engagement consultants for borrowers.

Concept of the subject of analysis

Identify the scope of risk to be analyzed, taking into account the impact on the bank's loans and future disclosures

[Objectives of physical risk quantitative analysis]

- The objective of physical risk analysis for climate change, not just floods, is to consider how risks should be addressed as a result of advanced warming. For general operating companies other than financial institutions, identifying the risks to which they are exposed will enable them to consider and implement countermeasures.
- For financial institutions, the objectives of the analysis are (1) to evaluate the physical risk to which the borrower company is exposed, and to consider how to finance the borrower company as a result of the damage that the borrower company is likely to incur, and (2) to review the credit risk to the financial institution.
- Although financial institutions would usually conduct a credit risk assessment for all borrowers, this would be extremely resource intensive due to e.g. the large quantity of physical risks. Therefore, it is common practice to conduct analysis targeting specific risks and limiting the scope of analysis.

[Concept of the subject of analysis]

(Target Risk)

- As mentioned above, it seems practical to conduct physical risk analysis by setting certain preconditions. The first risk to be considered is the assessment of "acute risk" "natural disaster", which is considered to be physical risk, and "flood risk", to which certain physical laws apply, among others.
- For financial institutions, the damage caused by the flood is the physical damage to the buildings of the borrower, which may be used as collateral against the loan, further there is a risk that the flood will cause an interruption of business , decreasing the borrower's profits and therefore credit risk profile

(Scope)

① Significant customers

Select and analyze companies that have a large loan balance and whose default is likely to have a significant impact on the financial institution.

② Companies located on the flood zone of the hazard map

- Although floods occur throughout Japan, most of them occur in specified river basins. Because some financial institutions limit loans to specific areas, there is a concept of assessing risks in jurisdictions.

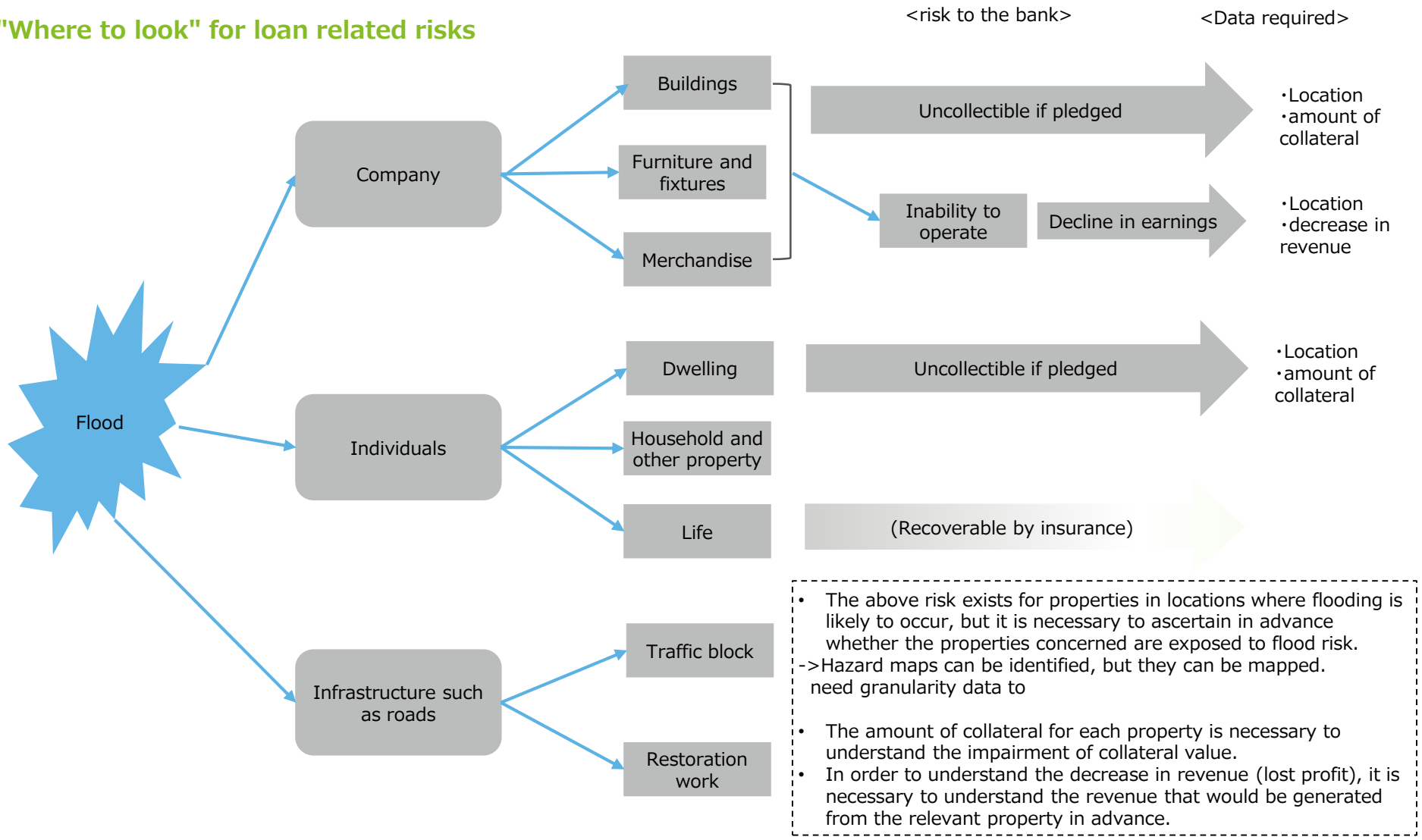
③ sector unit

- The concept of conducting assessments that are limited to specific sectors, such as those that are judged to have a high physical risk by qualitative analysis.

It is difficult to grasp the flood risk of all borrowers. The scope of the analysis was gradually expanded by starting to limit the subjects in stages under certain conditions.

[Target risks and required data]
What damage could a flood cause, what are the risks to a bank and what data is required to assess the impact.

"Where to look" for loan related risks



[Parameters for flood damage measurement]

Building damage ratio based on inundation depth

<Usage Parameters>

Maximum submergence	Loss ratio
~0.49 m	21.4%
50~0.99 m	29.3%
1~1.99 m	45.8%
2~2.99 m	64.6%
3 m~	83.6%

表-4.2　浸水深別被害率

浸水深 / 地盤勾配	床下	床上					土砂堆積（床上）	
		50cm未満	50～99	100～199	200～299	300cm以上	50cm未満	50cm以上
Aグループ	0.047	0.189	0.253	0.406	0.592	0.800	0.43	0.785
Bグループ	0.058	0.219	0.301	0.468	0.657	0.843		
Cグループ	0.064	0.235	0.325	0.499	0.690	0.865		

A：1/1000 未満、B：1/1000～1/500、C：1/500 以上

注：1．平成 5 年～平成 29 年災のうち利用可能な「水害被害実態調査」やハウスメーカー等へのヒアリングに基づき設定した被害率。（ただし、土砂堆積は従来の被害率）

2．家屋の全半壊についても考慮した数値である。

Note: Source material is written in Japanese.

Source: Water Management and National Land Conservation Bureau, Ministry of Land, Infrastructure, Transport and Tourism 'flood control economic research manual' (April 2020)

[Parameters for flood damage measurement]

Number of business suspension days for buildings based on inundation depth

<Usage Parameters>

Maximum submergence	Business suspension days
~ 0.49 m	6.4 days
50 ~ 0.99 m	13.5 days
1 ~ 1.99 m	20.0 days
2 ~ 2.99 m	41.2 days
3 m ~	56.1 days

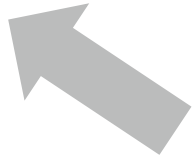


表-4.9　営業停止・停滞日数（日）

浸水深	床下	床上				
		50cm 未満	50～ 99	100～ 199	200～ 299	300cm 以上
停止日数	4.9	6.4	13.5	20.0	41.2	56.1
停滞日数	9.9	18.8	25.0	35.6	64.0	83.2

注：平成5年～平成29年災のうち利用可能な「水害被害実態調査」による。

Note: Source material is written in Japanese.

Source: Water Management and National Land Conservation Bureau, Ministry of Land, Infrastructure, Transport and Tourism 'flood control economic research manual' (April 2020)

[Climate Change Flood Probability Variation Parameters]

Increased frequency scenario.
Estimated to double in the 2 ° C scenario and quadruple in the 4 ° C increase scenario

<Usage Parameters>

	Rainfall	Flow rate	Flood occurrence Frequency
4 ° C (2040)	1.3 x	About 1.4 times	About 4 times
2 ° C (2040)	1.1 x	About 1.2 times	About twice

（流量変化倍率や洪水発生頻度の変化）

○気温上昇のシナリオ毎に降雨量変化倍率を全国の一級水系の治水計画で対象とする降雨に適用して試算した流量の変化倍率や洪水発生確率の変化倍率の全国平均値は、下記のとおりである。

○この結果について、２℃上昇相当時における変化について見ると、次のようになり、その影響は非常に甚大である。

・降雨量の変化倍率が 1.1 倍であるが、治水計画の目標とする規模（年超過確率 1/100）の洪水の流量の変化倍率は約 1.2 倍になる。

・現在の河川計画で目標としている降雨量や流量について見ると、その規模の洪水の発生頻度は約２倍になる。

表-4　降雨量、流量の変化倍率と洪水発生頻度の変化

	降雨量	流量	洪水発生頻度
４℃上昇（RCP8.5）	1.3倍	約1.4倍	約4倍
２℃上昇（RCP2.6）（暫定値）	1.1倍	約1.2倍	約2倍

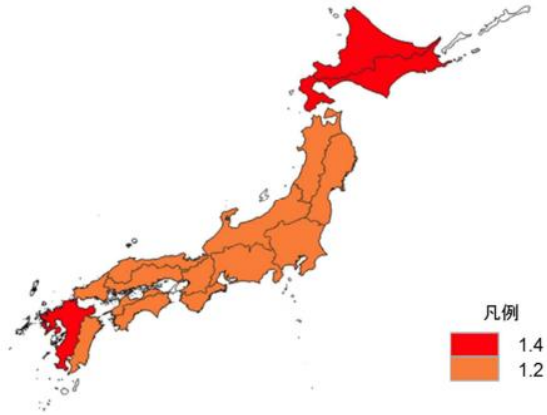


図-2　RCP8.5 における降雨量変化倍率（決定値）

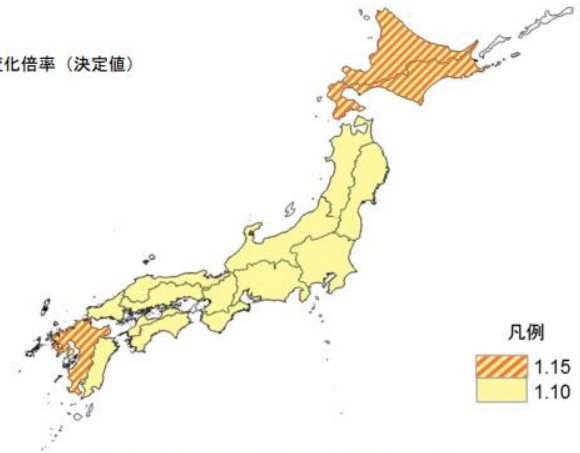


図-4　RCP2.6 における降雨量変化倍率（決定値）

Note: Source material is written in Japanese.

Source: Ministry of the Environment and others "Proposal of a flood control plan based on climate change" (p. 15)

[Procedure for analyzing the inundation risk of the property]

Overall flow

=>Introduced later

1. Prepare a list of properties

1-1. Selection of object property

1-2. Obtain address information

2. Match property information with hazard map information

2-1. On the overlapping hazard map Search maximum inundation depth

2-2. With the GIS geographic information system Search maximum inundation depth

2-2-1. Download relevant data from the Ministry of Land, Infrastructure, Transport and Tourism
2-2-2. Convert property address information to latitude/longitude information
2-2-3. Search maximum inundation depth with GIS Geographic Information System

3. Combine property list and hazard map data

3. Maximum inundation depth Search Results Summary

Search method for maximum inundation assumed depth

Summary of search results for maximum inundation depth

[analysis of inundation risk]
Investigate maximum inundation depth of object using hazard map

Method of investigating maximum inundation depth

For the number of properties (minority)

Superimpose hazard map

[Summary] A hazard map portal site published by the Ministry of Land, Infrastructure, Transport and Tourism. It is possible to refer to risk information such as floods, landslide disasters, and tsunamis in the area where the object is located.

https://disaportal.gsi.go.jp/

[Procedure] Using the map of "flood", search the maximum possible inundation depth of the subject property based on the address.

[Benefits] By entering the address of the subject property, it is possible to easily investigate.

[demerit] Since it is not possible to investigate multiple properties at once, it is not suitable for analyzing many properties.

For the number of properties (many)

GIS geographic information system

[Summary] A technology that comprehensively manages and processes data (spatial data). It contains information regarding geographical location and displays it visually, enabling advanced analysis and quick judgment. By using the exclusive data provided by the Ministry of Land, Infrastructure, Transport and Tourism, it is possible to superimpose the object and flood inundation assumption area on GIS.

[Procedure] ① National land map data provided by the Ministry of Land, Infrastructure, Transport and Tourism (base map information);
Download inundation risk area data (national land numerical information)

- ✓ Infrastructure Map Information: https://fgd.gsi.go.jp/download/menu.php
- ✓ Geographical Data: https://nlftp.mlit.go.jp/ksj/index.html

② Convert object address to latitude/longitude (The following is an example of a conversion tool.)

- ✓ JNS Address Recognition System: https://nlftp.mlit.go.jp/isj/jns_download.html
- ✓ The University of Tokyo Address Matching Service: http://newspat.csis.u-tokyo.ac.jp/geocode/

③ The maximum inundation depth of the object is searched by superimposing the object and the inundation assumed area data on GIS

[Reference] Key GIS Software

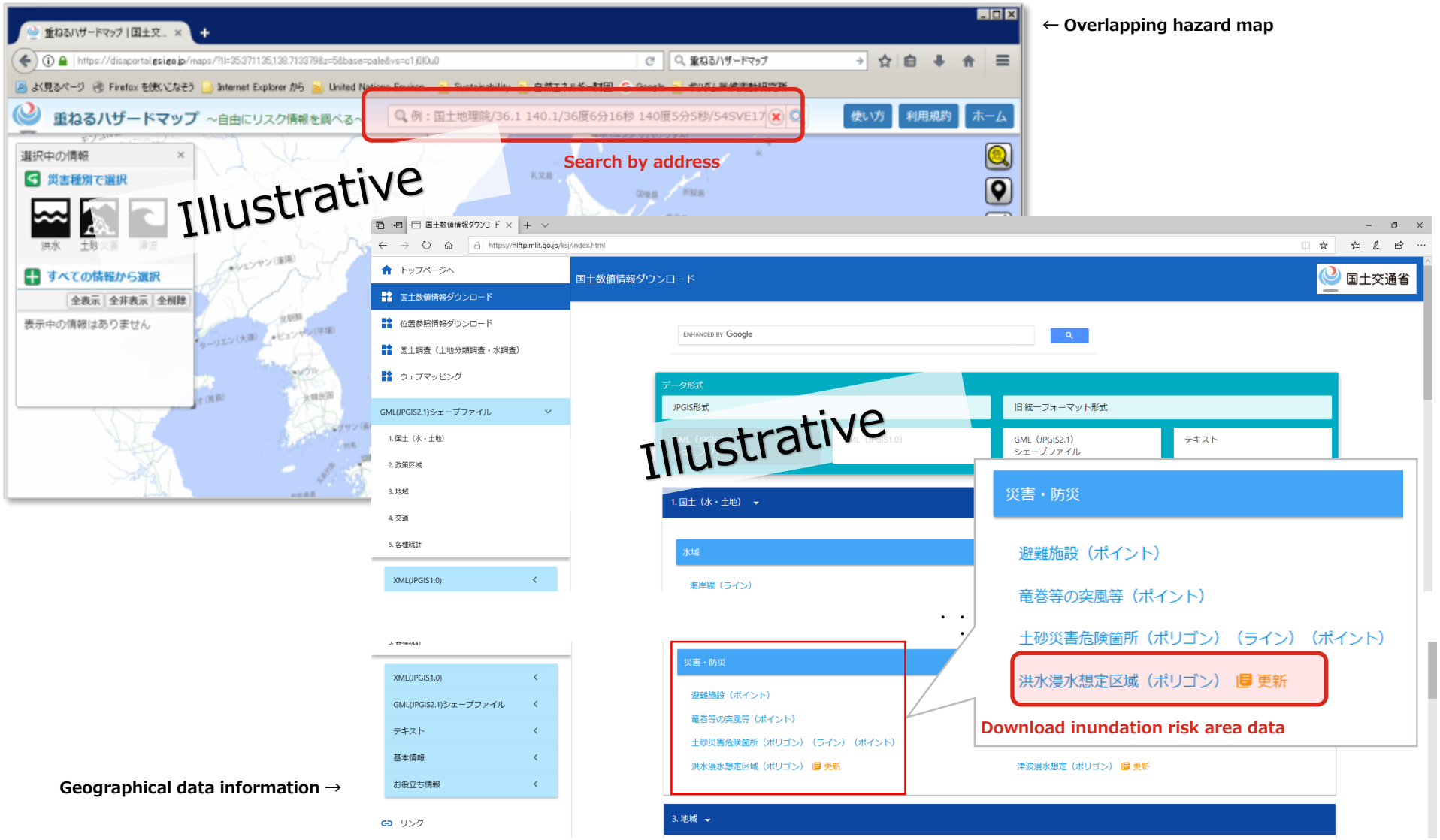
- ✓ ArcGIS — paid, supported https://www.esrij.com/products/arcgis/
- ✓ QGIS: Free (open source), no support https://qgis.org/ja/site/index.html

*Reference: QGIS Official User's Guide https://docs.qgis.org/2.18/ja/docs/user_manual/

[Benefits] Since multiple properties can be surveyed at once, it is efficient to analyze many properties.

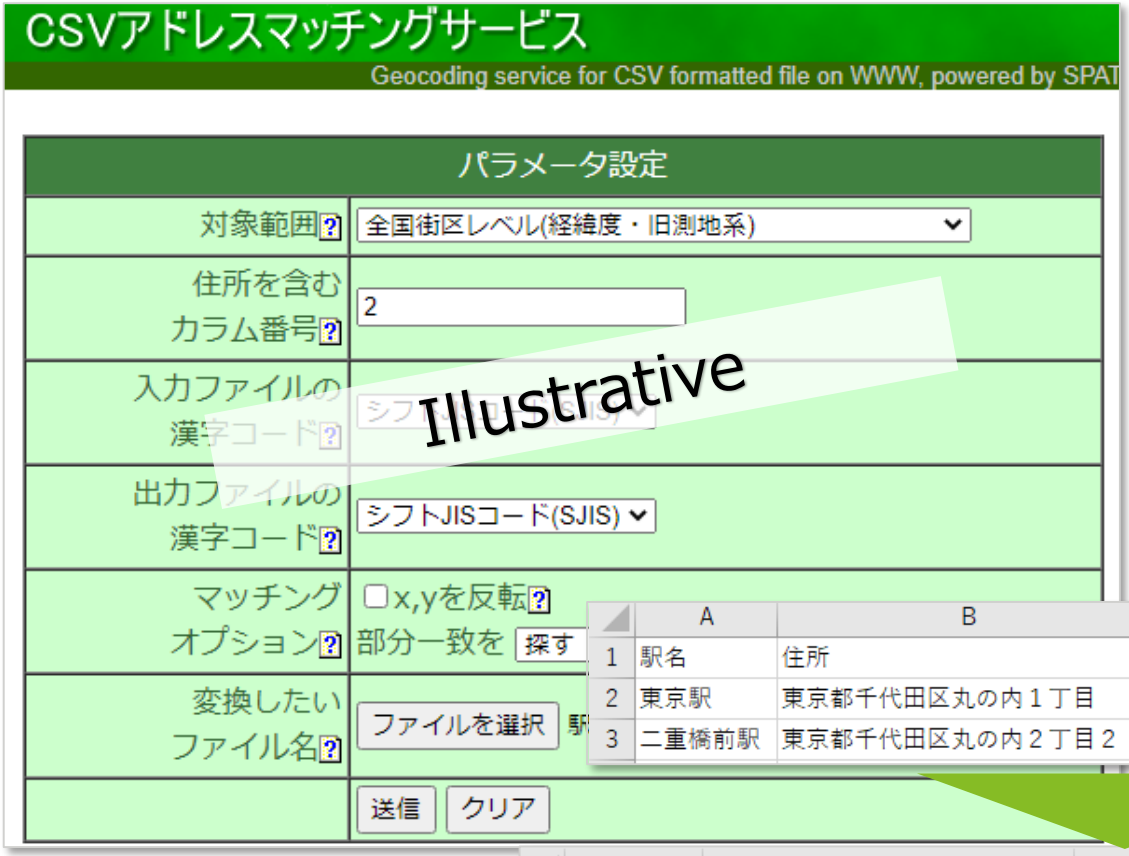
[demerit] A preparation process for analysis, such as converting addresses to latitude and longitude, is required, so it takes time for a small number of properties. It is also difficult to use without knowledge of GIS software.

[References]
Overlapping hazard maps and national land information websites



Note: Source material is written in Japanese.

[References]
Convert address information of the object to latitude and longitude



Before Address Matching

	A	B	C	D	E	F	G
1	駅名	住所					
2	東京駅	東京都千代田区丸の内１丁目					
3	二重橋前駅	東京都千代田区丸の内２丁目２					

Coordinates are output.

After address matching

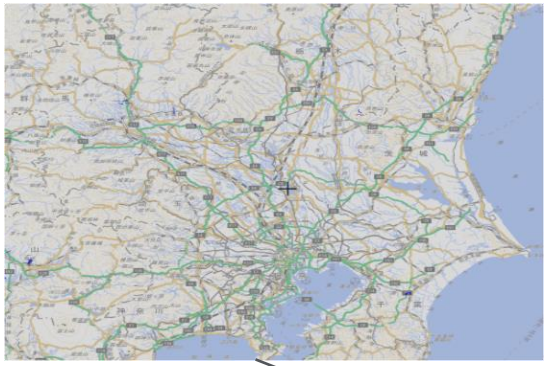
	A	B	C	D	E	F	G
1	駅名	住所	LocName	fX	fY	iConf	iLvl
2	東京駅	東京都千代田区丸の内１丁目	東京都/千代田区/丸の内/一丁目	139.76846	35.67926	5	6
3	二重橋前駅	東京都千代田区丸の内２丁目２	東京都/千代田区/丸の内/二丁目/２番	139.76578	35.6769	5	7

Note: Source material is written in Japanese.

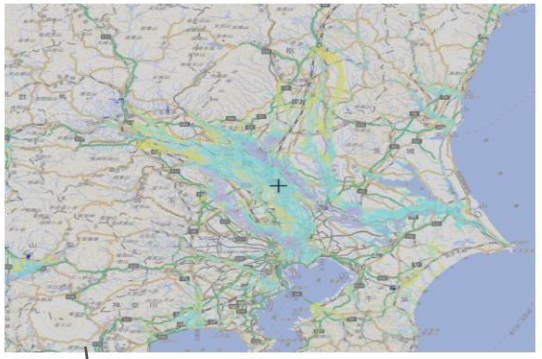
[References]
In the hazard map, the following flow is used to plot properties and extract data on those that suffer flood damage

Property plot image on hazard map

Layer 1
(Geographical Survey Institute map data)



Layer 2
(Ministry of Land, Infrastructure and Transport "Hazard Map")



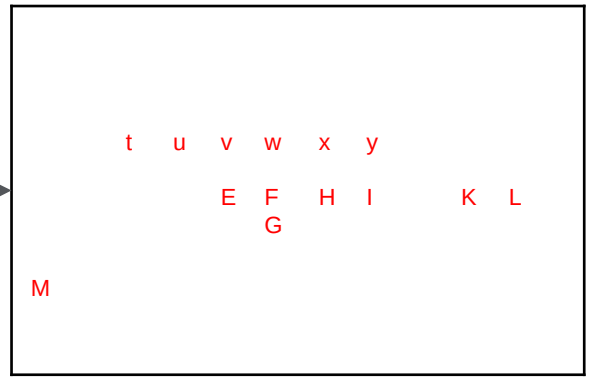
Layer 3
(Location latitude and longitude data of property)

		a	b	c	d	e	f	g	h		
	i	j	k	l	m	n	o	p	q		
r	s	t	u	v	w	X	y	z	A		
	B	C	D	E	F G	H	I	J	K	L	
M	N	O					P	Q	R		
							S	T			

		a	b	c	d	e	f	g	h		
	i	j	k	l	m	n	o	p	q		
r	s	t	u	v	w	X	y	z	A		
	B	C	D	E	F G	H	I	J	K	L	
M	N	O					P	Q	R		
							S	T			

Three-layer consolidation

inundated extraction



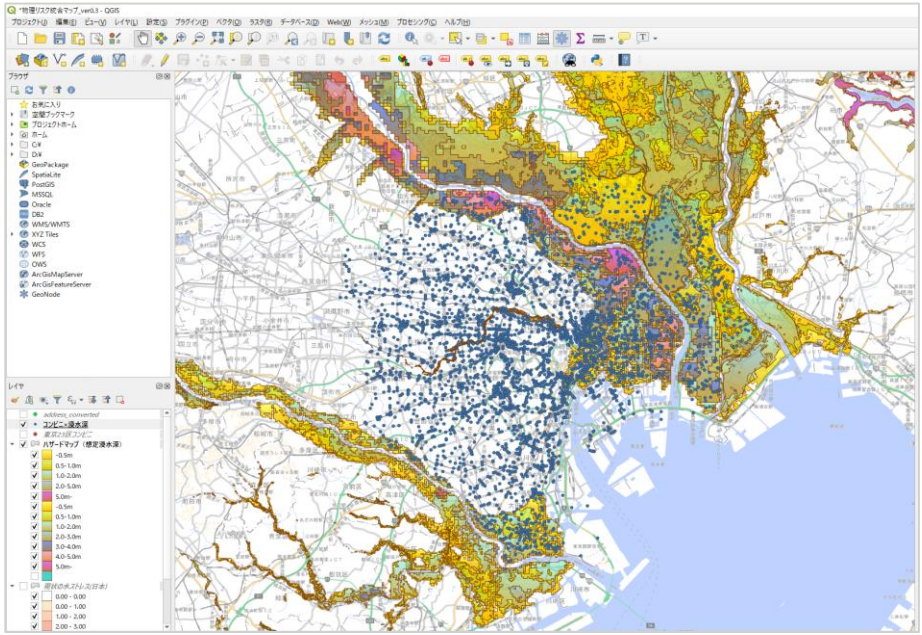
Inundate by the inundation depth to be able to identify objects

[References]
Link inundation risk analysis results to property lists

Example of overlapping hazard maps

Property	Inundation Depth (m)
w	0.5

GIS example (For QGIS)



Property	Inundation Depth (m)
t	3
u	2
v	2
⋮	⋮

[Calculation of building damage cost]

The amount of collateral for each property is calculated as the amount of damage based on the percentage of damage based on inundation depth.

Property	Collateral Value (Thousand Yen)	Inundation Depth (m)	Percentage of Loss (%)	Amount of Loss (Thousand Yen)
t	50,000	3	83.6	41,800
u	40,000	2	64.6	25,840
v	100,000	2	64.6	64,600
w	90,000	1	45.8	41,220
x	30,000	2	64.6	19,380
y	50,000	4	83.6	41,800
E	20,000	5	83.6	16,720
F	50,000	3	83.6	41,800
G	30,000	3	83.6	25,080
H	60,000	2	64.6	38,760
I	40,000	2	64.6	25,840
K	70,000	2	64.6	45,220
L	150,000	3	83.6	125,400
M	30,000	5	83.6	25,080

[Calculation of loss on absence from work]

The amount of collateral for each property is calculated as the amount of damage based on inundation depth.

Property	Revenue per day (Thousand Yen)	Inundation Depth (m)	#of days of missed work (Days)	Amount of Loss (Thousand Yen)
t	5,000	3	56.1	2,805
u	4,000	2	41.2	1,648
v	10,000	2	41.2	4,120
w	9,000	1	20.0	1,800
x	3,000	2	41.2	1,236
y	5,000	4	83.6	4,180
E	2,000	5	56.1	1,122
F	5,000	3	56.1	2,805
G	3,000	3	56.1	1,683
H	6,000	2	41.2	2,472
I	4,000	2	41.2	1,648
K	7,000	2	41.2	2,884
L	15,000	3	56.1	8,415
M	3,000	5	56.1	1,683

2. Scenario Analysis - Key Points of Practice
2-1. For starting scenario analysis
2-2. Assess materiality of climate-related risks
2-3. Identify and define range of scenarios
2-4. Evaluate Qualitative Business Impact
2-5. Quantitative assessment of transition risk
2-6. Quantitative assessment of physical risk
2-7. Documentation and Disclosure

[Documentation and Disclosure]

TCFD

(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.

[The TCFD recommendations]

The TCFD recommendations are structured around four thematic areas: Governance, strategy, risk management, and metrics and targets

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

Source: prepared by the Ministry of Environment based on the Task Force on Climate-related Financial Disclosures, "Final Report - Recommendations of the Task Force on Climate-related Financial Disclosures", 2017. p.14

[Strategy]
Expanded disclosure of climate-related risks and opportunities and qualitative impact disclosure

Strategy

XX

■In conjunction with the development of our management plan, we identified the following risks and opportunities related to climate change.

Type	evaluation item		Business Impact Analysis (qualitative information)	
	major group	subclassification	Risk	opportunity
Transition	policy / Regulation	carbon tax and price	Introduction of carbon prices (higher spending and lower sales) ・With the introduction of a carbon tax, ・・・・ XXX ・・・・ XXX mainly for power plants with high carbon emissions such as coal-fired power plants	Dissemination of renewable energy (increase in sales) ・XXXXX
		Carbon emissions targets by country		
	industry / Market	Energy mix, etc.		
		changes in customer behavior		
	Technology	Dissemination of low-carbon technologies		
	reputation	reputation from investors		
		reputation from customers		
Physical	chronic	Water shortages and drought		
		increase in mean temperature		
		sea level rise		
	acute	intensification of extreme weather		

Image

Point of disclosure

① Disclosing the Scope of Analysis (Reasons for selecting target sectors, basis for judgment, exposure of each sector's credit, etc.)

② Disclosure of sector risk and opportunity categories (Consideration of importance and qualitative impact on business)
*Depending on the disclosure method, it may be possible to disclose only important items in advance.

Content reference: (Details of implementation)

Data for narrowing down target sectors

Risk Importance Assessment x 3 Sectors

Disclosure required by TCFD
a) Describe the short, medium, and long-term climate-related risks and opportunities identified by the organization.
b) Explain the impact of climate related risks and opportunities on the organization's business, strategic, and financial planning.
c) Explain the resilience of an organization's strategy based on a variety of climate-related scenarios, including below 2 ° C.
[Guidance for the banking sector] Banks should consider describing the excessive concentration of credit exposure to carbon related assets and disclosures about climate related risks (Transition and Physical Risks) in loans and other financial intermediation services

[Strategy]
Scenario analysis may include narrowing down the scope of analysis, definition of scenario, financial impact, and countermeasures

S t r a t e g y

■In order to quantitatively grasp the impact of climate change-related risks on the Our Bank portfolio, a scenario analysis was conducted.

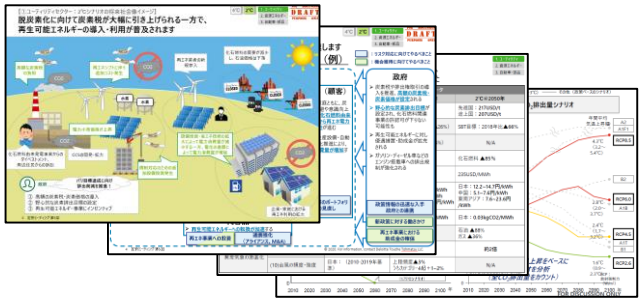
Point of disclosure

・In the scenario analysis, the following are described
③ definition of Scenario Groups (Scenarios used, time horizon, scenario assumptions, etc.)
④ Financial Impact Assessment (Qualitative and quantitative assessment)
⑤ definition of countermeasures

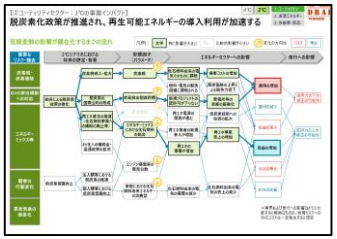
disclosure required by TCFD

a) Describe the short, medium, and long-term climate related risks and opportunities identified by the organization.
b) Explain the impact of climate related risks and opportunities on the organization's business, strategic, and financial planning.
c) Explain the resilience of an organization's strategy based on a variety of climate related scenarios, including below 2 ° C.

Content reference: (Details of implementation)



Scenario assumptions x 3 sectors (Parameters, World View, 5 Forces)



Financial impact x 3 sectors (Qualitative)

3. Scenario Analysis - Practice Examples

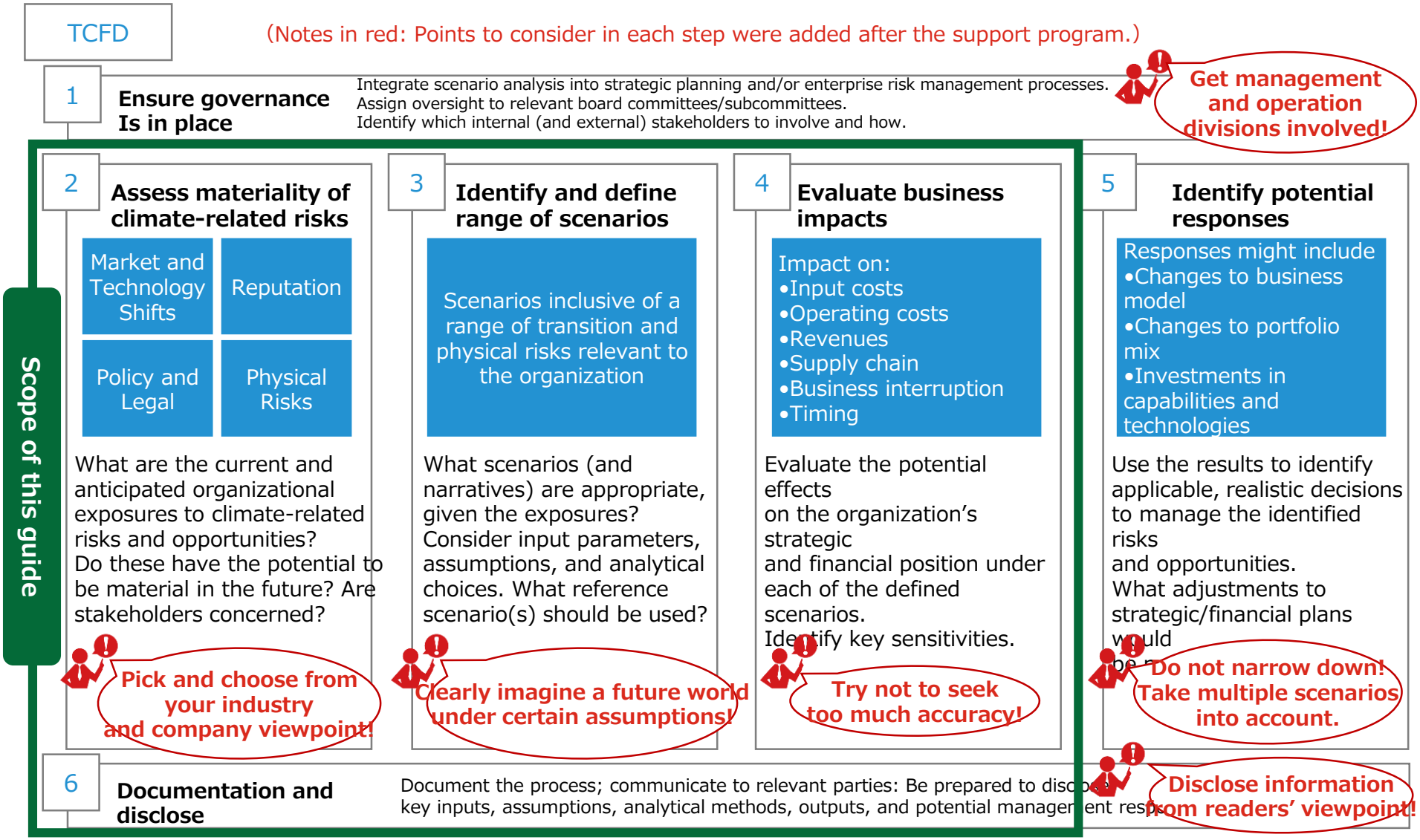
3-1. Shiga Bank, Ltd.

3-2. Hachijuni Bank, Ltd.

3-3. Higo Bank

Note : In this project, "Real Estate" "Energy" and "Transportation and Automobile" were selected as important sectors in each bank. In order to avoid duplication of data, this Practical Guide introduces qualitative analysis such as "Transportation and Automobile" for Shiga Bank, “Real Estate" for Hachijuni Bank, and "Energy" "Transportation and Automobile (Automotive Parts)" for Higo Bank. The results of analysis of the above three sectors are presented to the three banks.

Points to consider when implementing scenario analysis in line with the TCFD recommendations were mapped out for 18 companies, forming the basis of the trial



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.

Characteristics of Banks in Scenario Analysis

[Transition Risk Analysis]

- The sectors to be analyzed were set based on the degree of impact of climate change based on literature data and the lending exposure of each sector of each bank. However, the “electric power utility” was included in the analysis for all banks because it seems that the impact of climate change is huge. The sectors analyzed and summary of the analysis by each bank are as follows.

	Sector to be analyzed	Summary of Analysis Results
Shiga Bank	“Electric Power Utility" , "Automobiles and Transportation" , "Real Estate"	Within the scope of the sample enterprise analysis, it was confirmed that if the enterprises' mitigation measures and regulations for climate change are in line with the scenario, no additional credit costs are required. However, at the same time, under the worst scenario, the impact on credit and the importance of dialogue with creditors were recognized. In practice, in order to reflect the analysis results in credit costs, it is necessary to evaluate individual companies based on the results of quantitative analysis of sample companies. For small and medium-sized enterprises, in particular, the degree of impact of climate change is expected to differ from company to company, so an approach different from the analysis of large companies, including the acquisition of data, is required. In addition, since it was confirmed that the analysis of the automobile sector leads to the analysis of automobile transportation, it is considered possible to expand the analysis to related sectors in the future. Regarding qualitative analysis, it is necessary to further deepen the examination and analysis of sectors that have a high impact on the bank, and to respond to changes in scenarios such as fluctuations in basic parameters.
Hachijuni Bank	“Electric Power Utility" , "Automobiles (including "Automobile Sales")" , "Real Estate"	Through the analysis of sample companies, we were able to understand the risk factors and analysis methods that are important for each sector. Based on the scenario in which the sample companies take appropriate measures, the analysis shows that there will be no increase in credit costs. In order to link this analysis result to future disclosure, it is necessary to expand the analysis method of the sample companies to individual lenders. Utilizing the analysis method implemented for the sample companies, it is conceivable to focus on the disclosure data and risk factors of each company (in the case of automobiles, if the EV conversion rate progresses, the impact on sales will be small). In particular, it was understood that the changes in the number of automobiles sold obtained from the analysis of automobile manufacturers can be applied to the risks of automobile sales. The risks and opportunities derived from the analysis can also be used to engage with lenders.
Higo Bank	“Electric Power Utility" , "Automobiles (including "Automotive Parts manufacturing")" , "Real Estate"	Since there are many loans to regional companies, it is necessary to transfer the know-how of sample company analysis to regional companies in order to connect it to the evaluation and disclosure of credit costs in practice. In this analysis, in addition to automobile manufacturing, automobile parts manufacturing was also analyzed, and it was understood that if all sectors respond to EV conversion according to the scenario, it is unlikely that additional credit costs will occur. On the other hand, depending on the climate change efforts (mitigation measures) of each lender, there may be both risks and opportunities. It may be necessary to analyze credit costs after understanding the efforts of individual companies. The risks and opportunities obtained from the scenario analysis, including the results of the qualitative analysis, can be used as a tool to appeal the importance of climate change to the lenders.

Characteristics of Banks in Scenario Analysis

[Physical Risk Analysis]

- In the analysis, the occurrence of floods is greatly affected by the geographical factors of the location area of each bank's lender, so after specifying the scope of analysis based on the characteristics of the flood occurrence assumption, the importance of the lender, availability of data, etc. In consideration of the above, the target range for each bank was set, and summary of its analysis as follows.

	Geographical Factors	Selection of the Subject of Analysis	Summary of Analysis Results
Shiga Bank	Floods in the rivers that flow into Lake Biwa are expected. The inundation area will be wide, but it can be assumed that the inundation depth will not be too deep.	It was selected for a wide range of lenders in the prefecture.	As expected geographically, the inundation depth was about 2 m if limited to the properties to be analyzed this time. Therefore, it was assumed that the impact on credit risk would be limited for both collateral damage and loan loss.
Hachijuni Bank	Floods are expected mainly due to the flooding of the Chikuma River. Due to the mountainous terrain, the inundation area is limited to the Chikuma River basin, but it can be assumed that the inundation depth will be deep.	Refer to the hazard map in advance, and target the loan destinations located in the Chikuma River basin and the locations of branches of important companies in terms of loan balance.	In this analysis, the properties to be analyzed were limited to high-risk areas, so the overall picture of the damage could not be obtained, but an inundation depth of more than 2 m (some 5 m) was observed. In particular, it may be necessary to consider credit risk individually for properties with large assumed damage, but since the building structure is not considered in this analysis, further data collection is required for risk assessment.
Higo Bank	Since almost the entire area of Kumamoto City is covered with a hazard map, flooding in the river basin centered on Kumamoto City and damage in the center of Kumamoto City were assumed.	In order to estimate the damage in Kumamoto city, the loan recipients located in the downtown area and arcade area where the damage is expected were targeted.	Since the area and target properties were limited, the analysis was originally for properties that are expected to be damaged. The inundation depth is generally within the range of 2m, but some damage was expected to exceed 2m. It is necessary to further expand the target properties to evaluate the impact on credit risk.

3. Scenario Analysis - Practical Examples

3-1. Shiga Bank, Ltd.

3-2. Hachijuni Bank, Ltd.

3-3. Higo Bank

3. Practical examples of scenario analysis

3-1. Shiga Bank

① Assess materiality of climate-related risks

② Identify and define range of scenarios

③ Evaluate Qualitative Business Impact

④ Quantitative assessment of transition risk

⑤ Quantitative assessment of physical risk

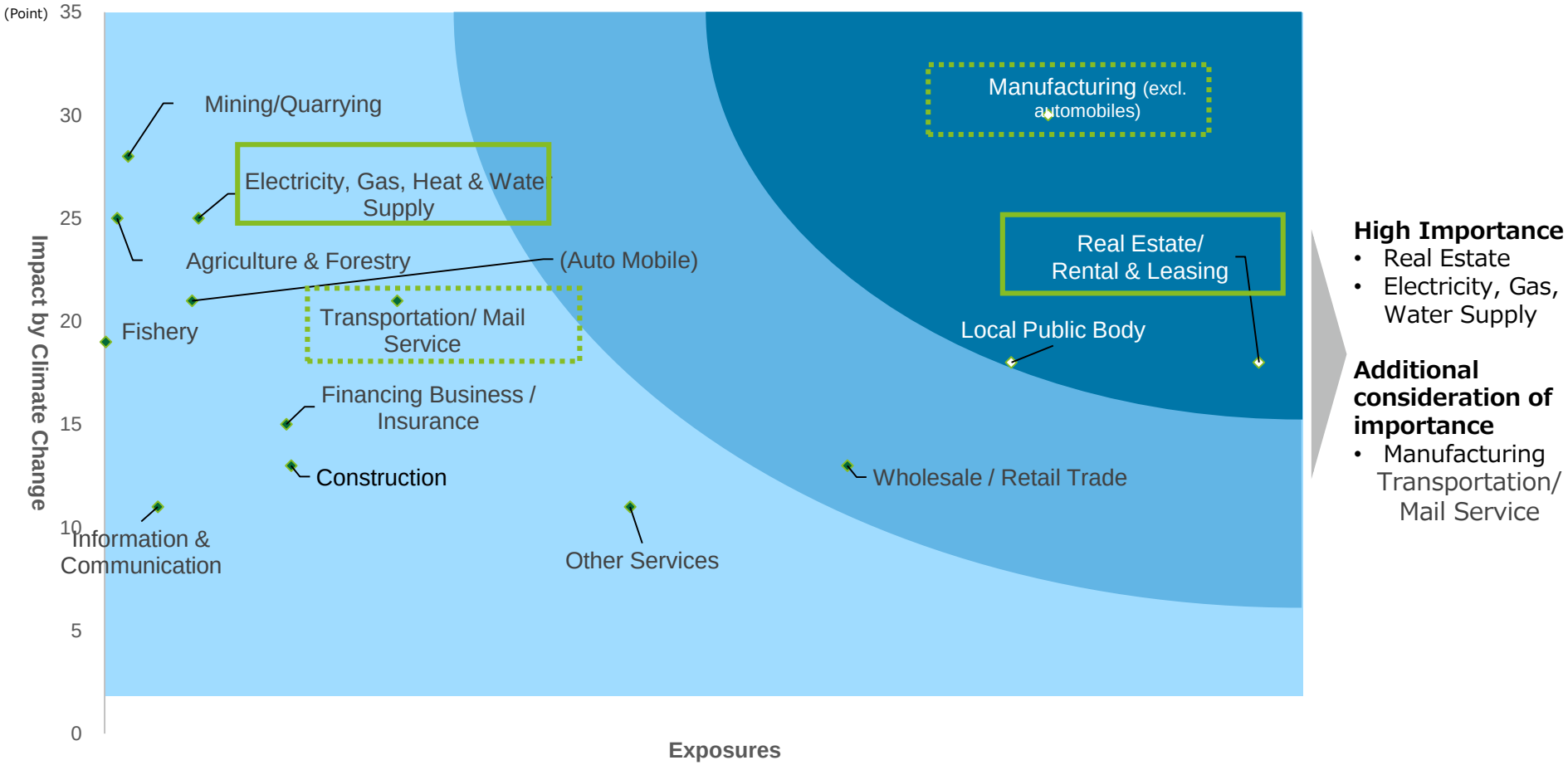
3-2. Hachijuni Bank

3-3. Higo Bank

[Examination of the business sector to be analyzed]

From the exposure by industry on the bank (total amount), we can assume that the importance of “Real Estate” “Electricity, Gas, Heat and Water Supply" is high.

Industry Exposures and Climate Risk Impact



(Note 1) Goods Rental and Leasing do not include exposures classified as
(Note 2:) "Other", which have different risk ratings depending on commercial products.
Source: Exposure prepared based on "Financial Results for Fiscal 2019"

[Draft Assessment of Climate Change Risks and Opportunities in the Transport Sector]

Carbon taxes, energy prices, electric vehicles, and catastrophic disasters are expected to have an impact.

①Real estate
② Energy
③ Automobiles and transportation

Type	Evaluation item		Business Impact Analysis (qualitative information)		Proposal of importance
	Major group	Subclassification	Risk	Opportunity	
Transition	Policy / Regulation	Carbon tax and price	**Introduction of a carbon tax (rising operating costs)** • The introduction of a carbon tax would require the payment of a tax on GHG emissions from corporate activities	**Shift to alternatives through the introduction of a carbon tax (increase in sales)** • Modal shifts (Shift from automobile to rail transport) may accelerate as a carbon tax is introduced	Large
		Addressing GHG emission regulations	**Strengthening of GHG emission regulations (rising operating costs)** • Fuel efficiency regulations will become stricter, requiring the payment of fines for unmet emissions.	**NA**	Medium
		Fossil fuel subsidy	**Abolition of fossil fuel subsidies (rising R & D costs)** • If fossil fuel subsidies are eliminated, support projects for the development of low-carbon technologies may be terminated, resulting in high R & D costs.	**NA**	Small
	Market	Increase or decrease in the price of important products	**Rising demand for raw materials (rising operating costs)** • If the price of materials and parts (Batteries, etc.) rises due to the progress of EV shift, the manufacturing cost will rise.	**NA**	Medium
		Energy price	**Higher energy prices (rising operating costs)** • Higher energy prices lead to higher electricity and fuel costs in transport, resulting in higher transport and overhead costs	**Increased use due to changes in modes of transport (increase in sales)** • May choose rail or other transportation over trucks during periods of high gasoline prices	Large
	Technology	Dissemination of electric vehicles (Dissemination of next-generation technologies)	**Conversion to electric vehicles (increase in capital investment)** • Conversion cost from internal combustion trucks to EV trucks is high due to the spread of EVs throughout the market and requests from customers.	**Expansion of electric vehicles and low-carbon technologies (higher sales and lower operating costs)** • Advances in technology will lower the cost of introducing EVs • The development of transportation technologies will increase the maximum load per vehicle and the spread of low-carbon technologies will reduce transportation costs.	Large
		Spread of renewable and energy-saving technologies	**NA**	**Lower energy costs (lower operating costs)** • Technological progress reduces capital investment costs for CO2 reduction • Expanding services through the development of energy-saving technologies and the procurement of renewable energy through self-generation	Medium
	Reputation	Changes in customer behavior	**Changing customer preferences (decline in sales)** • Increased customer awareness of environmental considerations (CO2 reduction, etc.) may result in less companies being chosen for their environmental efforts	**NA**	Medium
		Changing investor reputation	**Poor investor reputation (higher funding costs)** • The divestment trend accelerates, which becomes a hindrance for enterprises that are not managing against environmental factors. As a result, the cost of financing increases.	**NA**	Medium
Physical	Chronic	Changes in precipitation and weather patterns	**Lower demand for existing products (decline in sales)** • Changes in weather patterns and increased frequency of flooding will result in sales of amphibious vehicles in some areas, which will impact sales.	**NA**	Medium
		Increase in mean temperature	**Thermal expansion of lines (Increase in capital investment and operating costs)** • Thermal waves cause thermal expansion and breakage of lines, leading to delays in rail transport and higher response costs	**NA**	Large
	Acute	Intensification of extreme weather	**Damage to operations due to severe disaster (Increase in capital investment and operating costs)** • When abnormal weather occurs frequently and manufacturing bases and warehouses are damaged, operations are suspended or restoration costs are incurred, and existing assets are damaged.	**NA**	Large

*Considering the importance in the image of medium- to long-term Transition risk/physical risk (Example: Climate change in 2030/2050)

3. Practical examples of scenario analysis

3-1. Shiga Bank

① Assess materiality of climate-related risks

② **Identify and define range of scenarios**

③ Evaluate Qualitative Business Impact

④ Quantitative assessment of transition risk

⑤ Quantitative assessment of physical risk

3-2. Hachijuni Bank

3-3. Higo Bank

[(3) List of automobile sector parameters]

Forecast parameter data is collected for critical risks and opportunities, for the 2 ° C/4 ° C scenario

Important Items (object of analysis)	Configured Parameter	Current	4 ° C		2 ° C	
			Before 2030	2040 and later	Before 2030	2040 and later
Carbon tax and price	(1) Carbon tax	Japan: N/A	(2030) Japan: N/A	(2040) Japan: N/A	(2030) Developed Countries: 100 USD/t Developing countries: 75 USD/t	(2040) Developed Countries: 140 USD/t Developing countries: 75 USD/t
Addressing GHG emission regulations	(2) Carbon emission reduction target	(base year) 4 ° C - varies by country 2 ° C: 2018 years	(2030) High targets limited to some countries	N/A	(2030) **▲30%**	N/A
Energy price	(3) Crude oil price	(2019) **63 USD/barrel**	(2030) **76 USD/barrel**	(2040) **85 USD/barrel**	(2030) **56 USD/barrel**	(2040) **53 USD/barrel**
	(4) Vehicle sales with engines	(2015) base year	(2030) **+16%**	(2060) **+49%**	(2030) **▲29%**	(2060) **▲86%**
Dissemination of next-generation technologies	(5) Dissemination of electric vehicles	(2016) Japan: 28000 (EV, PHV and FCV)	**PHV/ZEV: 5% increase**	**PHV/ZEV: 7% increase**	**PHV/ZEV: 39% increase**	**PHV/ZEV: 63% increase**
Intensification of extreme weather	(6) Flood damage amount	(2010) base year	(2030) **+67%**	N/A	N/A	N/A
	(7) Typhoon	N/A	N/A	(2100) All typhoons ▲ 5.7% Fierce typhoon + 3.6%	N/A	N/A

Definition of scenario groups: Accelerate expansion of environmentally friendly vehicles for decarbonization

2 ° C world view @ 2050 (example)

: What You Need to Do to Address Risk

: What you need to do to get the opportunity

Motor Vehicle

New entrant

- Companies involved in the use of renewable energy and environmentally friendly vehicles enter the market in China and other countries.

Strengthening cooperation (Alliances, M&As, etc.)

Seller (Suppliers)

- Increased demand for products to reduce vehicle weight and improve energy efficiency
- Higher production costs due to carbon tax, shifting to sales prices

Strengthening Cooperation with Suppliers (Price negotiations, securing products, etc.)

Seller (Energy, etc.)

- Increasing share of renewable energy in energy demand and decreasing demand for oil
- Crude Oil Prices Fall

Industry/Company

- Withdrawal of production of gasoline vehicles and shift to production of ZEVs
- Promoting the use of renewable energy and environmentally friendly vehicles
- Increasing need for additional energy-efficient capital investment

Promoting investment in low-carbon technologies

Improving Production Plans for Low-Carbon Production

(Substitute)

- Decarbonization promotes EVs and FCVs using renewable energy

Buyer (customer)

- Increasing demand for EVs for a decarbonized society
- On the other hand, demand for vehicles with engines declined due to the expansion of ZEVs, etc.
- In addition to the increased demand for EVs, the cost reduction will be promoted and the barrier to EV purchase will be lowered.

Introduction and sales expansion of environmentally-friendly vehicles such as ZEV *

Government

- To achieve the 2 ° C target, the government is promoting the introduction of carbon taxes and emissions trading, and carbon prices are rising.
- Implementation of preferential policies for domestic EV manufacturers
- Stricter regulations on internal combustion vehicles
- Expanding charging infrastructure to promote EVs

Prompt access to policy information; and securing subsidies

Promoting renewable energy and next-generation vehicles in cooperation with the government

*ZEV ･･･ zero-emission vehicles (Electric and hydrogen vehicles)

Definition of scenario groups:
Maintains the traditional market environment and increases physical risks such as severe disasters

①Real estate
② Energy
③ Automobiles and transportation

4 ° C world view @ 2050 (example)

: What You Need to Do to Address Risk
: What you need to do to get the opportunity

Motor Vehicle

New entrant

- As ICE cars continue to dominate, the presence of new EV manufacturers is limited.

Seller (Suppliers)

- Slow pace of development for low carbon technologies and products
- Increasing need for countermeasures due to intensification of natural disasters

Reinforcing the Supply Chain for Abnormal Weather

Seller (Energy, etc.)

- Crude Oil Prices Rise as Decarbonization Fails and Oil Demand Grows

Promoting renewable energy procurement and private power generation

Industry/Company

- Increased energy costs for cooling vehicle production sites
- Production of ICE in manufacturing has continued and business portfolio is maintained
- Low Carbon Vehicle Sales Slow

Minimizing investment in EV development (Concentrate resources on improving ICE performance)

(Substitute)

Buyer (customer)

- The lack of a product lineup for infrastructure and next-generation vehicles remains an issue.
- In addition, the subsidy policy has not progressed, and the product cost is high, so the customer's desire to purchase the next generation car has not increased, and as a result, the market centering on ICE cars * has continued.

Minimizing investment in EV development (Concentrate resources on improving ICE performance)

Government

- The low carbon/decarbonization trend weakens and external pressure from the international community weakens
- Slow or stop the spread of ZEVs and renewable energy policies
- No regulations on carbon taxes will be introduced
- Subsidies (Breakwater, etc.) for increased physical risks such as floods

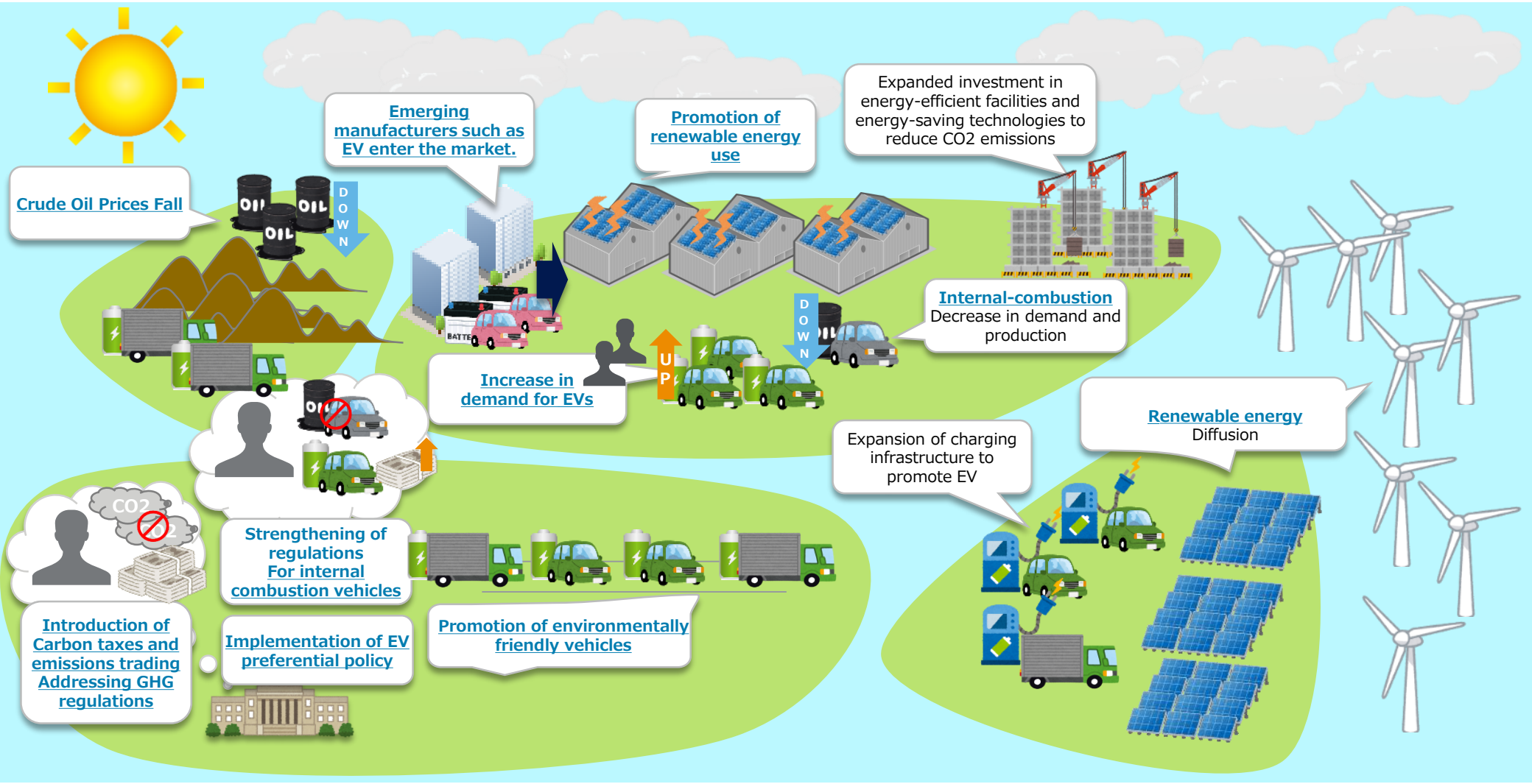
Prompt access to policy information; and securing subsidies

*ICE cars ･･･ internal combustion engines (gasoline and diesel vehicles)

[Vision of Future Society under the 2 ° C Scenario]

Strong promotion of decarbonization, the introduction of a carbon tax and increased use of renewable energy and EVs

①Real estate
② Energy
③ Automobiles and transportation



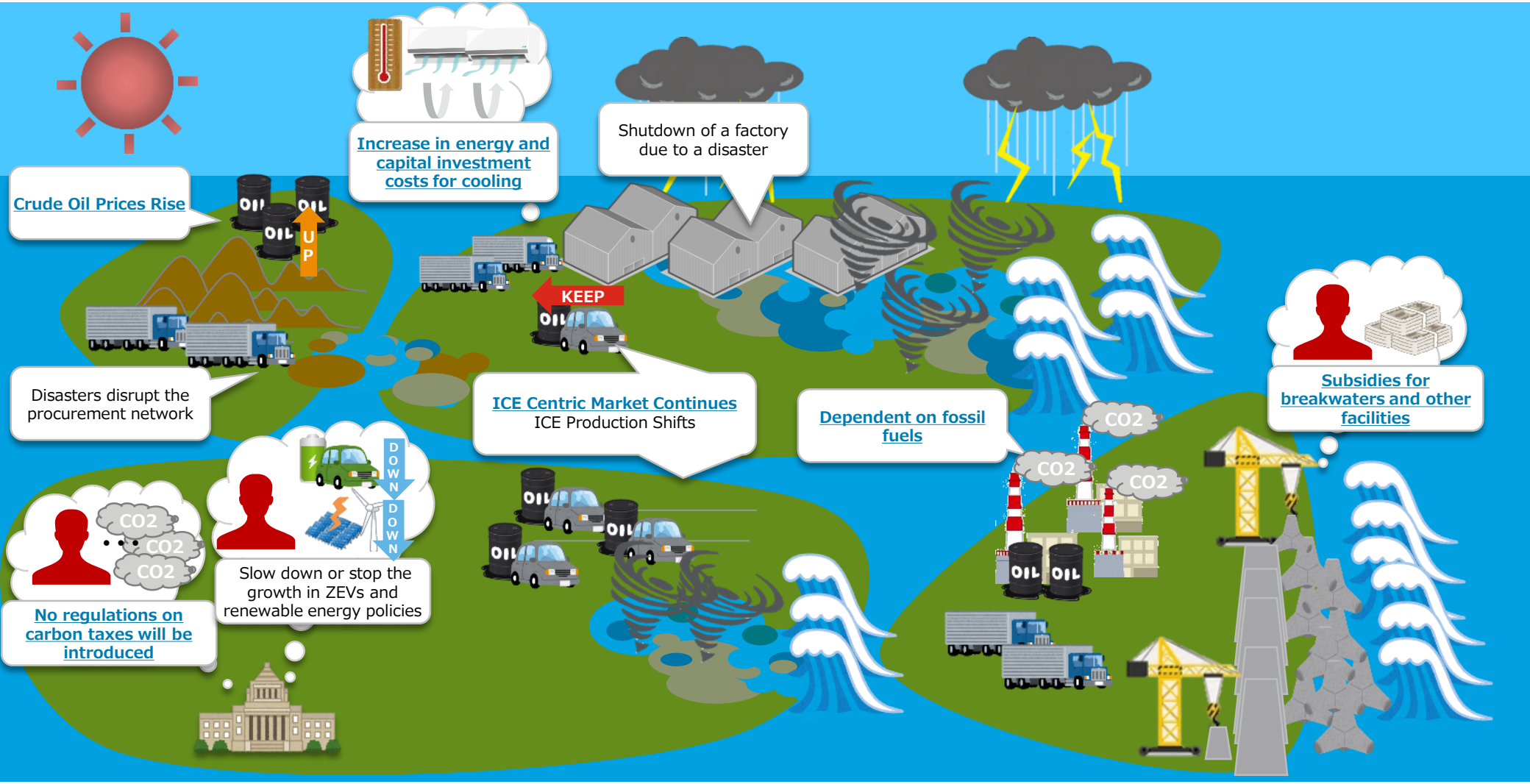
[Vision of Future Society under the 4 ° C Scenario]

Lack of progress regarding ow carbon/decarbonization levels, increasing physical risk

①Real estate

② Energy

③ Automobiles and transportation



3. Practical examples of scenario analysis

3-1. Shiga Bank

① Assess materiality of climate-related risks

② Identify and define range of scenarios

③ Evaluate Qualitative Business Impact

④ Quantitative assessment of transition risk

⑤ Quantitative assessment of physical risk

3-2. Hachijuni Bank

3-3. Higo Bank

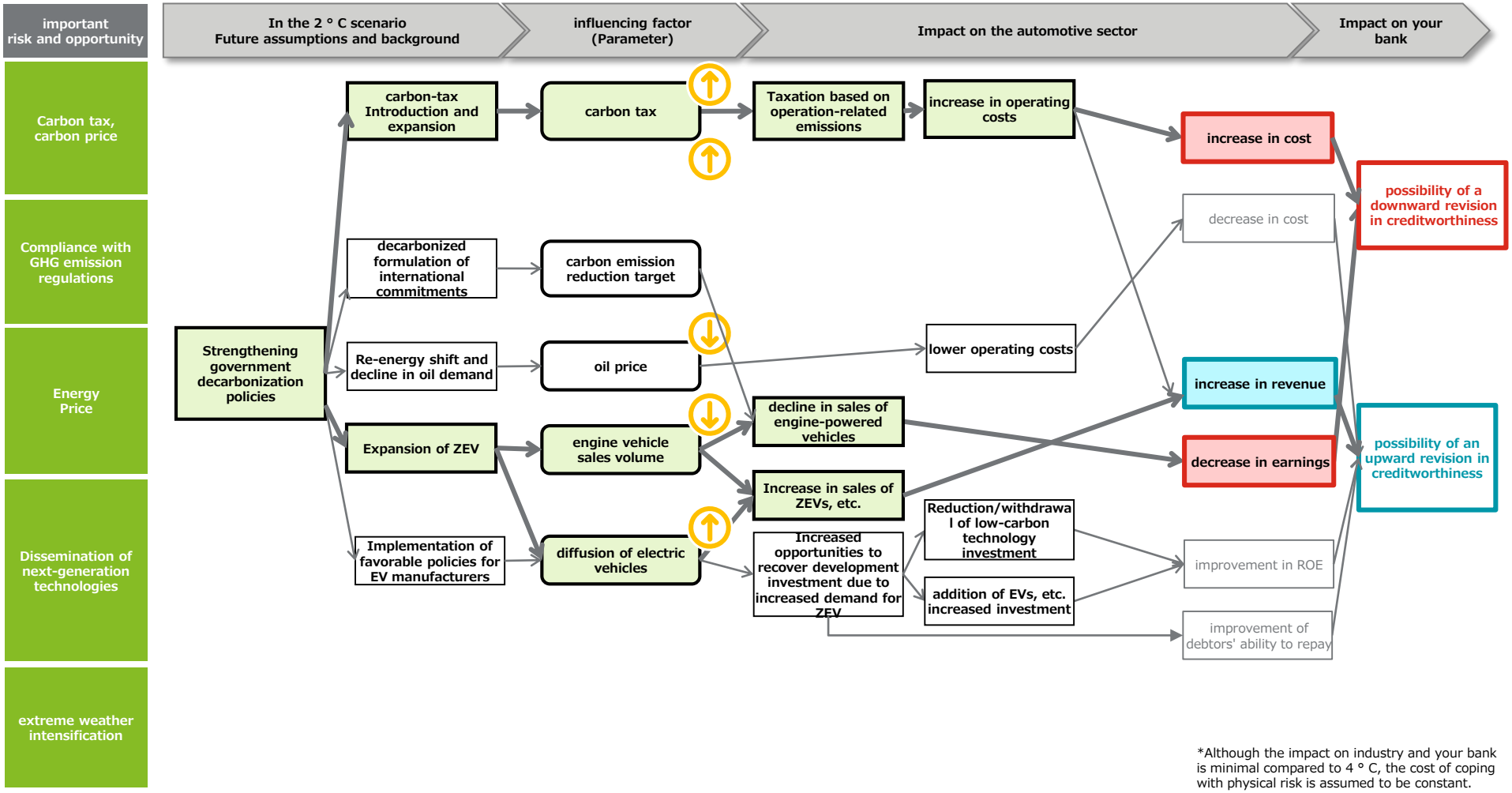
[(3) Business impact of automobile × 2 ° C] Decarbonization policies will be promoted, and modal shifts and EV use will accelerate

4 ° C | 2 ° C

① Real estate
② Energy
③ Motor Vehicle

Flow of climate change impacts to materialize

Legend: **Bold** have a particularly large impact on | Gray have a relatively small impact on | direction of change | Risk | opportunity



*Although the impact on industry and your bank is minimal compared to 4 ° C, the cost of coping with physical risk is assumed to be constant.

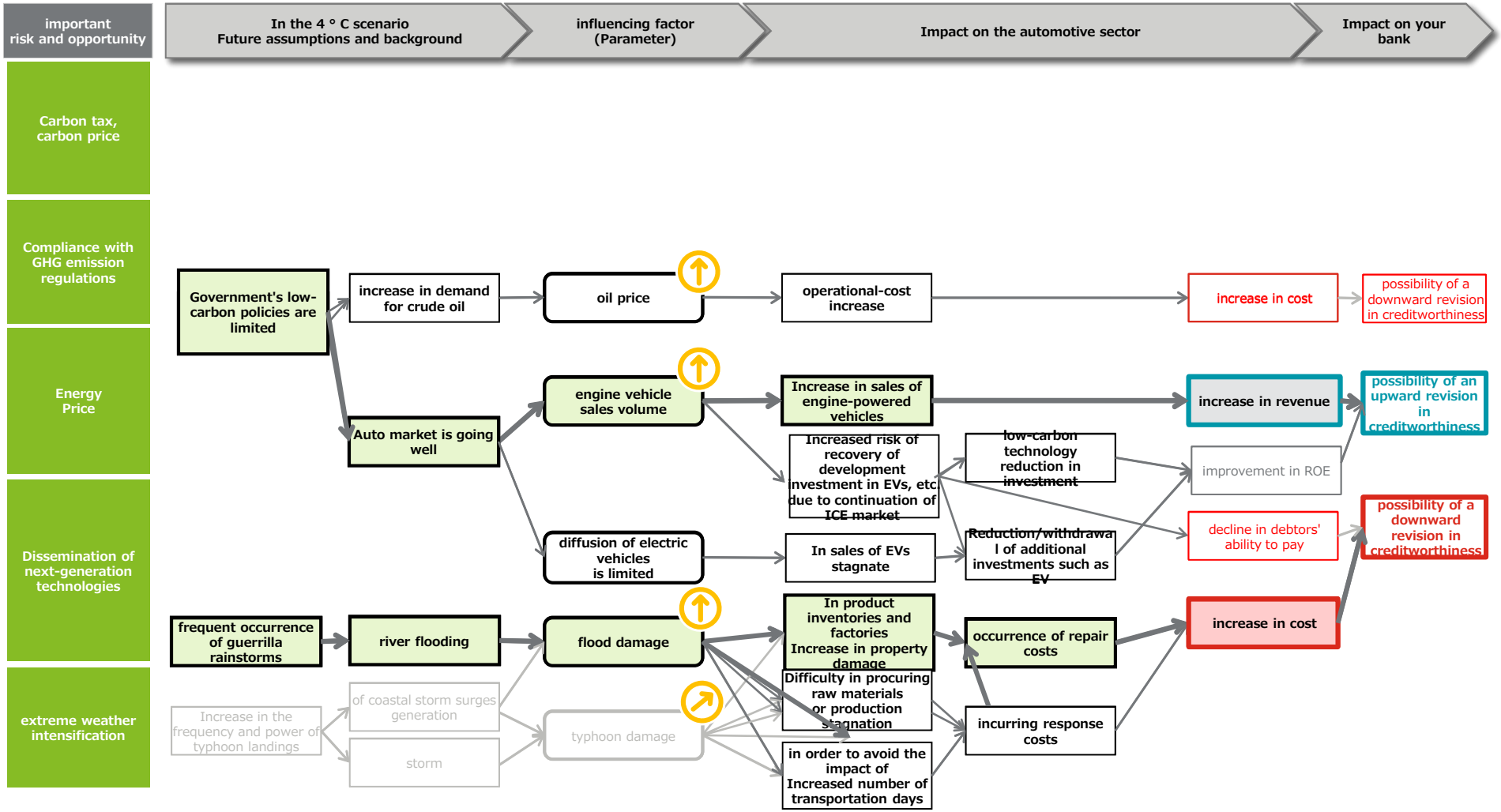
[(3) Business impact of automobile × 4 ° C]
While the current regulatory and market environment continues, the cost of extreme weather will increase.

4 ° C | 2 ° C

① Real estate
② Energy
③ Motor Vehicle

Flow of climate change impacts to materialize

Legend: **Bold** have a particularly large impact on | Gray have a relatively small impact on | ↗ direction of change | Risk | opportunity



3. Practical examples of scenario analysis

3-1. Shiga Bank

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- ② Identify and define range of scenarios
- ③ Evaluate Qualitative Business Impact
- **④ Quantitative assessment of transition risk**
- ⑤ Quantitative assessment of physical risk

3-2. Hachijuni Bank

3-3. Higo Bank

Approach to Analysis of the Impact of Transition Risk on Financial Statements

Example of analysis(1):
Energy sector (Electric Power Company (1))

Note: The value set as XXX in the numerical value in the graph is not shown as a real number because it was analyzed by a sample company (the same applies hereinafter).

If the carbon tax scenario is built on the assumption that the CO2 emissions will remain constant in the near future, there will be an excess of liabilities.

STEP 1: Carbon Tax Considerations

Item	Value	Remarks
CO2 emission volume	approximately XX, X00,000 [t-CO2]	Last ESG Report
Exchange rate	105 yen/$	Level at the end of January 2020

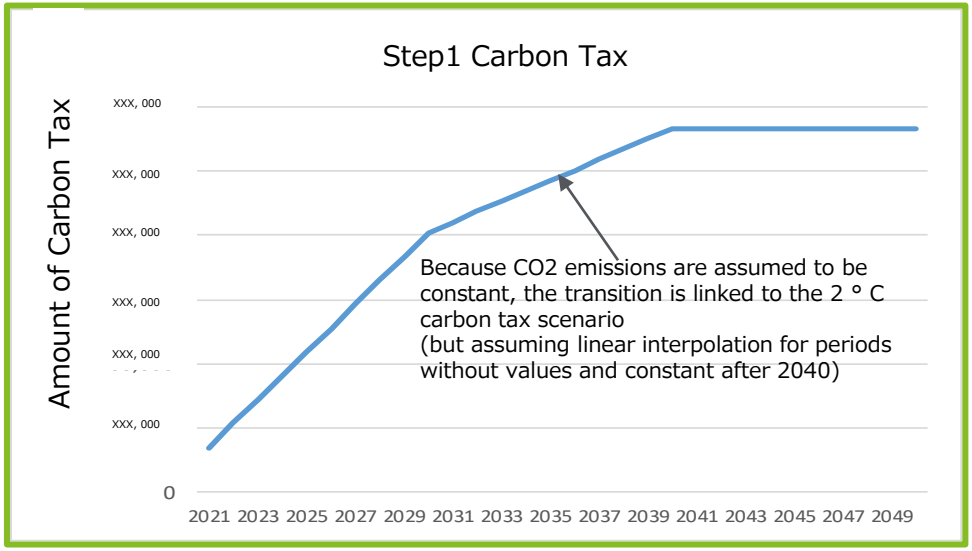
2 ° C Scenario	A carbon tax is introduced regardless of country or region.

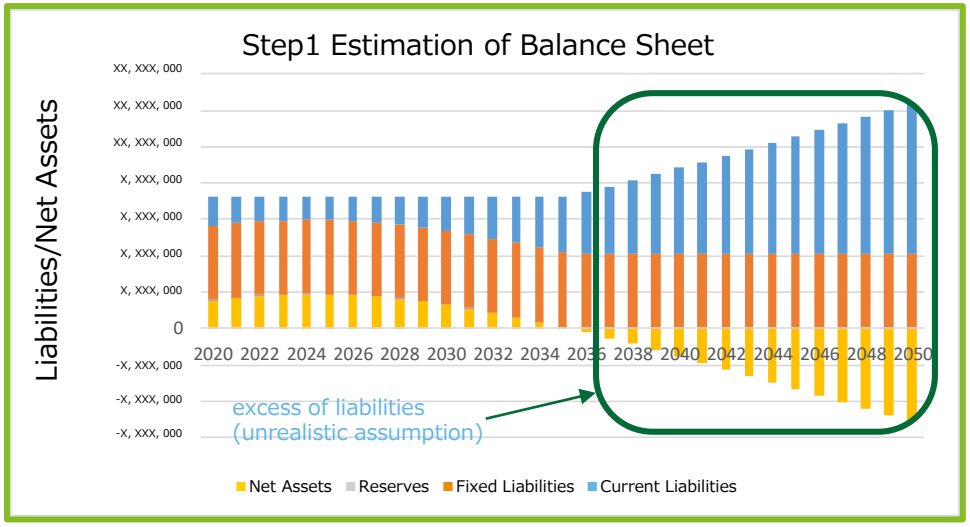
	Developed country	Developing country
Current situation	(Reference) Average successful bid price in EU-ETS in Europe: approximately US $/ t *"Implementation and Review of Emissions Trading in Other Countries" From (Ministry of the Environment Report 2016)	N/A
2030	100 US $/ tCO2	75 US $/ tCO2
2040	140 US $/ tCO2	125 US $/ tCO2

consideration

- (whole) As global carbon prices rise to achieve the 2 ° C target, the government is promoting the introduction of carbon taxes and emissions trading. On the other hand, companies with high GHG emissions are more likely to be asked to do so by governments and business partners, and more likely to be engaged by investors.
- (Real Estate) Due to rising steel and cement prices and transportation costs, green buildings utilizing new low-carbon materials have become popular.
- (Tenants/Residents) Tenants will see an increase in decarbonization and demand for energy-efficient facilities

*Data source:
- Extracted from IEA "World Energy Outlook 2019" Sustainable Development Scenario numbers



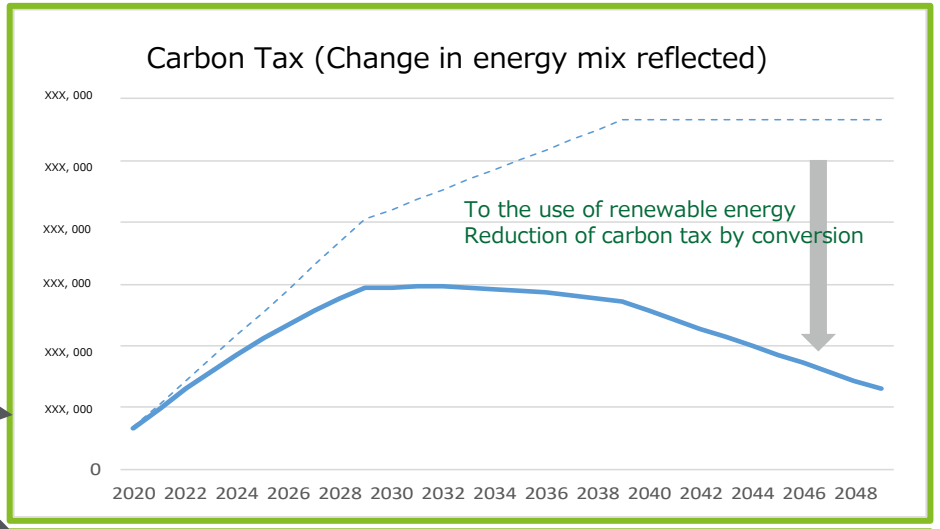


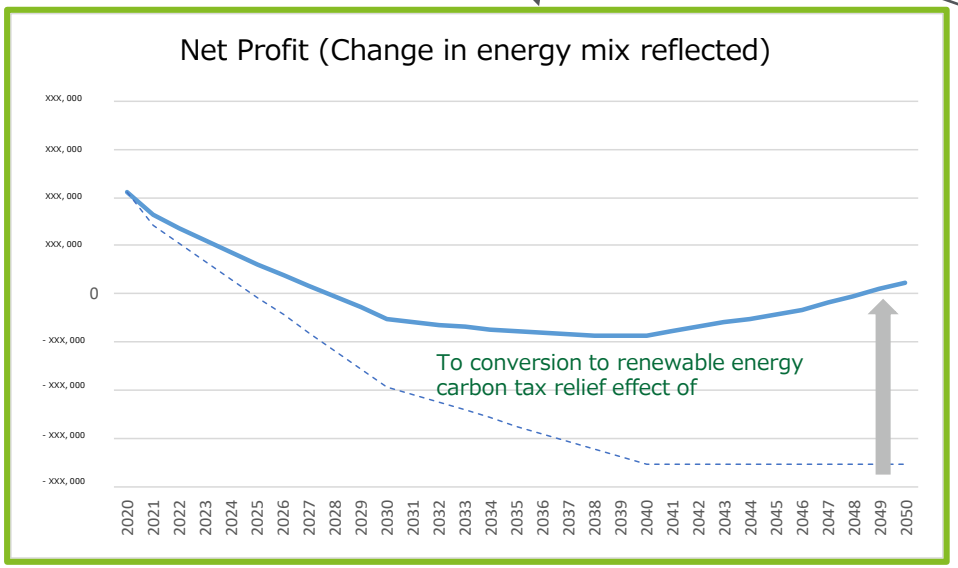
A decrease in the use of fossil fuels in favor of renewable energy is expected to lead to a reduction in the carbon tax burden and therefore an increase in net income

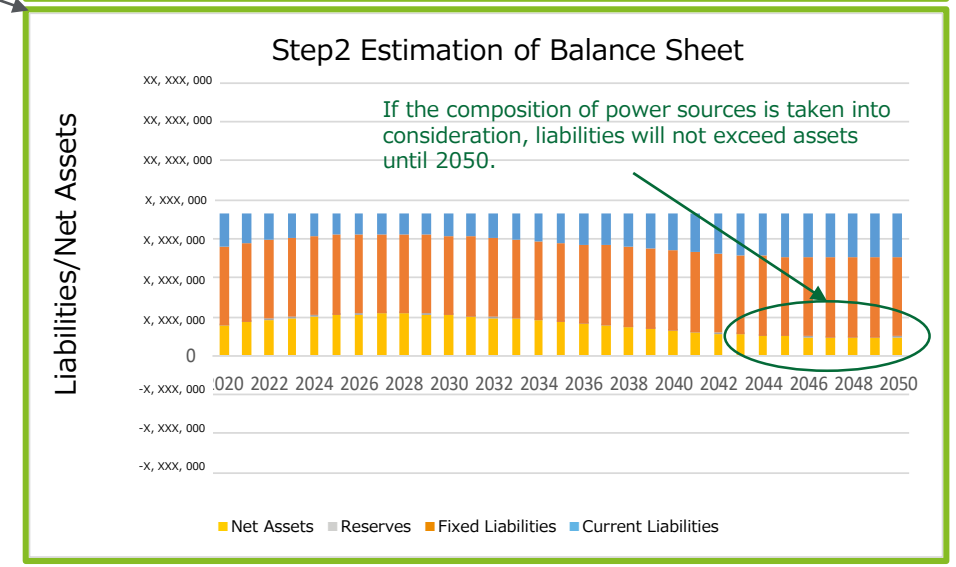
STEP 2: Estimating Financial Impact Based on Changes in Power Supply Composition

The reduction in carbon tax due to conversion to renewable energy is expected to increase net income and avoid excess liabilities.

Although this estimate assumes that the conversion will take place in stages, it is inferred that if the conversion is delayed, the deficit will widen as shown in Step 1, and there is a possibility that liabilities will exceed assets.





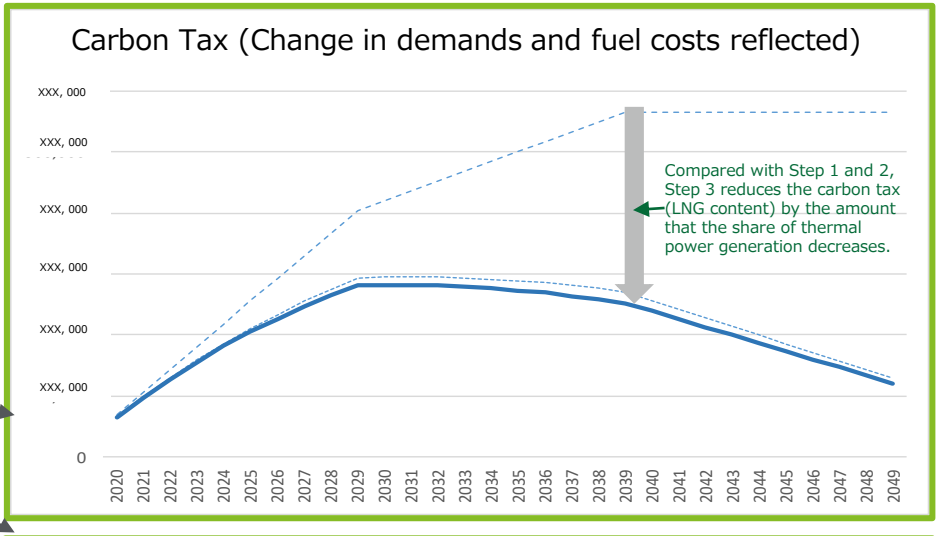


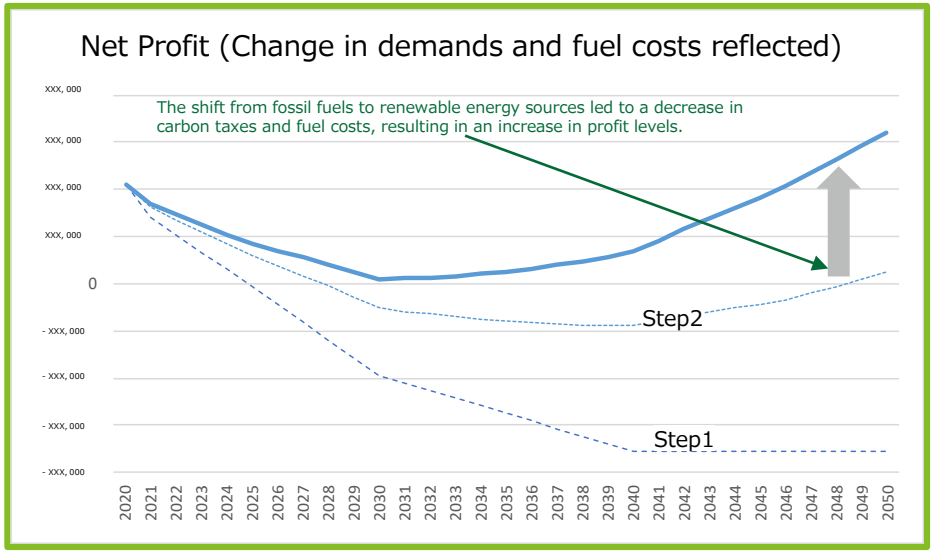
Based on the power supply composition transition scenario, a decrease in carbon tax burden and fossil fuel expenses caused by a decrease in thermal power generation is expected to increase net income

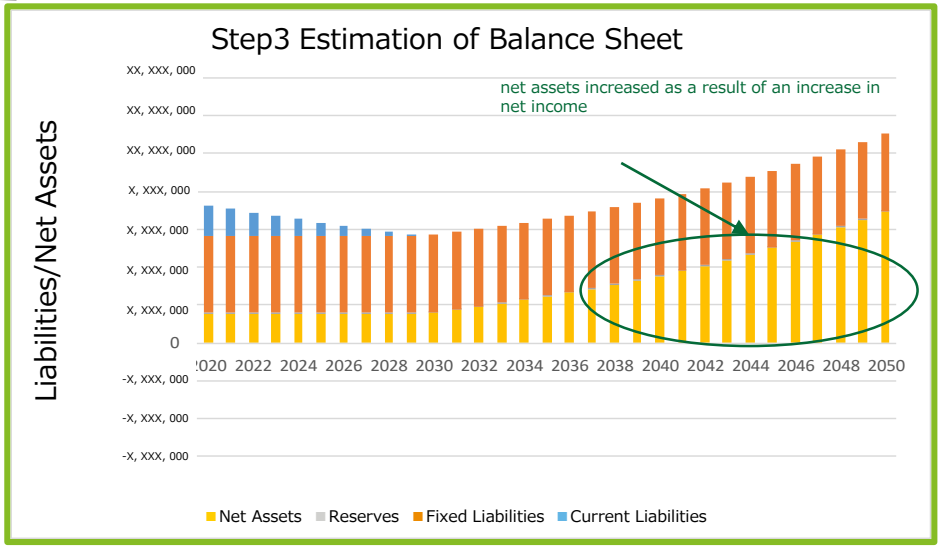
STEP 3: Reflection of transition scenario of power supply composition ratio

Reduction in carbon tax and fuel costs through conversion to renewable energy is expected to increase net income and avoid excess liabilities

Although this estimate assumes that the conversion will take place in stages, it is inferred that if the conversion is delayed, the deficit will widen as shown in Step 1 and 2, or the liabilities may exceed assets.







Example of analysis (2): Motor vehicle manufactures

Assuming the changes in profit and loss and the size of assets and liabilities are as they were in the most recent financial statements, the impact of the carbon tax is insignificant and net income is expected to continue

STEP 1: Carbon Tax Considerations

Item	Value	Remarks
CO2 emissions	About X, XXX, 000 [t-CO2]	Most recent environmental report *
Exchange rate	105 yen/$	Level at the end of January 2020

2 ° C Scenario	A carbon tax is introduced regardless of country or region.

	Developed country	Developing country
Current situation	(Reference) Average successful bid price in EU-ETS in Europe: approximately US $/ t *"Implementation and Review of Emissions Trading in Other Countries" From (Ministry of the Environment Report 2016)	N/A
2030	100 US $/ tCO2	75 US $/ tCO2
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consideration

- (whole) As global carbon prices rise to achieve the 2 ° C target, the government is promoting the introduction of carbon taxes and emissions trading. On the other hand, companies with high GHG emissions are more likely to be asked to do so by governments and business partners, and more likely to be engaged by investors.
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*Data source:
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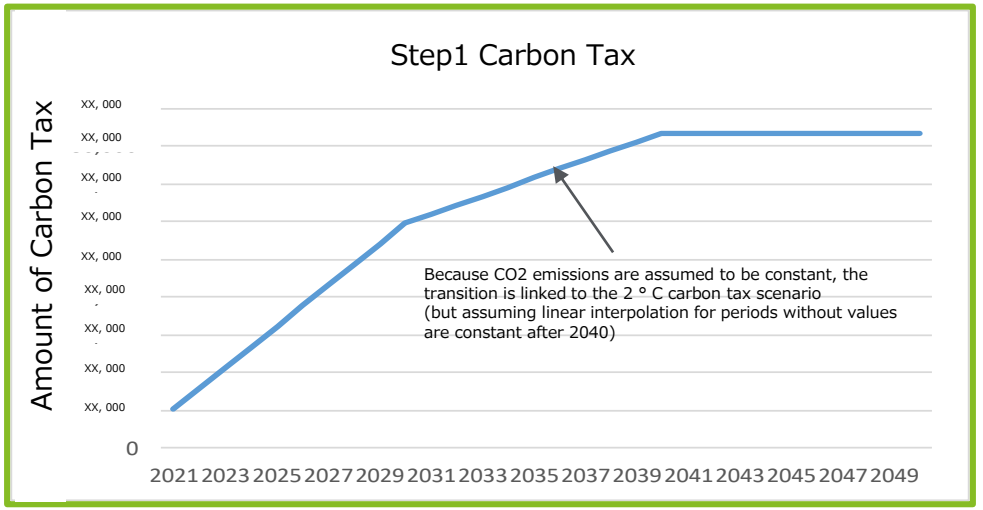
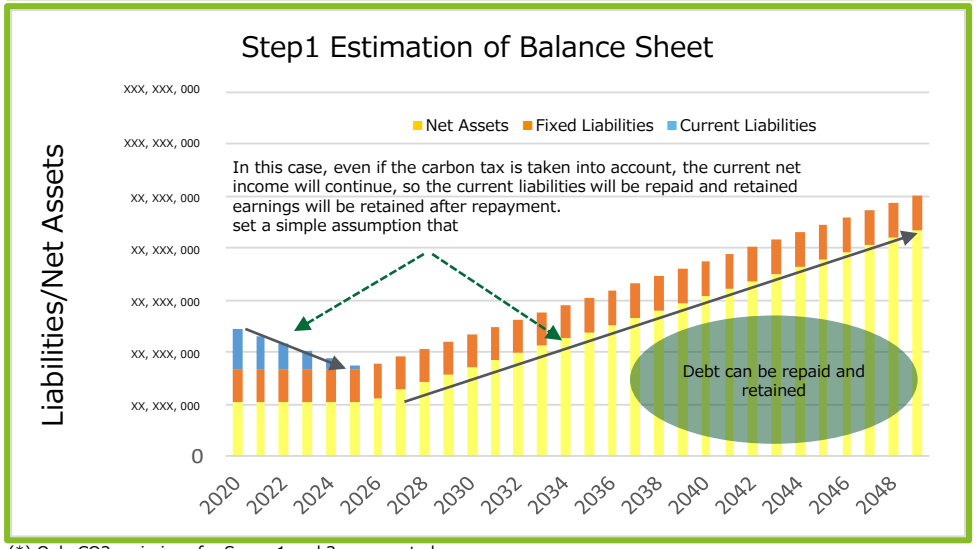
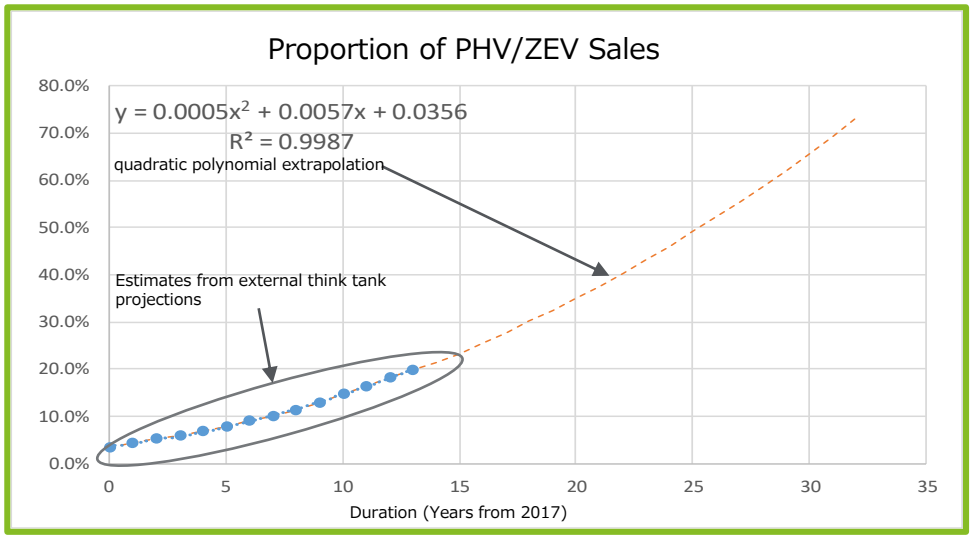


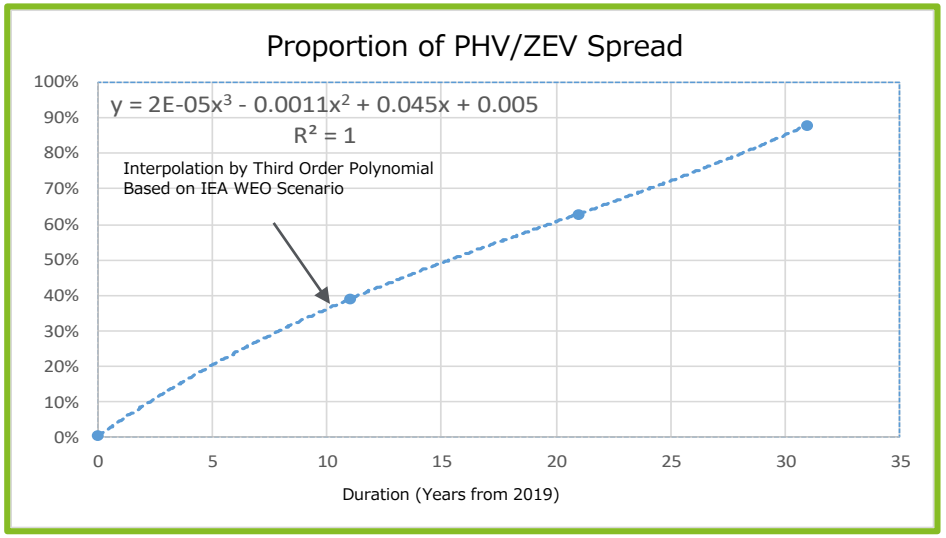


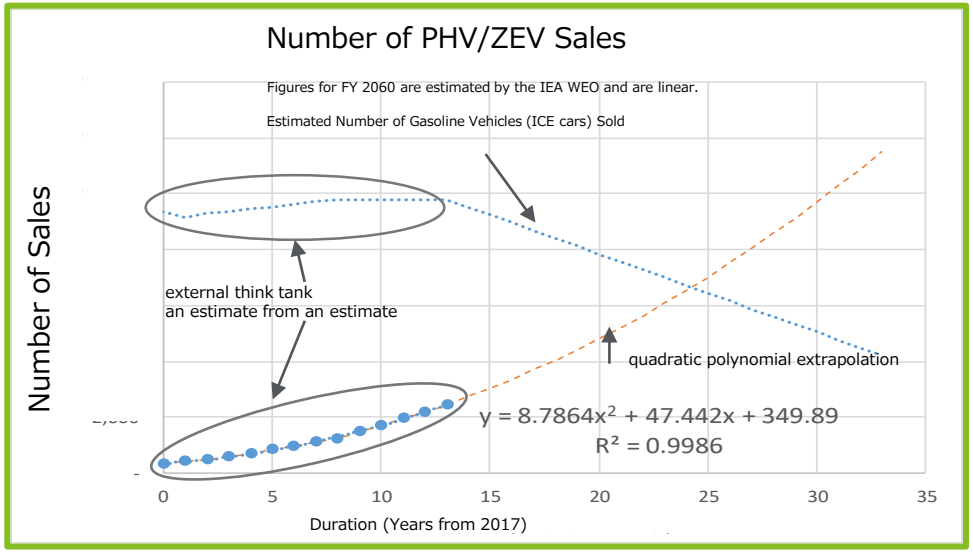
(*) Only CO2 emissions for Scope 1 and 2 are counted.

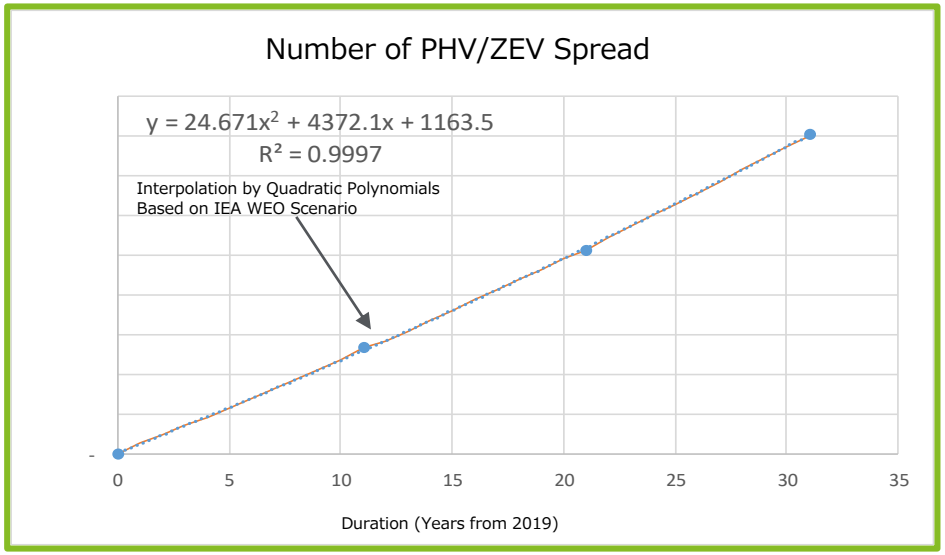
In order to take into account future changes in unit sales, calculations have been made from estimates of the "Percentage and number of units sold" and "Proportion of use and number of units" for next-generation vehicles, using scenarios developed by external think tanks and the IEA WEO

STEP 2: Forecasting the Future of Next-Generation Vehicles (≒ PHV or ZEV) in the Overall Automotive Market



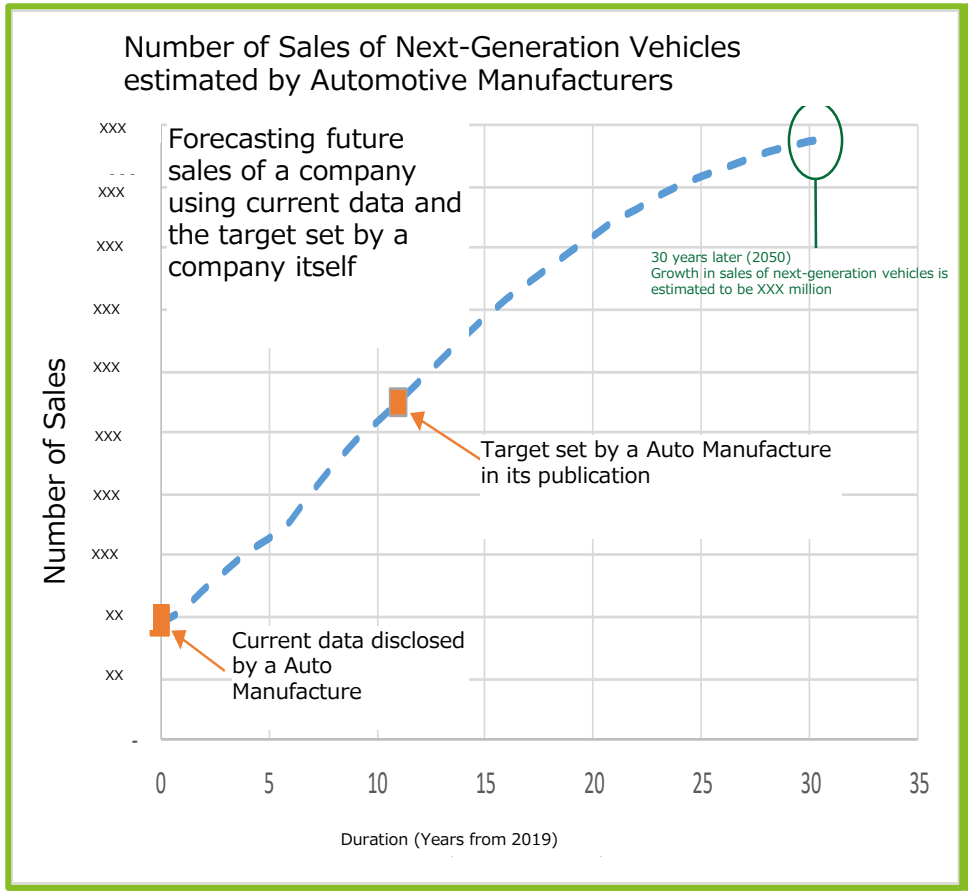


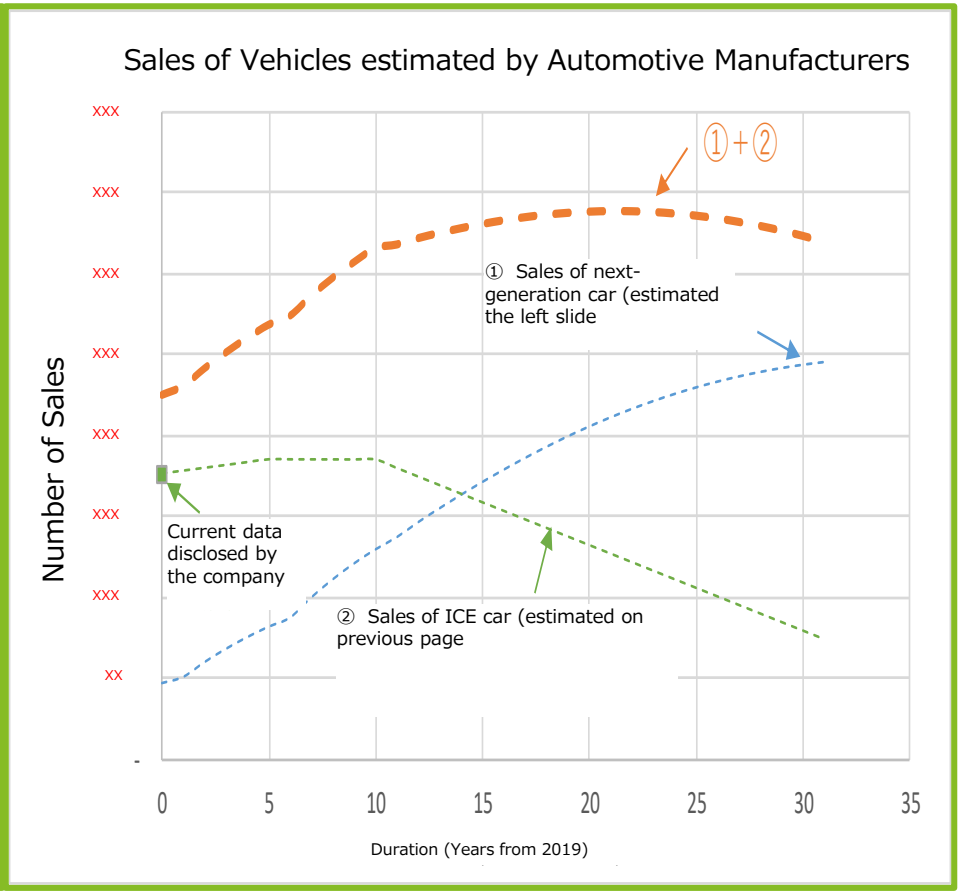




Based on the assumption that it will be linked to the market for next-generation vehicles as described in the previous page, we calculated the number of units sold by automobile manufacturers based on the actual and projected figures shown in our environmental and annual reports.

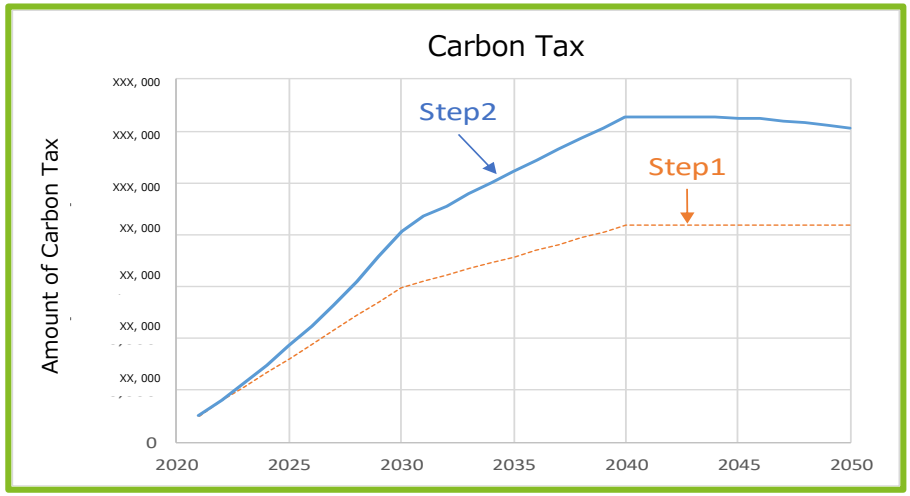
STEP 2: Automotive Manufacturers ' Forecasts for Future Sales of Next-Generation Vehicles (≒ PHV or ZEV)

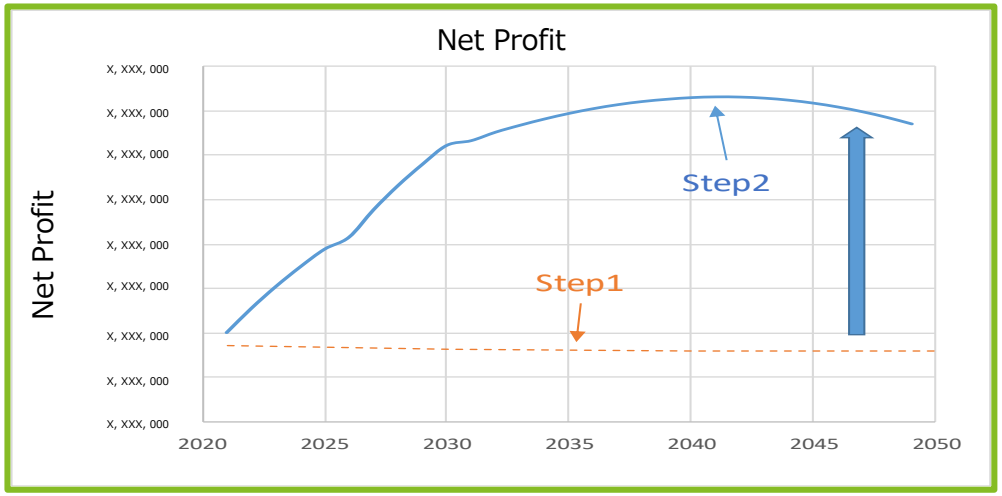


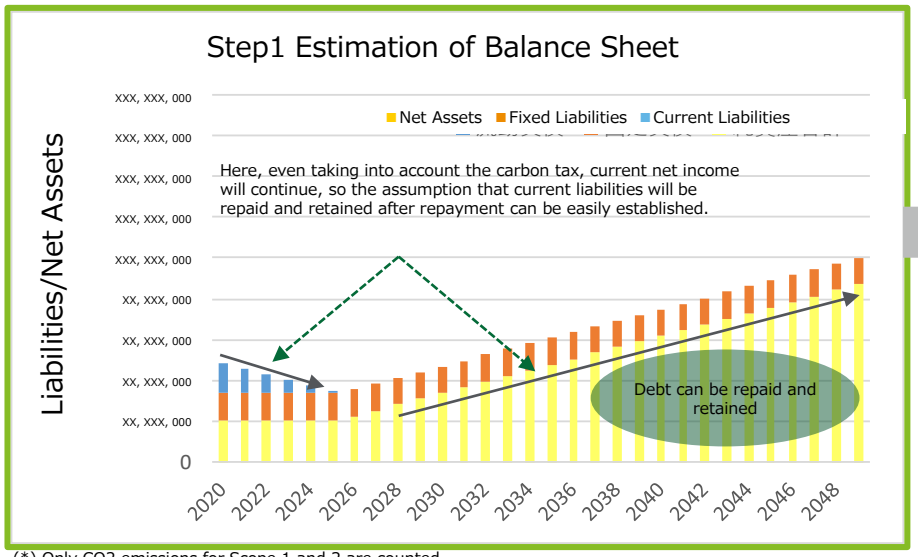


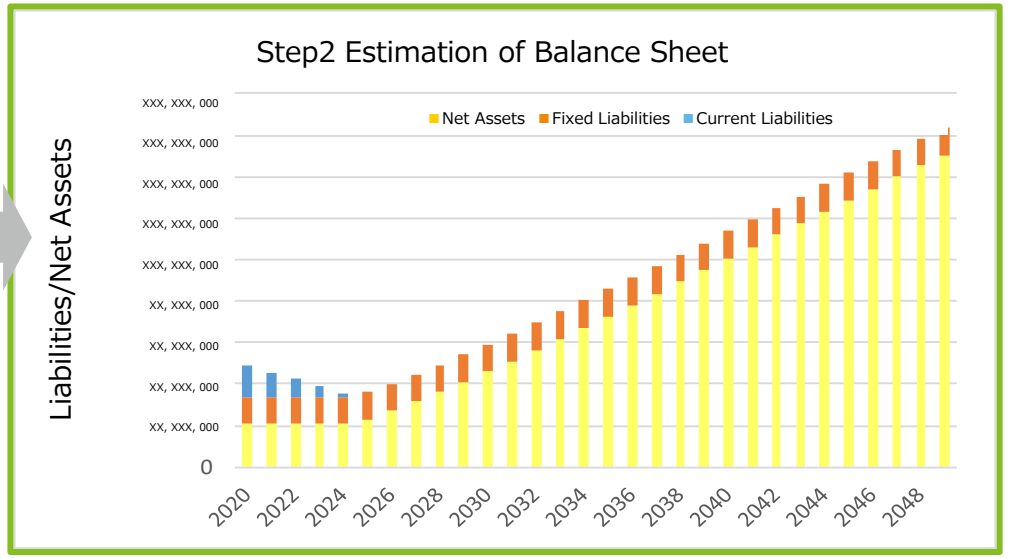
If we assume a change in the number of units sold (Sales and R & D expenses are simply linked to the aforementioned sales volume scenario.), we expect net income to increase, although the burden of carbon tax will increase.

STEP 2: Projections for future changes in sales









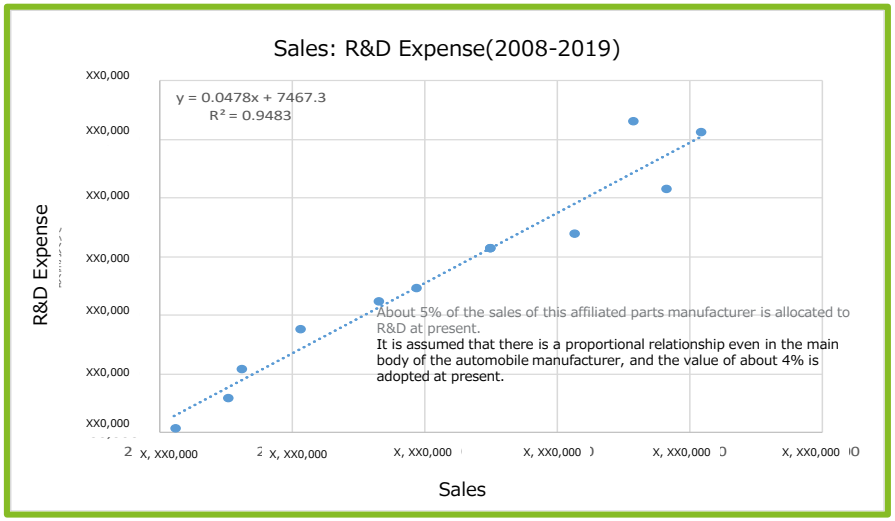
(*) Only CO2 emissions for Scope 1 and 2 are counted.

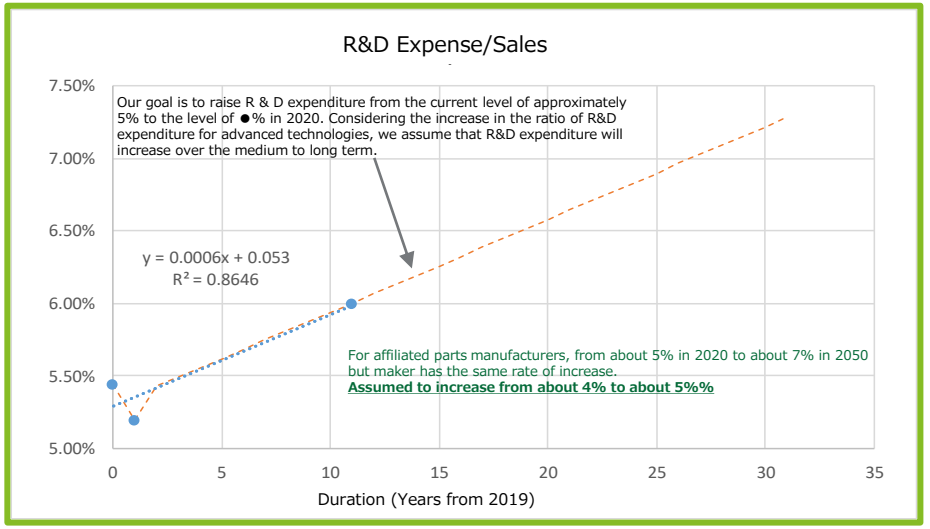
Based on data disclosed by component manufacturers affiliated with automobile manufacturers, we estimated changes in parameters relating to automobile manufacturers R&D expenditure and capital investment.

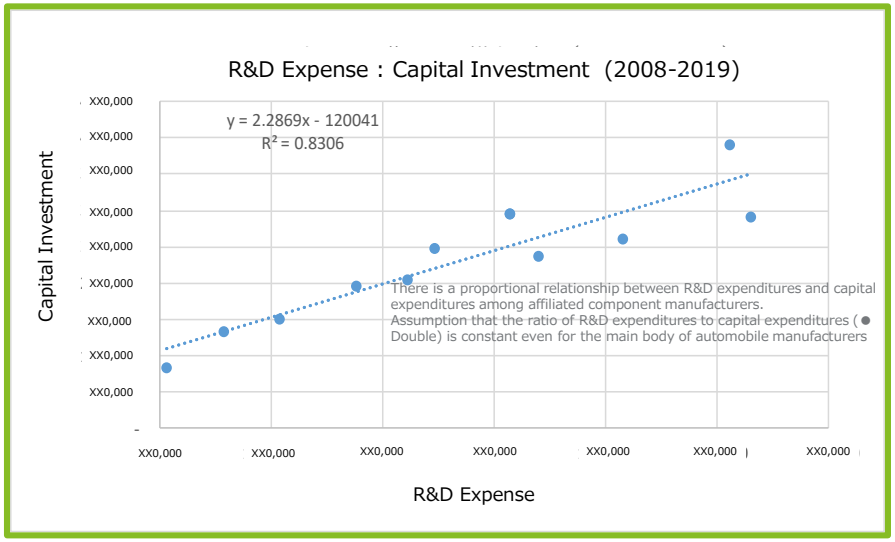
STEP 3: Future Forecast of Next-Generation Vehicle Development Costs by Automobile Manufacturers (Estimation based on data disclosed by affiliated component manufacturers)

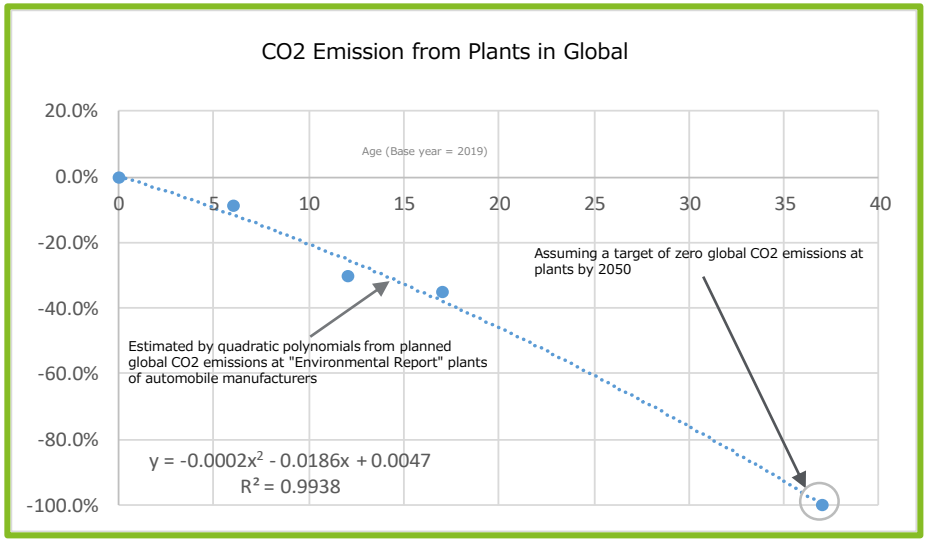
Estimates from the prior year's data

Future projections from disclosed targets







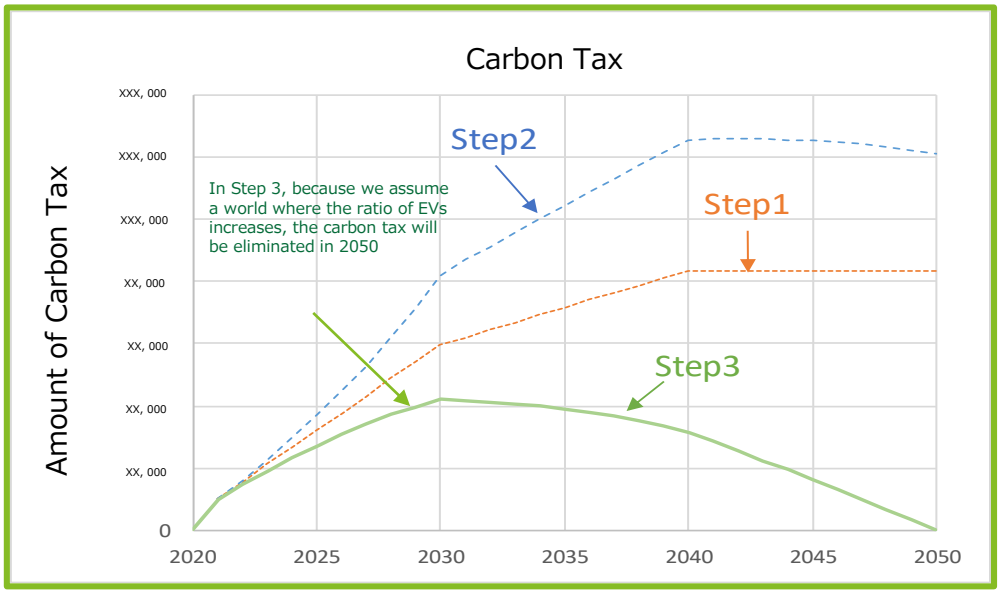


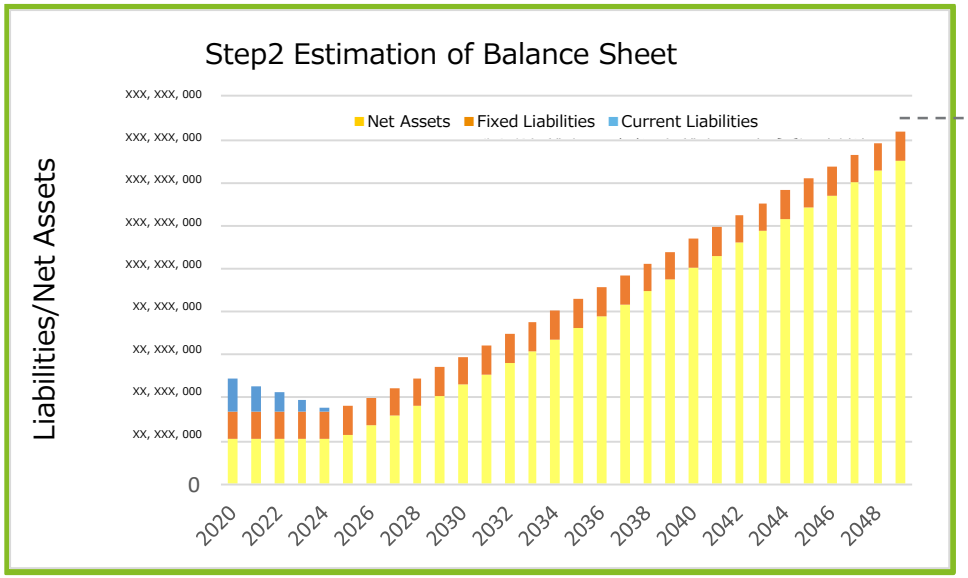
Even if certain assumptions are made in R&D cost projections as shown in the previous page, internal reserves will increase, but if assumptions such as sales volume and capital investment slightly change, the results will change, such as incurring an excess of liabilities.

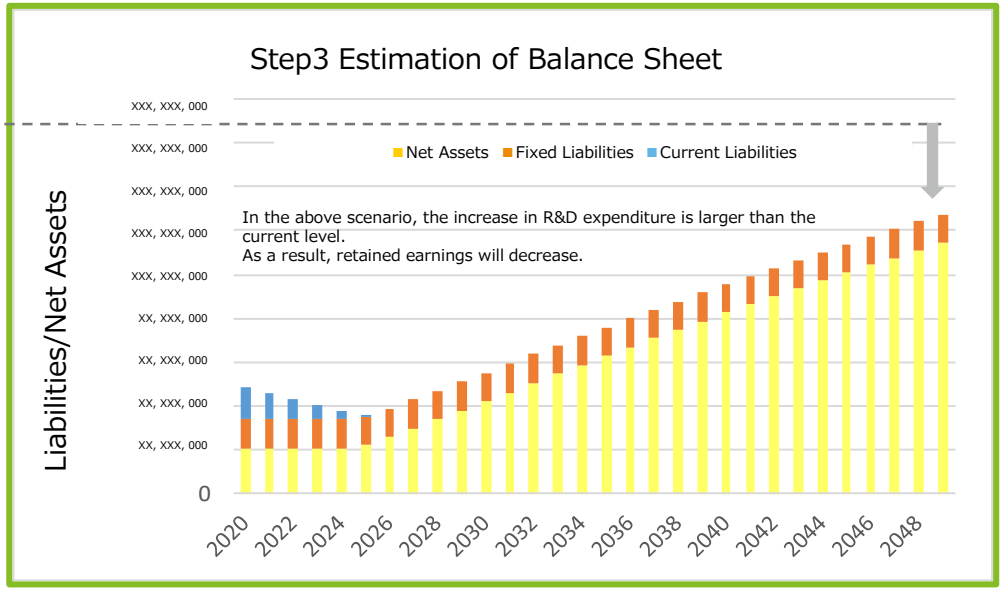
STEP 3: Study incorporating the forecast of R&D costs

[Assumptions Summary]

- Vehicle sales (Next-generation vehicles and gasoline-powered vehicles) are also sold according to the scenario, regardless of region or regulation.
- Assumes that the unit selling price of automobiles does not change on average
- Capital investment and R&D expenses are within the estimated range on the previous page.
- Reduction in global CO2 emissions at plants is expected to zero by 2050







Example of analysis (3): Real estate company

The negative impact of carbon tax on income is expected to be negligible. Even so, any reduction in income is expected to be attributable to an estimated accumulation within retained earnings rather than a result of increasing credit costs.

STEP 1: Carbon Tax Considerations

Item	Value	Remarks
CO2 emissions	approximately XX0,000 [t-CO2]	ESG Report, etc.
Exchange rate	105 yen/$	Level at the end of January 2020

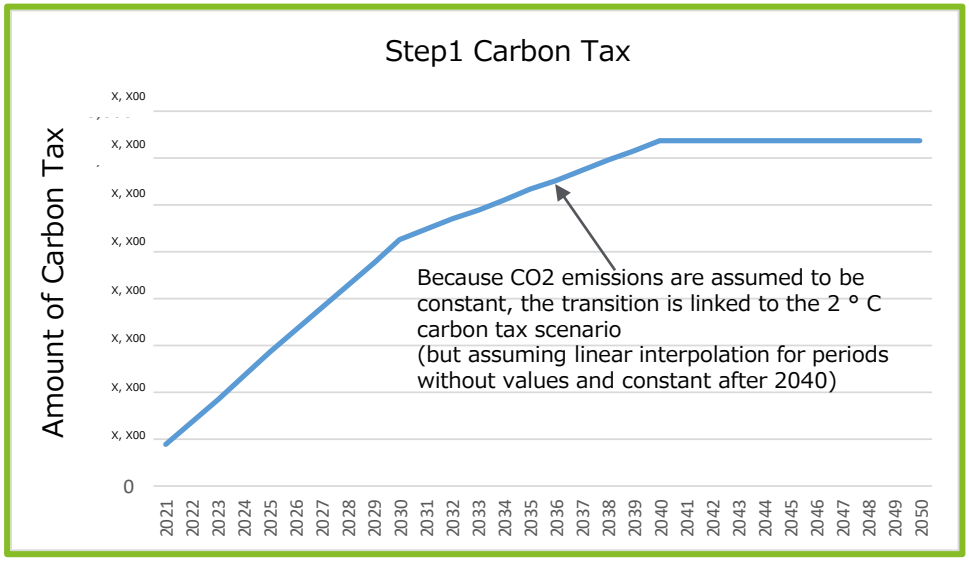
2 ° C Scenario	A carbon tax is introduced regardless of country or region.

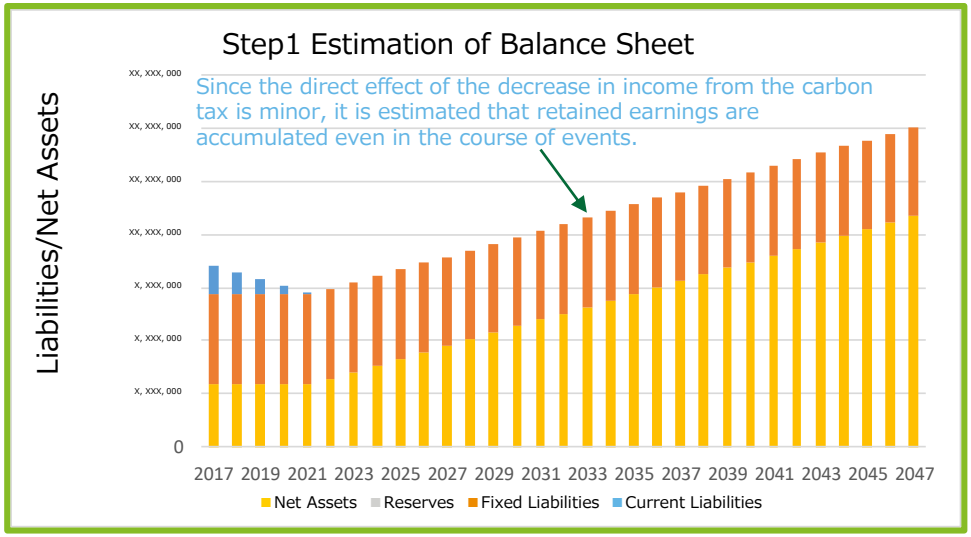
	Developed country	Developing country
Current situation	(Reference) Average successful bid price in EU-ETS in Europe: approximately US $/ t *"Implementation and Review of Emissions Trading in Other Countries" From (Ministry of the Environment Report 2016)	N/A
2030	100 US $/ tCO2	75 US $/ tCO2
2040	140 US $/ tCO2	125 US $/ tCO2

consideration

- (whole) As global carbon prices rise to achieve the 2 ° C target, the government is promoting the introduction of carbon taxes and emissions trading. On the other hand, companies with high GHG emissions are more likely to be asked to do so by governments and business partners, and more likely to be engaged by investors.
- (Real Estate) Due to rising steel and cement prices and transportation costs, green buildings utilizing new low-carbon materials have become popular.
- (Tenants/Residents) Tenants will see an increase in decarbonization and demand for energy-efficient facilities

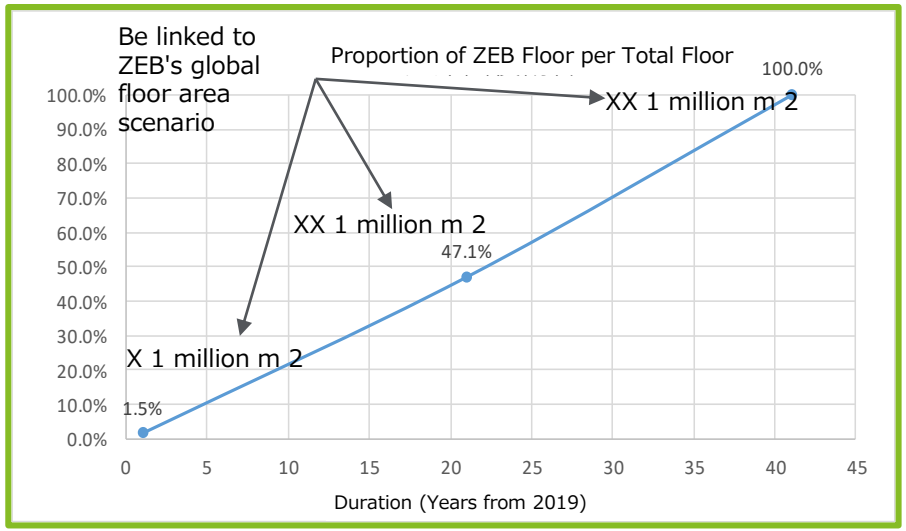
*Data source:
- Extracted from IEA "World Energy Outlook 2019" Sustainable Development Scenario numbers

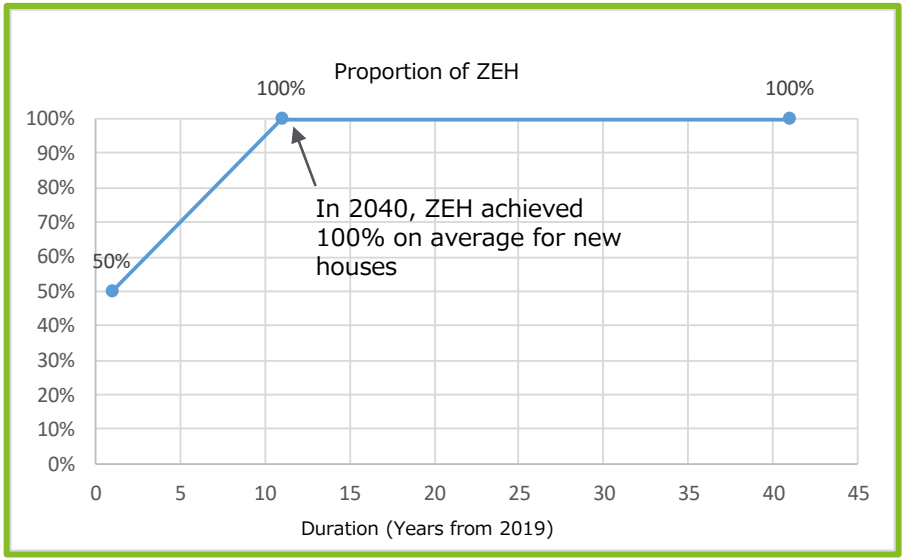




ZEB and ZEH are set on the basis of IEA scenarios and national targets, simplified assumptions are made regarding initial cost increases and carbon tax reduction

STEP 2: Sample Company Response (Compatible with ZEB/ZEH)





[Prerequisites for ZEB]

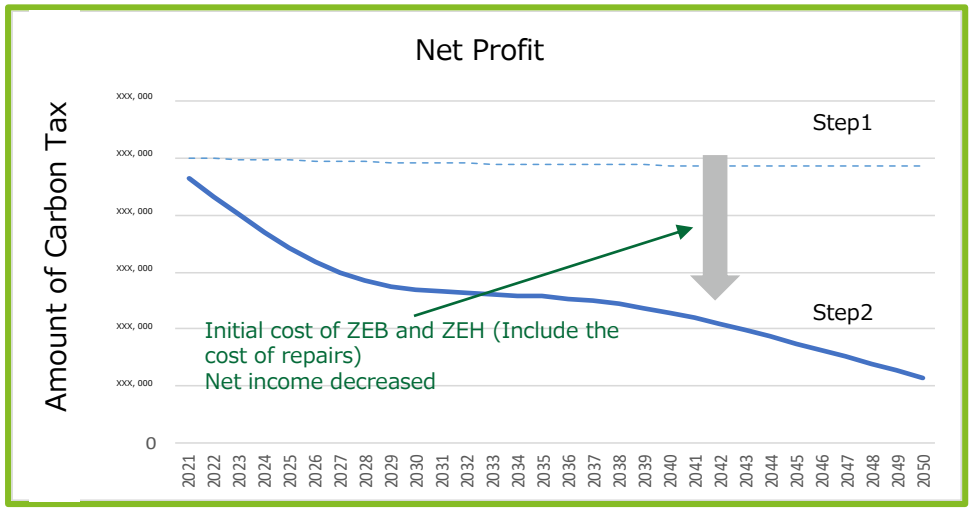
- As the total floor area increased by XXX 1000 m2 per year, the percentage cost increase of ZEB is shown in the graph on the left.
- In addition, the renovation cost will be added, based on the assumption that the current total floor area plus the increase is all ZEB by 2060.
- Reduction of carbon tax for ZEB

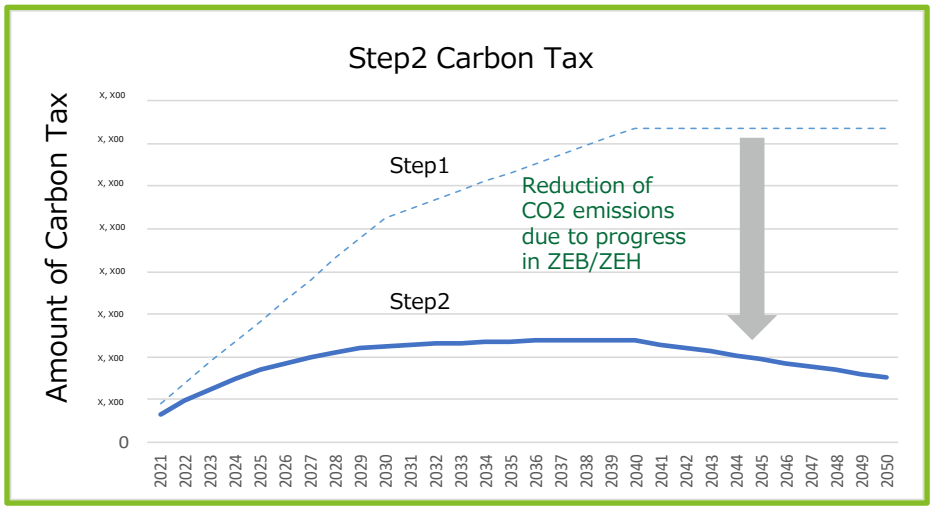
[Assumptions regarding ZEH compliance]

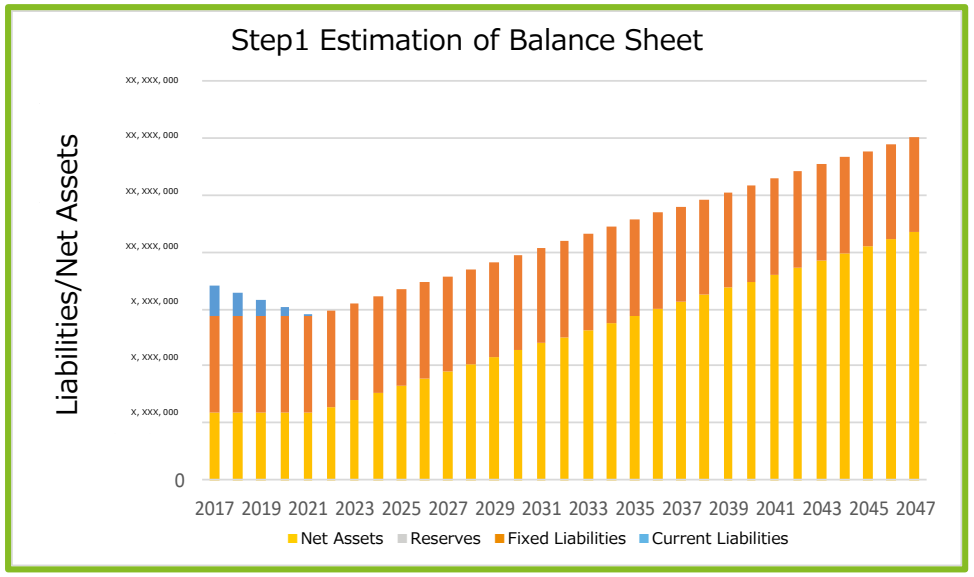
- The cost of ZEH is added to X, X00 new houses for several years by the ratio shown in the graph on the left.
- Reduction of carbon tax for ZEH

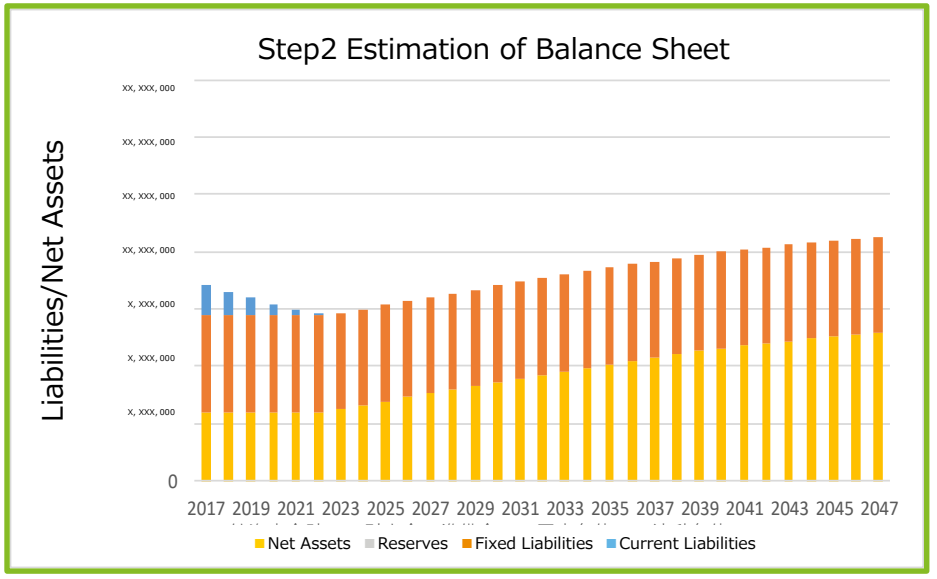
As ZEB and ZEH are implemented, the carbon tax will decrease, but the estimated result is that net income will decrease by the increase in costs

STEP 2: Estimating the Financial Impact Based on the Response of the Sample Company



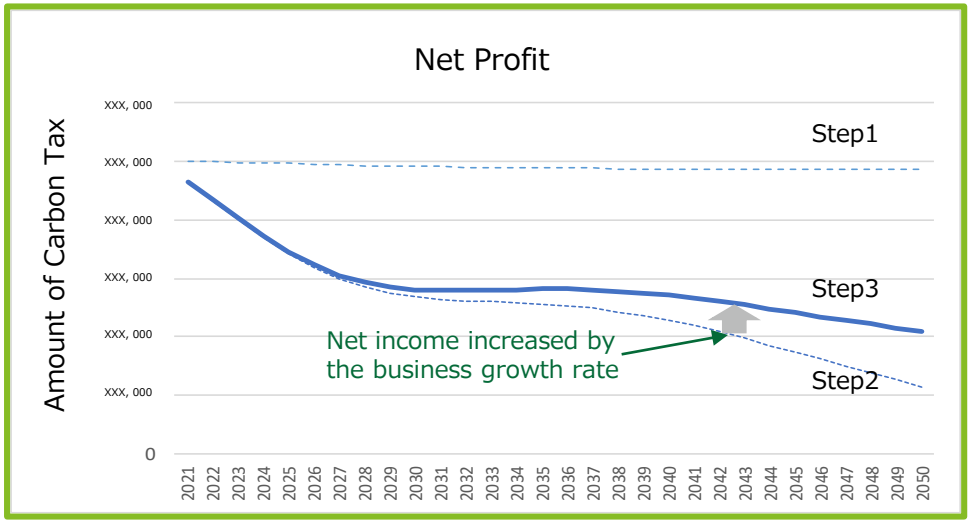


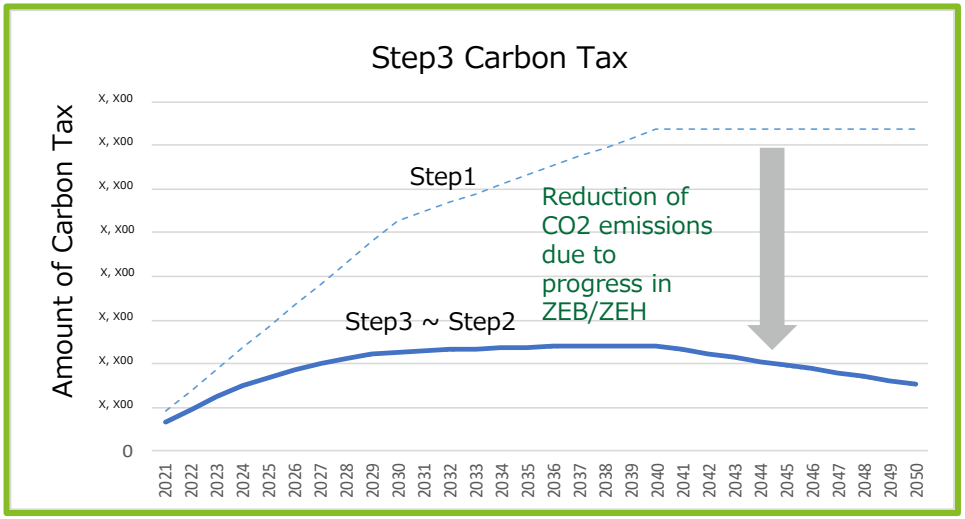


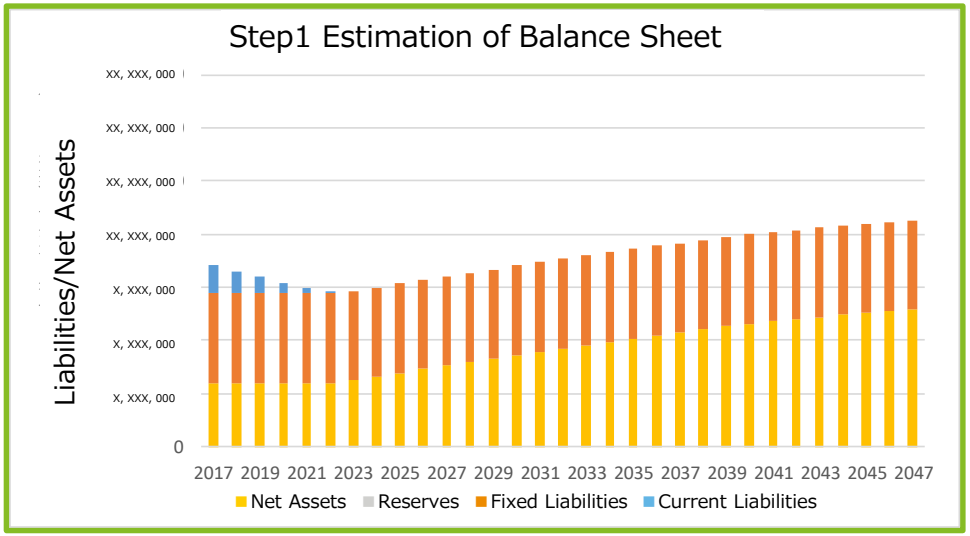


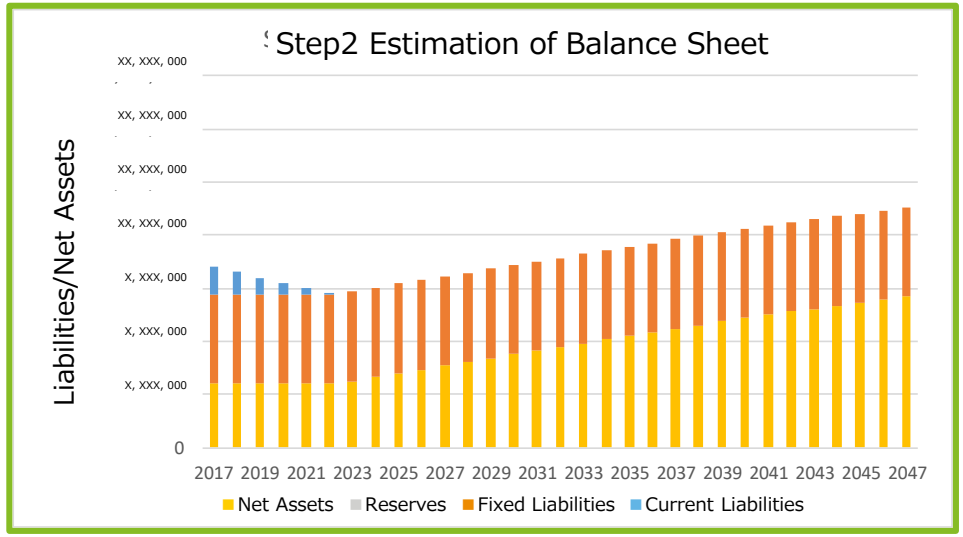
Taking into consideration the long-term growth rate (CAGR 1.12% by 2050) of the real estate business based on the long-term estimation of GDP, the profit level rises and the retained earnings rise slightly

STEP 3: Reflect Market Variables (Forecast)









3. Practical examples of scenario analysis

3-1. Shiga Bank

① Assess materiality of climate-related risks
② Identify and define range of scenarios
③ Evaluate Qualitative Business Impact
④ Quantitative assessment of transition risk
⑤ Quantitative assessment of physical risk

3-2. Hachijuni Bank

3-3. Higo Bank

① collateral valuation

[Properties in scope]
- Extract properties located near the hazard map

[Prerequisites for the Property]
- Number of building floors: Since data on the number of floors of each property was unavailable, it was calculated uniformly.
- The variable used for the damage ratio is the one after the rank correction (Leveling of mixed floors).
- Building structure: The analysis was made by combining wooden and non-wooden construction. As above, the variable used for the damage ratio is not structure-specific.

[Damage ratio variable]
- Adjustment due to inundation depth zones that do not match the inundation depth classification and damage ratio classification on the hazard map

Hazard map inundation depth section	Flood control economic research manual		After adjustment loss ratio
	inundation depth section	loss ratio	
Less than 0 ~ 0.5 m	Less than 0 ~ 0.5 m	21.40%	21.40%
Less than 0.5 ~ 1.0 m	0.5 ~ 0.99 m	29.30%	29.30%
Less than 1.0 ~ 2.0 m	1.0 ~ 1.99 m	45.80%	45.80%
Less than 2.0 ~ 5.0 m	2.0 ~ 2.99 m	64.60%	83.6%
	3.0 m or more	83.60%	
5.0 m or more	—	—	100%

*According to the flood control economic survey manual, inundation depth of 3 m or more is assumed

In order to reduce the loss ratio to a uniform 83.6%, it is necessary to reduce assumptions regarding the damage caused.

The expected damage of an inundation depth of ≥5 m cannot be estimated. Inundation of ≥ 5 m is assumed to be a total loss (100%)

For a distance between 2 m and less than 5 m captured in the hazard map, it is assumed that the midpoint is 3.5 m

The Economic Survey Manual includes a ratio of loss caused by damage of 83.6% for 3m or more

[Calculation logic]
① Property identification: All collateral properties - land properties = buildings
② Understanding of inundation depth: building property address (latitude-longitude transformation) → inundation depth on hazard map
③ Damage Calculation: Collateral amount by inundation depth and building x Damage ratio by inundation depth = Loss on collateral due to flooding (Assumptions)

② valuation of the company's decline in sales

[Properties in scope]
- Targeted at companies with a certain level of outstanding loans in Shiga Prefecture
- Identifying the locations of head offices and sales

[Prerequisites for the Property]
- Number of building floors: Since data on the number of floors of each property was unavailable, it was calculated uniformly.
- The variable used for the damage ratio is the one after the rank correction (Leveling of mixed floors).
- Building structure: The analysis was made by combining wooden and non-wooden construction. As above, the variable used for the damage ratio is not structure-specific

[Number of days off work]
- Adjustment due to inundation depth zones that do not match the inundation depth classification and damage ratio classification on the hazard map

Hazard map inundation depth section	Flood control economic research manual		After adjustment number of days off work
	inundation depth section	number of days off work	
Less than 0 ~ 0.5 m	Less than 0 ~ 0.5 m	6.4 days	6.4 days
Less than 0.5 ~ 1.0 m	0.5 ~ 0.99 m	13.5 days	13.5 days
Less than 1.0 ~ 2.0 m	1.0 ~ 1.99 m	20.0 days	20.0 days
Less than 2.0 ~ 5.0 m	2.0 ~ 2.99 m	41.2 days	56.1 days
	3.0 m or more	56.1 days	
5.0 m or more	—	—	73 days

*According to the flood control economic survey manual, inundation depth of 3 m or more results in 56.1 days off work.

The number of business downtime days for inundation of 5m or more is based on the Dmap and interpolated linearly over the period (73 days).

For distances between 2 m and 5 m captured in the hazard map, it is assumed that the midpoint is 3.5 m.

Number of business suspension days by inundation depth = sales decrease due to flooding (Assumptions)

[Calculation logic]
① Understanding of inundation depth: building property address (latitude-longitude transformation) → inundation depth on hazard map
② Net Sales Decrease Calculation: Net Sales by Flood Depth and Property/Number of Business Days (Calculated for 242 days excluding holidays and national holidays)

3. Practical examples of scenario analysis

3-1. Shiga Bank

3-2. Hachijuni Bank

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⑤ Quantitative assessment of physical risk

3-3. Higo Bank

3. Practical examples of scenario analysis

3-1. Shiga Bank

3-2. Hachijuni Bank

① Assess materiality of climate-related risks

② Identify and define range of scenarios

③ Evaluate Qualitative Business Impact

④ Quantitative assessment of transition risk

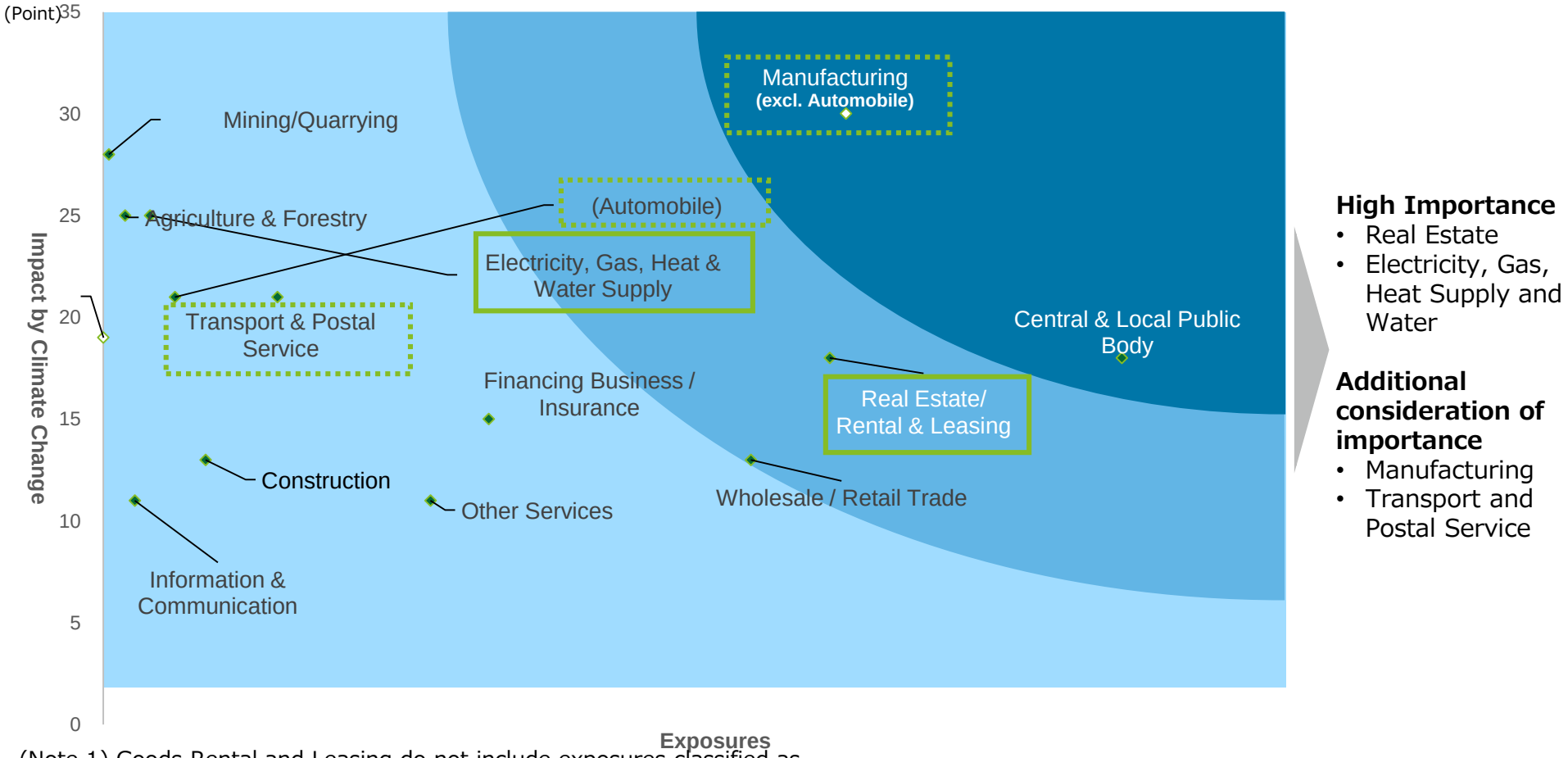
⑤ Quantitative assessment of physical risk

3-3. Higo Bank

[Examination of the business sector to be analyzed]

From the exposure by industry in the bank (total amount), we can assume that the importance of "real estate" "Electricity, Gas, Heat Supply and Water" is high.

Industry Exposures and Climate Risk Impact



(Note 1) Goods Rental and Leasing do not include exposures classified as
(Note 2:) "Other", which have different risk ratings depending on commercial products.
Source: Prepared based on your bank "Summary of Financial Results for the Year Ended March 2020 [JGAAP] (Consolidated)"

[Draft Assessment of Climate Change Risks and Opportunities in the Real Estate Sector (1/3)]

Transition risks are assumed to be significant, driven by the impact of higher building material prices and GHG emissions regulations

①Real estate
② Energy
③ Automobiles and transportation

Type	Evaluation item		Business Impact Analysis (qualitative information)		Draft Severity (real estate)
	Major group	Subclassification	Risk	Opportunity	
Transition	Policy / Regulation	Carbon tax and price	**Increase in the petroleum and coal tax rate (Increased construction and operation costs)** • Higher oil and coal taxes are expected to raise the cost of procuring construction materials and fuel for operating facilities.	**Introduction of high-efficiency buildings and low-carbon building materials (Avoidance of increased construction and operation costs)** • The shift to energy saving/renewable energy construction and the use of low-carbon building materials can mitigate carbon tax impacts and increase market value.	Large
		Addressing GHG emission regulations	**Energy report for operating facilities based on the Energy Conservation Law (increased operating costs)** • Compulsory energy conservation performance stipulated in the Building Energy Conservation Law will be further strengthened, and if energy conservation measures are insufficient in operating facilities, an announcement and improvement order will be issued. • In order to achieve the energy conservation standards for existing buildings subject to the Energy Conservation Law, it is necessary to continuously invest in equipment renovation. **Stricter energy efficiency regulations for new buildings (increased construction costs)** • If policies such as the fiscal 2030 target of the "Global Warming Countermeasures Plan" formulated by the Japanese government in response to the Paris Agreement, and regulations on the introduction of ZEB to achieve a 40% reduction in CO2 emissions from the commercial and household sectors are implemented, it will become essential to enhance the environmental performance of buildings in the construction of subdivision and rental housing as well as new buildings, and energy conservation measures will be required in the operation of facilities.	**Ensuring superiority through environmental performance (Improving competitiveness)** • Companies with strengths in related technologies, such as building environmental performance and energy conservation know-how in facility management, may improve their competitiveness.	Large
		Promotion of energy conservation policies	**Strengthening of energy conservation based on Tokyo Cap and Trade System (Increased construction and operation costs)** • Under the reduction obligation for large business establishments in Tokyo, if GHG emission reductions of 7% on average in the 3rd plan period (2020 ~ 2024) and 17% on average in the 4th plan period (2025 ~ 2029) cannot be achieved, credits must be purchased for the properties held. In order to avoid this, it is necessary to invest in equipment to enhance environmental performance. • In the event of a violation of laws and regulations, there is a possibility of a decline in corporate brand value and a decline in stock prices due to the publication of company names, fines, or business suspension.	**Ensuring superiority through environmental performance (Improving competitiveness)** • Companies with strengths in related technologies, such as building environmental performance and energy conservation know-how in facility management, may improve their competitiveness.	Small
		Subsidies for renewable energy, etc.	**Renewable energy business utilizing FIT system (decrease in operating income)** • At present, many real estate companies are expanding their renewable energy business by utilizing the FIT system. The end of FIT purchases will affect the profitability of new renewable energy businesses. • It is highly likely that the hurdle for new investment will be raised as the situation of new investment utilizing existing permits will change. • Revenues from existing renewable energy businesses will decrease after the purchase period ends.	**Acquiring public incentives (cost reduction)** • When a new renewable energy support policy is introduced, incentives such as subsidies may be utilized. **New Business Opportunities (Entry into new markets)** • There is a possibility of access to new markets such as renewable energy certificate trading.	Small
	Industry / Market	Changes in the energy mix	(Nothing in particular.)	**Lower grid power emission factor (Reduced construction and operating costs)** • Low carbon grid electricity reduces carbon tax payments and investment in energy-saving facilities through building construction and facility management. • Lower procurement costs associated with the spread of renewable electricity will make it easier to use low-carbon energy sources.	Medium

*Considering the importance in the image of medium- to long-term Transition risk/physical risk (Example: Climate change in 2030/2050)

[Draft Assessment of Climate Change Risks and Opportunities in the Real Estate Sector (2/3)]

Increasing customer demand for buildings with high environmental performance is considered to have a relatively large impact.

①Real estate
② Energy
③ Automobiles and transportation

Type	Evaluation item		Business Impact Analysis (qualitative information)		Draft Severity (real estate)
	Major group	Subclassification	Risk	Opportunity	
Transition	Industry / Market	Trends in energy demand	**Higher energy prices (Increased construction and operation costs)** • Tight energy demand increases electricity procurement costs and construction and facility operating costs.	**Ensuring superiority through environmental performance (Improving competitiveness)** • Companies with strengths in related technologies, such as building environmental performance and energy conservation know-how in facility management, may improve their competitiveness. **Increase profits in renewable energy business (increase in sales)** • When the demand for low carbon energy increases due to the increase in the number of companies participating in RE 100, the selling price of renewable energy increases.	Small
		Changes in customer behavior	**Shifting customer needs to buildings with high environmental performance (Increase in construction costs and decrease in rent)** • With the spread of the Tokyo Metropolitan Condominium Environmental Performance Labeling System and the building environmental performance labeling systems such as CASBEE, LEED, and BELS, the increasing awareness of residential users and the increasing energy efficiency consciousness of tenants (Especially foreign companies) require that the leasing of condominiums and office buildings be differentiated from other companies in terms of building environmental performance. • In order to meet the above needs, the construction cost of condominiums for sale and lease will increase in order to enhance the environmental performance of buildings. • Rent decreases due to competitive disadvantage of low environmental performance buildings..	**Meeting Customer Needs with Environmental Performance (Improving competitiveness)** • The provision of high-efficiency buildings in response to the growing interest in energy efficiency differentiates the company from other companies and raises rents.	Large
	Technology	Dissemination of electric vehicles	**Development of EV charging stations in buildings (higher construction costs and lower sales)** • In response to the spread of EVs, it is necessary to install charging facilities in operating facilities and condominiums, which increases capital investment costs. • The development of charging facilities at operating facilities will lead to differentiation from competing facilities and affect the ability to attract customers.	(Nothing in particular.)	Small
		Spread of renewable and energy-saving technologies	**Building innovations (higher construction costs and lower sales)** • The cost of responding to technological innovations such as building environmental performance and environmental consideration of services will increase. If the response is delayed, it will lead to a competitive disadvantage against other companies. • Rent decreases due to competitive disadvantage in ZEB technology.	**Lower prices for energy-saving equipment and renewable energy materials (lower construction and operating costs)** • With the development and diffusion of high-efficiency energy-related products, prices will drop, the cost of introducing renewable energy/energy-saving technologies will be reduced, and installation in operating facilities and condominiums will become easier. • Construction material cost is reduced by the efficiency improvement of transportation means and production and distribution processes. • Advances in energy conservation and renewable energy technologies will reduce operating costs.	Medium
		Diffusion of CCS	**Rising grid electricity prices due to the spread of CCS (Increased construction and operating costs)** • If electric power companies pass on CCS costs in electricity rates, construction and operation costs for operating facilities and condominiums will increase. • In order to cope with the increase in electricity rates, the cost of energy conservation will increase.	(Nothing in particular.)	Small

*Considering the importance in the image of medium- to long-term Transition risk/physical risk (Example: Climate change in 2030/2050)

[Draft Assessment of Climate Change Risks and Opportunities in the Real Estate Sector (3/3)]

The impact of physical risk on assets due to abnormal weather disasters is assumed to be large.

①Real estate
② Energy
③ Automobiles and transportation

Type	Evaluation item		Business Impact Analysis (qualitative information)		Draft Severity (real estate)
	Major group	Subclassification	Risk	Opportunity	
Transition	Reputation	Changes in customer behavior	**Corporate evaluation by customers and the general public (decline in reputation)** • As environmental awareness increases, insufficient disclosure of non-financial information and efforts to address climate change will result in a decline in corporate reputation among customers and the general public. • This may lead to a decrease in rental income and sales of condominiums.	(Nothing in particular.)	Small
		Reputation from investors	**Investor valuations (decline in reputation)** • As the momentum for ESG investment increases, insufficient disclosure of non-financial information and climate change efforts will result in lower investor valuations. • This leads to a competitive disadvantage in financing and a disadvantageous lending rate.	(Nothing in particular.)	Small
Physical	Chronic	Increase in mean temperature	**Global Warming Countermeasures at Operating Facilities and Construction Sites (Increased construction and operating costs)** • The increasing number of extremely hot days requires measures to ensure summer comfort at operating facilities and construction sites. • The cost of measures for employee health and safety management will increase, and construction delays may occur. • Construction costs will increase due to the need to reinforce thermal insulation and air conditioning equipment in operating facilities. • Higher cooling loads in operating facilities due to higher temperatures will increase operating costs.	**Reduction in air conditioning costs through energy-saving measures (lower operating costs)** • The introduction of highly efficient thermal insulation and air conditioning equipment in operating facilities can reduce cooling costs in the summer, leading to competitive advantages in operating costs. • Advantages of introducing advanced technologies such as AI air conditioning will expand.	Medium
		Changes in precipitation and weather patterns	**Building durability improvements and adverse weather effects in operating facilities (Increase in repair and R&D costs and decrease in sales)** • As the deterioration rate of building materials due to ultraviolet rays and storms increases, it is necessary to develop technologies for materials with lower cost and higher durability. • An increase in the number of rainy days at resort facilities such as golf courses leads to a decrease in the number of visitors.	(Nothing in particular.)	Small
		Sea level rise	**Impact of sea level rise on existing assets (higher construction costs and lower sales)** • Costs of sea-level rise countermeasures in operating facilities located in coastal areas will increase. • The number of visitors to coastal resort facilities is expected to decrease as the risk of high tides rises.	(Nothing in particular.)	Medium
	Acute	Intensification of extreme weather	**Water and sediment disasters in existing assets (Increase in construction, operation, and R&D costs, decrease in asset value, and decrease in sales)** • Torrential rains, typhoons and floods cause inundation, power outages, and landslides inside and outside the facilities, requiring restoration costs. • The number of business days will decrease due to damage to operating facilities and the number of users will decrease due to harmful rumors. • In order to respond to extreme weather events, which are more severe than conventional assumptions, it is necessary to conduct R&D to improve the durability of houses and operating facilities against extreme weather events and to reduce the cost. • Property value decreases in areas at high risk of flooding/storm surges. • Insurance premium payments to compensate for wind and flood damage will increase.	**Competitive Advantage through Enhanced Disaster Response (Improving competitiveness)** • By driving disaster prevention measure improvements in terms of hardware and software of condominiums and operating facilities to be constructed, the company will gain a competitive advantage. This will lead to an increase in rent income, an increase in sales of condominiums, and an increase in the number of users of operating facilities such as senior facilities.	Large

*Considering the importance in the image of medium- to long-term Transition risk/physical risk (Example: Climate change in 2030/2050)

3. Practical examples of scenario analysis

3-1. Shiga Bank

3-2. Hachijuni Bank

① Assess materiality of climate-related risks

② Identify and define range of scenarios

③ Evaluate Qualitative Business Impact

④ Quantitative assessment of transition risk

⑤ Quantitative assessment of physical risk

3-3. Higo Bank

Once risks and opportunities were narrowed down to those deemed most significant (‘large impact’). Predicted data for 2 ° C/4 ° C scenarios were collected as parameters.

①Real estate
② Energy
③ Automobiles and transportation

Important Items (object of analysis)	Configured Parameter	Current	4 ° C		2 ° C	
			Before 2030	2040 and later	Before 2030	2040 and later
Carbon tax and price	(1) Carbon tax	Japan: None Overseas: Some	(2030) Japan: N/A EU: 33 USD/t	(2040) Japan: N/A EU: 43 USD/t	(2030) Developed Countries: 100 USD/t Developing countries: 75 USD/t	(2040) **Developed Countries: 140 USD/t** Developing countries: 75 USD/t
Addressing GHG emission regulations	(2) Energy consumption per unit of building	(base year) Global 2014	(2030) Improvement rate of 6%	(2040) Improvement rate of 21%	(2030) Improvement rate of 7%	(2040) **Improvement rate of 34%**
	(3) Grid power emission factor	(base year) Japan: 2018 0.48 kg CO2/kWh	(2030) 0.31 kg CO2/kWh	(2040) 0.29 kg CO2/kWh	(2030) 0.19 kg CO2/kWh	(2040) **0.06 kg CO2/kWh**
	(4) Mandatory implementation of ZEB/ZEH (government target)	(base year) 2014	(2020) Total floor area of ZEB 0 Billion m2	(2040) Total floor area of ZEB 5 Billion m2	(2020) Total floor area of ZEB 1 Billion m2	(2040) Total floor area of ZEB **32 Billion m2**
Changes in customer behavior	(5) Rent increase or decrease due to environmental performance	4.4% increase in rent	N/A	N/A	N/A	N/A
Intensification of extreme weather	(6) Flood damage amount	(base year) Japan: 2010	(2030) +121%	N/A	N/A	N/A
	(7) Changes in flood frequency	(base year) 2019	N/A	(2040) Flood occurrence frequency of about 4 times	N/A	(2040) Flood occurrence frequency of about 2 times
	(8) Occurrence of typhoons and cyclones	(base year) Japan: 2016	N/A	(2100) Observations are highly uncertain and the number of typhoons per year is uncertain	N/A	N/A
	(9) Sea level rise	(base year) 2015	(2030) 0.18 m	(2040) 0.25 m	(2030) 0.1 m	(2040) 0.15 m

Definition of scenario groups: Accelerate construction of facilities with a view to reducing environmental impact

①Real estate
② Energy
③ Automobiles and transportation

: What You Need to Do to Address Risk
: What you need to do to get the opportunity

2 ° C world view @ 2050 (example)

Real estate

New entrant

- New market entry by low-carbon construction materials suppliers and others with low environmental impact
- Companies that are ahead of ZEB in advanced technology

Seller (Suppliers)

- A carbon tax is imposed during the manufacturing and production of construction materials, which incurs additional costs that are passed on to sales prices.
- Introduction and use of low-carbon building materials
- Development of new technology (Building materials and related equipment) to realize ZEB

Secure suppliers using raw materials and equipment with low environmental impact

Industry/Company

- High carbon taxes and high carbon prices on procured materials such as steel and cement raise construction costs.
  Expanded and widespread use of new low carbon materials (Example: Low carbon concrete, etc.)
- The presence or absence of technology related to ZEB is a source of competitiveness
- In order to meet the energy conservation standards for existing buildings subject to the Energy Conservation Law, continuous invest in equipment renovation is needed, resulting in an increase in operating costs.

Providing high-efficiency buildings

Development and use of technologies related to ZEB

Substitute

- Low-Carbon construction materials to replace iron and cement

Buyer (customer)

- Interest in ZEB and the introduction of renewable energy has increased, and energy-saving buildings, LED lighting, BEMS, etc. have become important items for investment/purchase decision making.
- Growing demand for energy-efficient buildings and construction methods due to soaring carbon taxes
- Expanding customer needs for properties that meet LEED, GRESB and other green building certification requirements

Providing high-efficiency buildings

Government

- Promote the introduction of carbon taxes and emissions trading, and set high carbon taxes and carbon prices
- ZEB/ZEH mandatory to achieve zero primary energy consumption in buildings 100% by 2030
- Compulsory energy conservation performance stipulated in the Law Concerning the Rational Use of Energy in Buildings is further strengthened, and targets for improvement of energy consumption rate of buildings are set.
- Stricter energy efficiency regulations for new buildings

Prompt access to policy information Cooperation with the Government

Lobbying for a new policy

Definition of scenario groups: Accelerate construction of facilities with a view to reducing environmental impact

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② Energy
③ Automobiles and transportation

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2 ° C world view @ 2050 (example)

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- Stricter energy efficiency regulations for new buildings

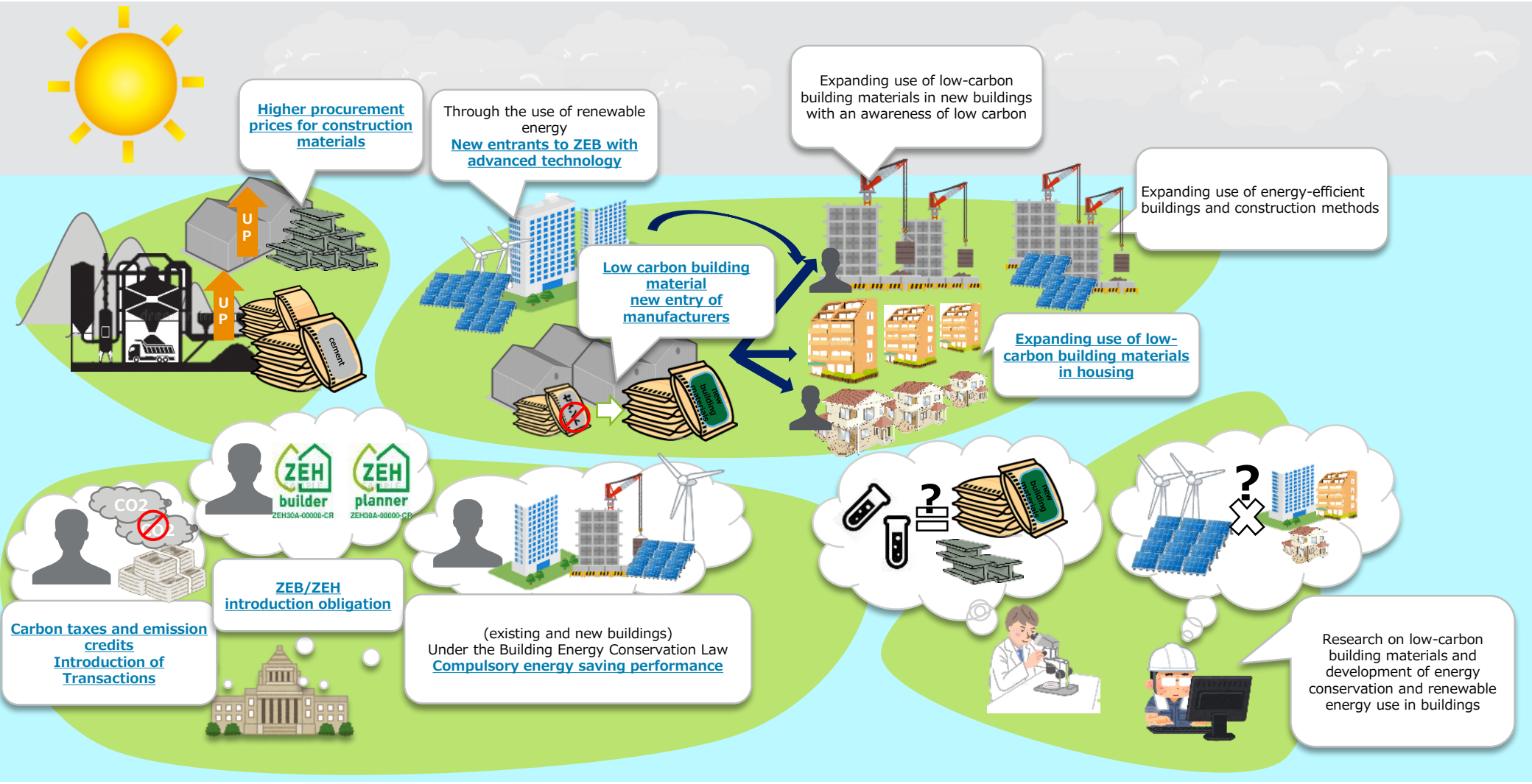
Prompt access to policy information Cooperation with the Government

Lobbying for a new policy

[Vision of Future Society under the 2 ° C Scenario]

Decarbonization will be strongly promoted and a carbon tax will be introduced. Use of low-carbon building materials and introduction of renewable energy in buildings will be promoted.

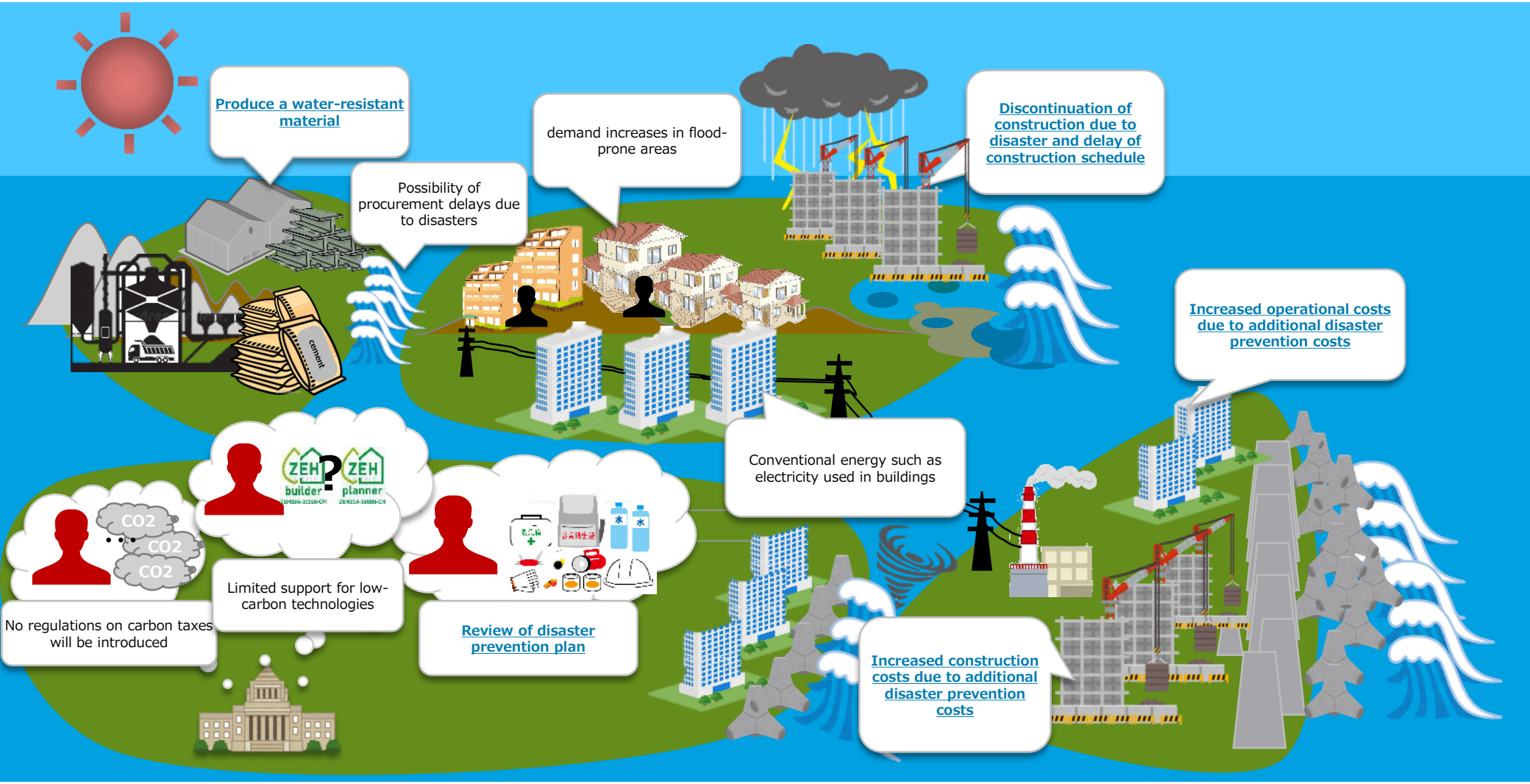
①Real estate
② Energy
③ Automobiles and transportation



[Vision of Future Society under the 4 ° C Scenario]

Increase in physical risks and higher demand for highly disaster-resistant buildings

①Real estate
② Energy
③ Automobiles and transportation



3. Practical examples of scenario analysis

3-1. Shiga Bank

3-2. Hachijuni Bank

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3-3. Higo Bank

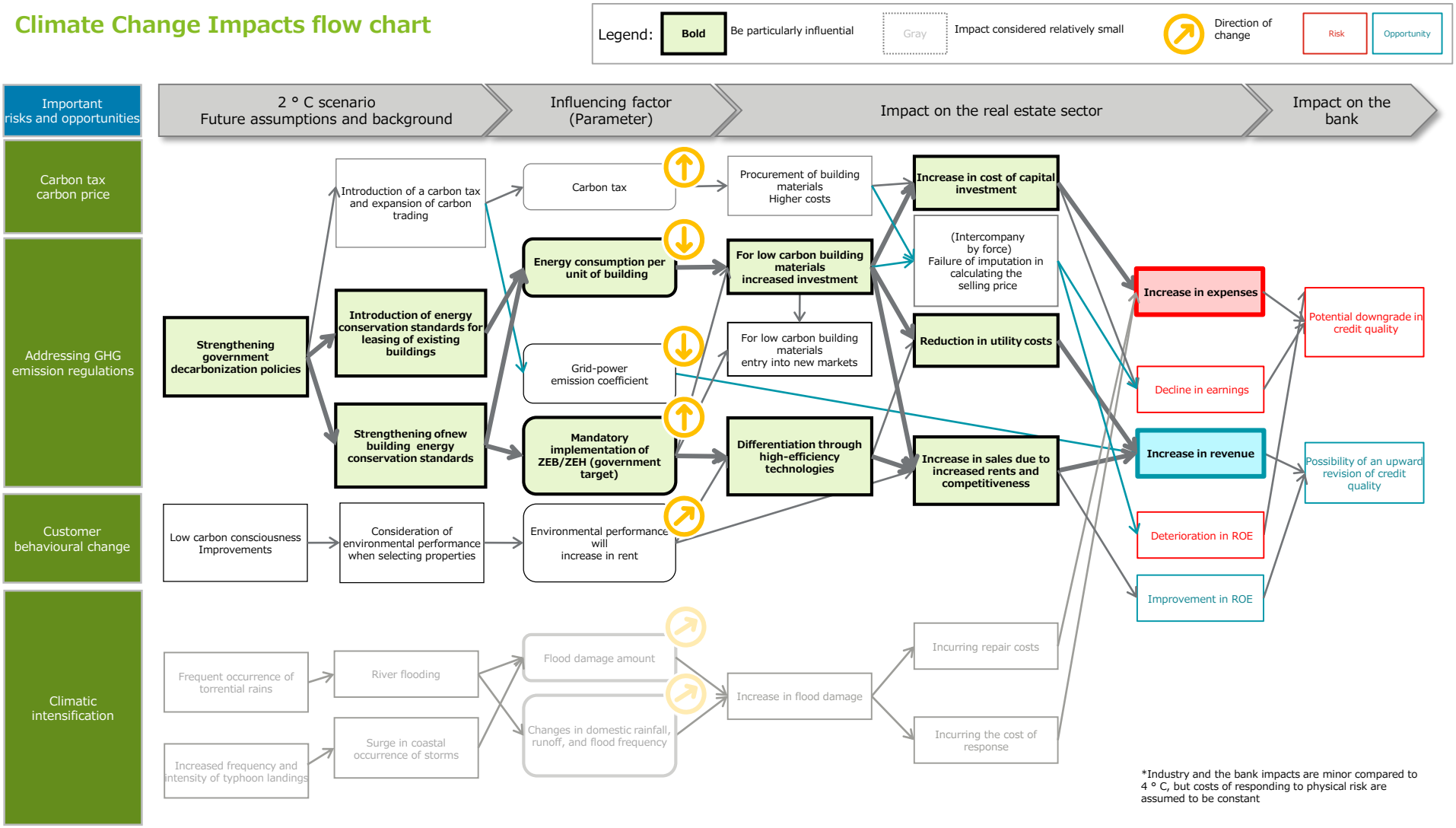
[(1) Real Estate × Business Impact of 2 ° C]

Decarbonization policies will be promoted and low-carbon buildings will increase

4 ° C | 2 ° C

①Real estate
② Energy
③ Automobiles and transportation

Climate Change Impacts flow chart



*Industry and the bank impacts are minor compared to 4 ° C, but costs of responding to physical risk are assumed to be constant

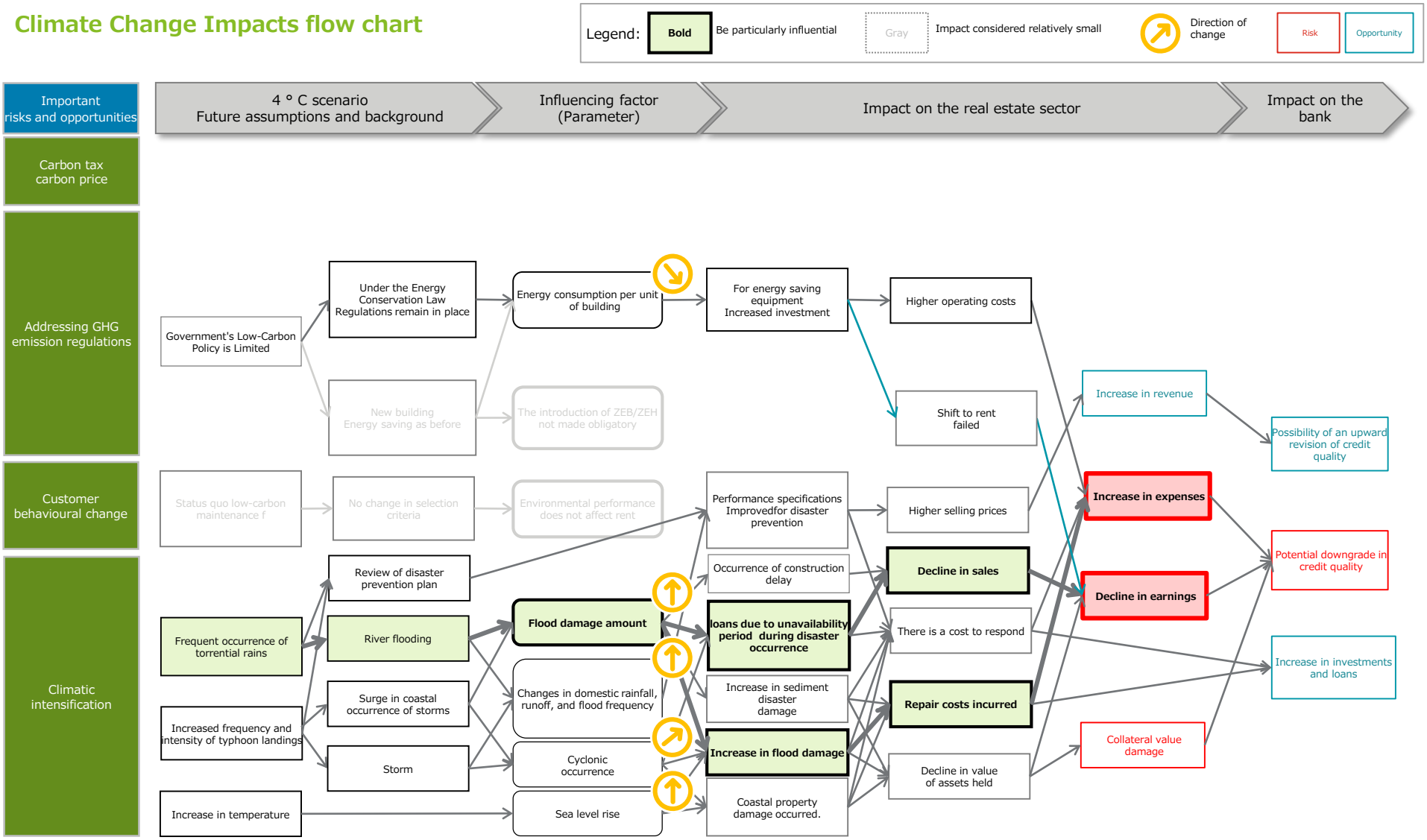
[(1) Real Estate × Business Impact of 4 ° C]

While the cost increase due to abnormal weather increases, the number of buildings with high disaster prevention performance increases.

4 ° C | 2 ° C

①Real estate
② Energy
③ Automobiles and transportation

Climate Change Impacts flow chart



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Approach to Analyzing the Impact of Transition Risk on Financial Statements

Example of analysis (1):
Energy sector (Electric Power Company (2))

If CO2 emissions are kept constant under the assumption of maintaining the status quo, and only the carbon tax scenario is reflected simply, the country would become insolvent.

STEP 1: Carbon Tax Considerations

Item	Value	Remarks
CO2 emissions	approximately XX, X00,000 [t-CO2]	ESG Reports
Exchange rate	105 yen/$	Level at the end of January 2020

2 ° C Scenario	A carbon tax is introduced regardless of country or region.

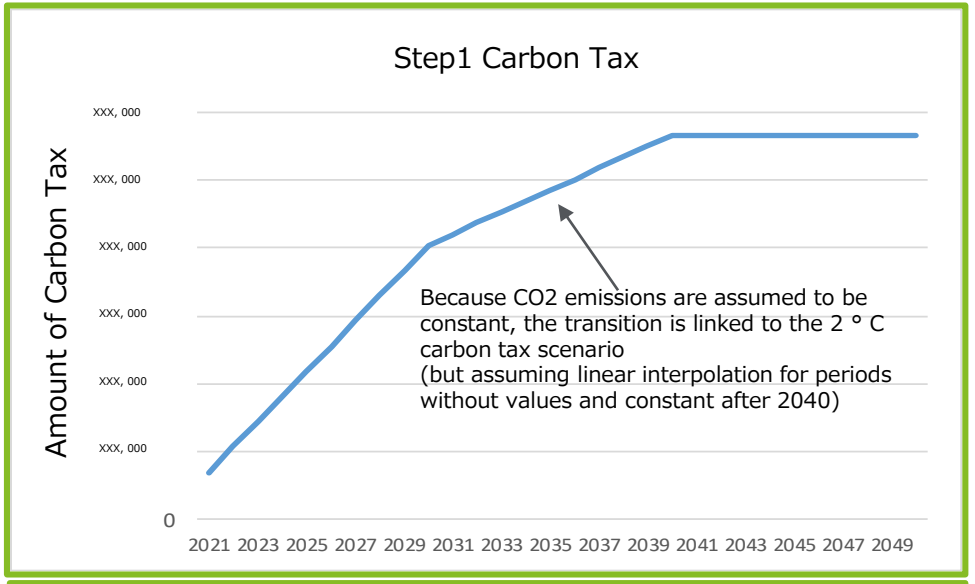
	Developed country	Developing country
Current situation	(Reference) Average successful bid price in EU-ETS in Europe: approximately US $/ t *"Implementation and Review of Emissions Trading in Other Countries" From (Ministry of the Environment Report 2016)	N/A
2030	100 US $/ tCO2	75 US $/ tCO2
2040	140 US $/ tCO2	125 US $/ tCO2

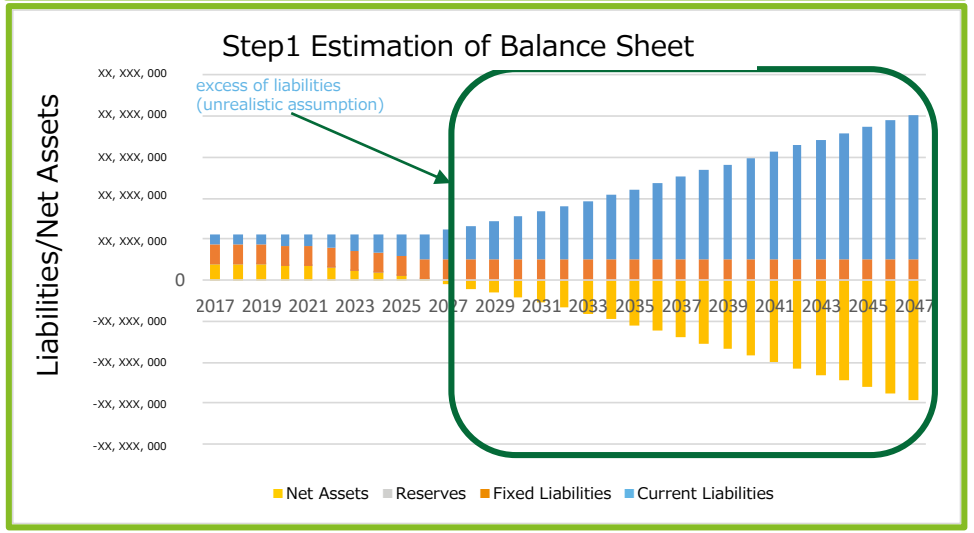
consideration

- (whole) As global carbon prices rise to achieve the 2 ° C target, the government is promoting the introduction of carbon taxes and emissions trading. On the other hand, companies with high GHG emissions are more likely to be asked to do so by governments and business partners, and more likely to be engaged by investors.
- (Real Estate) Due to rising steel and cement prices and transportation costs, green buildings utilizing new low-carbon materials have become popular.
- (Tenants/Residents) Tenants will see an increase in decarbonization and demand for energy-efficient facilities

*Data source:

- Extracted from IEA "World Energy Outlook 2019" Sustainable Development Scenario numbers



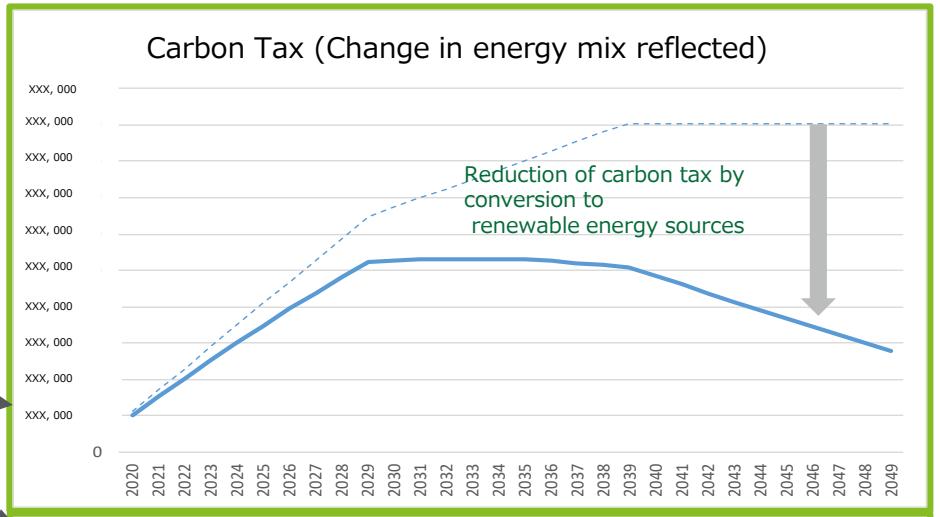


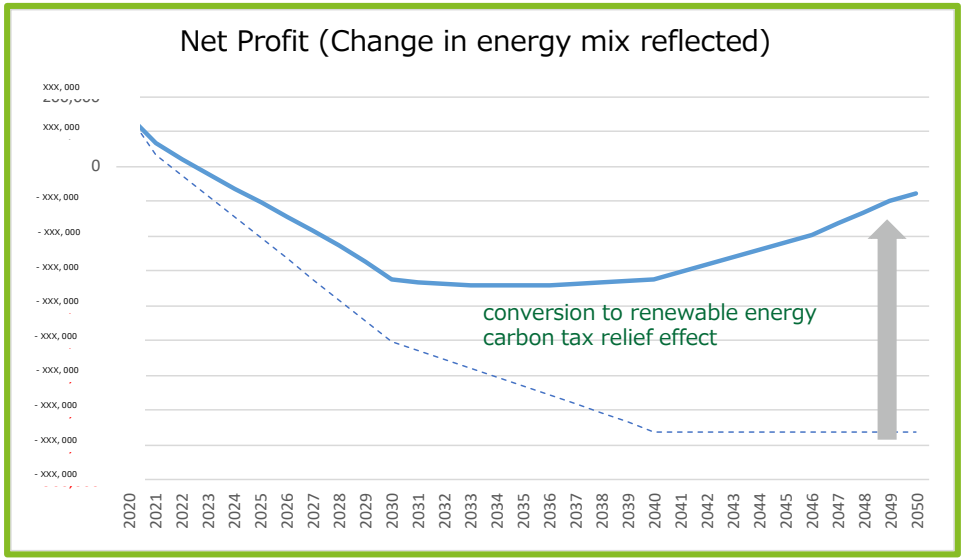
A decrease in the use of fossil fuels in favor of renewable energy is expected to lead to a reduction in the carbon tax burden and therefore an increase in net income

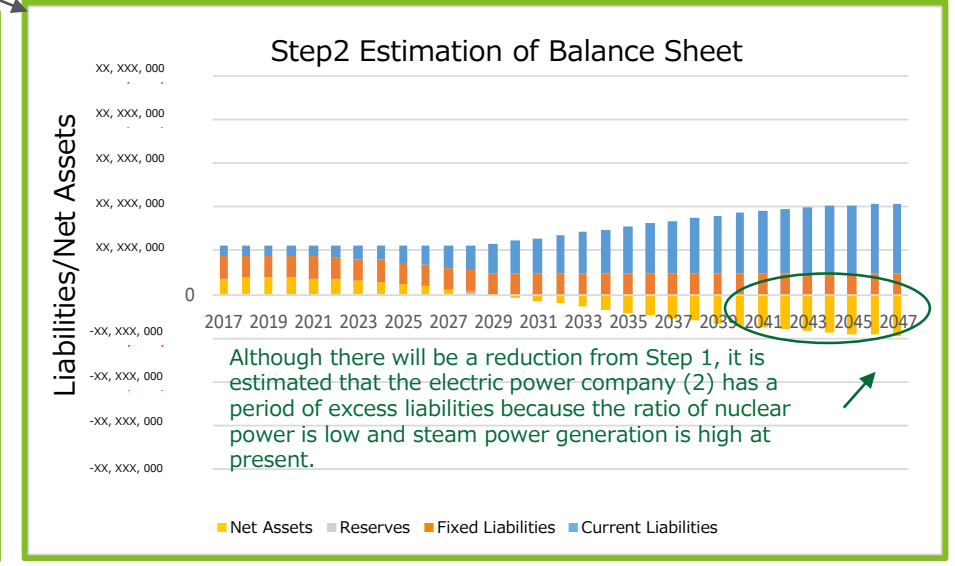
STEP 2: Estimating the Financial Impact Based on the Sample Company's Response

The reduction in carbon tax due to the conversion to renewable energy is expected to increase net income and avoid excess liabilities.

Although this estimate assumes that the conversion will take place in stages, it is inferred that if the conversion is delayed, the deficit will widen as shown in Step 1, and there is a possibility that liabilities will exceed assets.

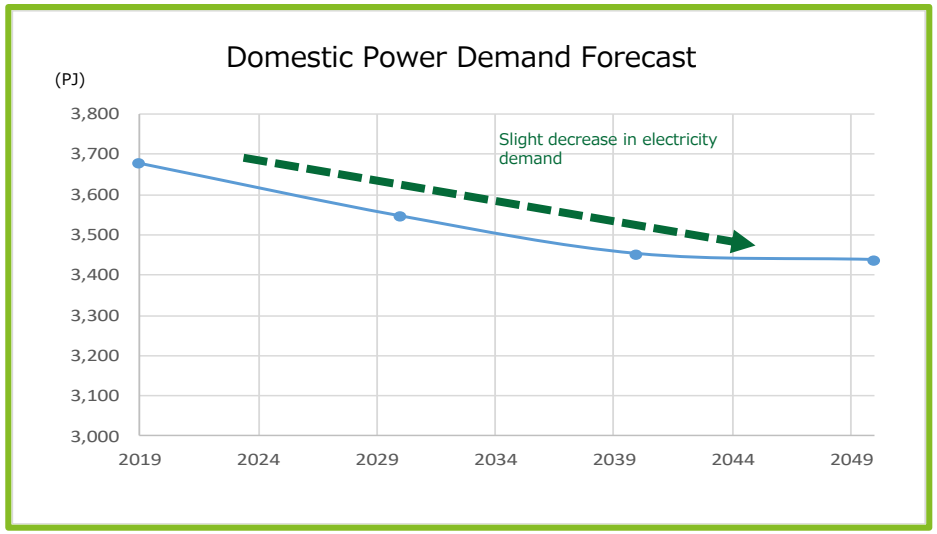


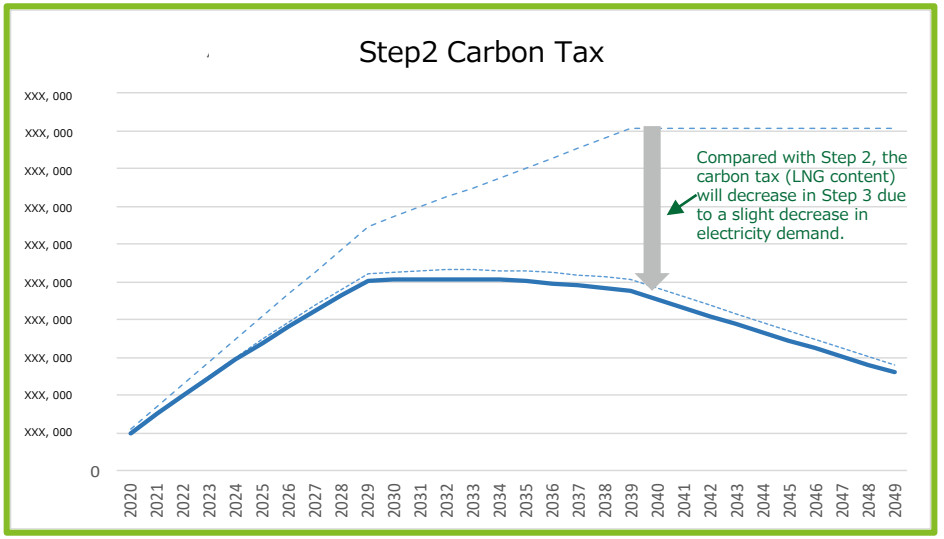


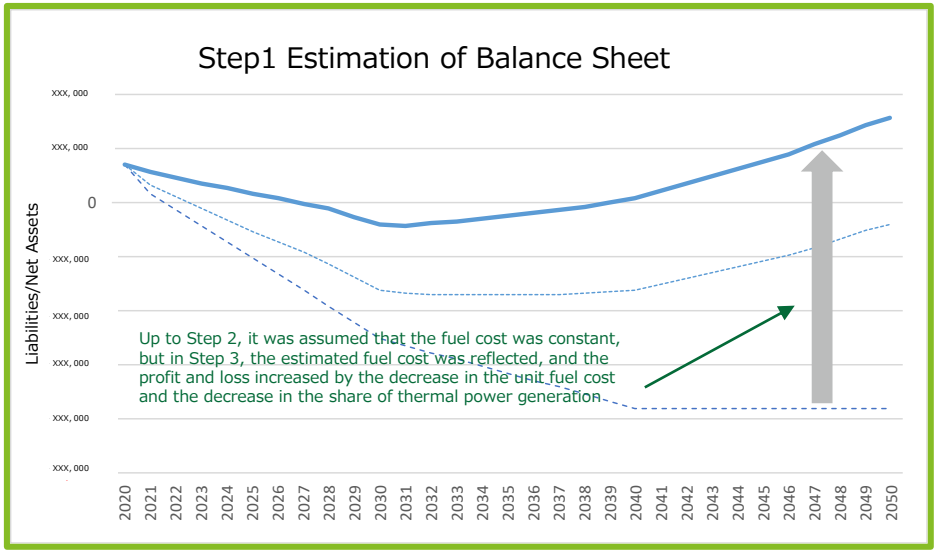


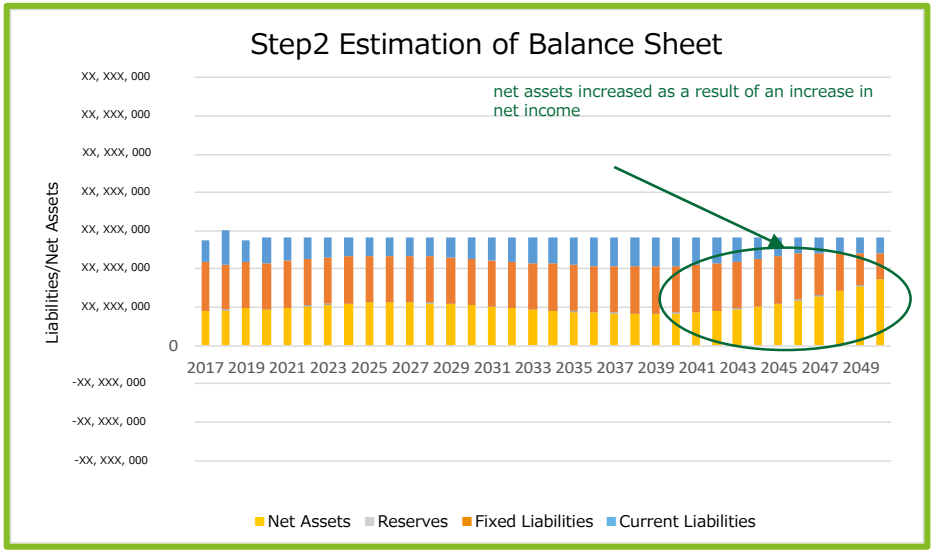
Considering the forecast of fuel costs, an increase in the unit price of fossil fuels is expected, but an increase in net income is expected due to a decrease in thermal power generation.

STEP 3: Reflect Market Variables (Demand and Fuel Cost Forecasts)









Example of analysis (2): Real estate (major player) (Omitted)

Example of analysis (3):
Motor vehicle manufactures (Omitted)

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3-3. Higo Bank

① Collateral valuation

[Properties in scope]
- Buildings and structures in real estate collateral held in the Chikuma River basin, Nagano City

[Prerequisites for the Property]
- Number of building floors: Since data on the number of floors of each property was unavailable, it was calculated uniformly.
- The variable used for the damage ratio is the one after the rank correction (Leveling of mixed floors).
- Building structure: The analysis was made by combining wooden and non-wooden construction. As above, the variable used for the damage ratio is not structure-specific..

[Damage ratio variable]
- Adjustment due to inundation depth zones that do not match the inundation depth classification and damage ratio classification on the hazard map

Hazard map inundation depth section	Flood control economic research manual		After adjustment loss ratio
	inundation depth section	loss ratio	
Less than 0 ~ 0.5 m	Less than 0 ~ 0.5 m	21.40%	21.40%
Less than 0.5 ~ 1.0 m	0.5 ~ 0.99 m	29.30%	29.30%
Less than 1.0 ~ 2.0 m	1.0 ~ 1.99 m	45.80%	45.80%
Less than 2.0 ~ 5.0 m	2.0 ~ 2.99 m	64.60%	83.6%
	3.0 m or more	83.60%	
5.0 m or more	—	—	100%

*According to the flood control economic survey manual, inundation depth of 3 m or more is assumed

In order to reduce the loss ratio to a uniform 83.6%, it is necessary to reduce assumptions regarding the damage caused.

The expected damage of an inundation depth of ≥5 m cannot be estimated. Inundation of ≥ 5 m is assumed to be a total loss (100%)

For a distance between 2 m and less than 5 m captured in the hazard map, it is assumed that the midpoint is 3.5 m

The Economic Survey Manual includes a ratio of loss caused by damage of 83.6% for 3m or more

[Calculation logic]
① Property identification: All collateral properties - land properties = buildings
② Understanding of inundation depth: building property address (latitude-longitude transformation) → inundation depth on hazard map
③ Damage Calculation: Collateral amount by inundation depth and building x Damage ratio by inundation depth = Loss on collateral due to flooding (Assumptions)

② Valuation of the company's decline in sales

[Properties in scope]
- Identifying locations and sales volumes of business offices (e.g. Branches) of companies selected from major borrowers in Nagano Prefecture

[Prerequisites for the Property]
- Number of building floors: Since data on the number of floors of each property was unavailable, it was calculated uniformly.
- The variable used for the damage ratio is the one after the rank correction (Leveling of mixed floors).
- Building structure: The analysis was made by combining wooden and non-wooden construction. As above, the variable used for the damage ratio is not structure-specific

[Number of days off work]
- Adjustment due to inundation depth zones that do not match the inundation depth classification and damage ratio classification on the hazard map

Hazard map inundation depth section	Flood control economic research manual		After adjustment number of days off work
	inundation depth section	number of days off work	
Less than 0 ~ 0.5 m	Less than 0 ~ 0.5 m	6.4 days	6.4 days
Less than 0.5 ~ 1.0 m	0.5 ~ 0.99 m	13.5 days	13.5 days
Less than 1.0 ~ 2.0 m	1.0 ~ 1.99 m	20.0 days	20.0 days
Less than 2.0 ~ 5.0 m	2.0 ~ 2.99 m	41.2 days	56.1 days
	3.0 m or more	56.1 days	
5.0 m or more	—	—	73 days

*According to the flood control economic survey manual, inundation depth of 3 m or more results in 56.1 days off work.

The number of business downtime days for inundation of 5m or more is based on the Dmap and interpolated linearly over the period (73 days).

For distances between 2 m and 5 m captured in the hazard map, it is assumed that the midpoint is 3.5 m.

Number of business suspension days by inundation depth = sales decrease due to flooding (Assumptions)

[Calculation logic]
① Understanding of inundation depth: building property address (latitude-longitude transformation) → inundation depth on hazard map
② Net Sales Decrease Calculation: Net Sales by Flood Depth and Property/Number of Business Days (Calculated for 242 days excluding holidays and national holidays)

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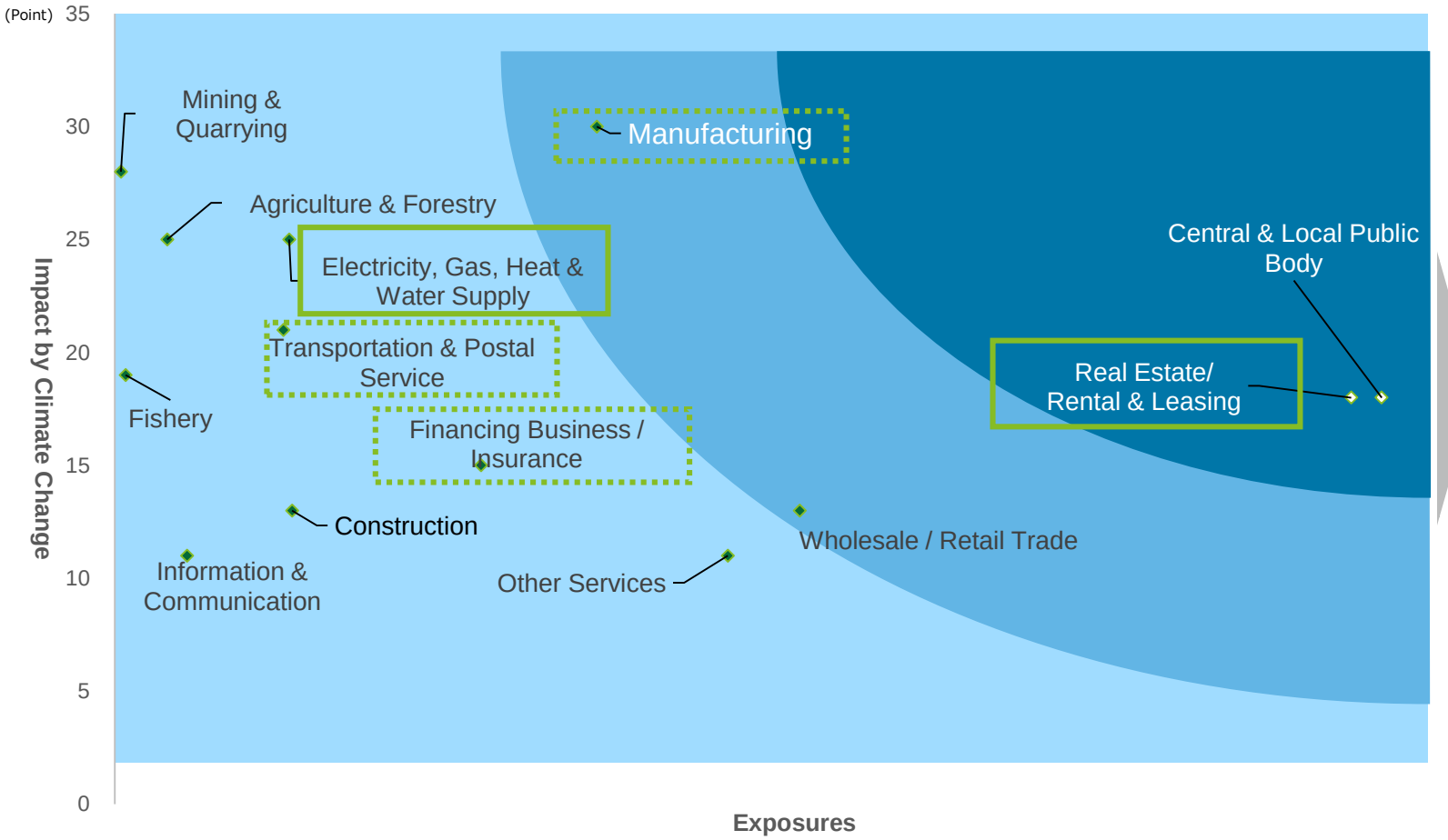
[Examination of the business sector to be analyzed]

From the exposure by industry on the bank (total amount), we can assume that the importance of “real estate” “Gas, Heat Supply and water” is high.

Industry Exposures and Climate Risk Impact



High Importance
- Real Estate
- Electricity, Gas, Heat Supply and Water

Additional consideration of importance
- Manufacturing
- Transport and Postal Service

(Note 1) Goods Rental and Leasing do not include exposures classified as (Note 2:) "Other", which have different risk ratings depending on commercial products.
Source: Prepared based on "Financial Results for Fiscal 2019"

[Draft Assessment of Climate Change Risks and Opportunities in the Energy Sector (1/2)]

The impact of carbon taxes, GHG emissions regulations and energy mix are considered high

①Real estate
② Energy
③ Transportation

Type	Evaluation item		Business Impact Analysis (qualitative information)		Proposal of importance
	Major group	Subclassification	Risk	Opportunity	
Transition	Policy / Regulation	Carbon tax and price	**Raising the petroleum and coal tax rate (higher construction and operating costs, lower asset values, and lower sales)** ・As carbon taxes are introduced, operating costs increase due to higher prices of construction materials, taxes on fossil fuel and other products, and taxes on emissions from operations. ・Extreme carbon taxation undermines the profitability of business operations and causes oil and gas fields, power plants and other assets to run aground ・Carbon taxes reduce sales of high-GHG-emitting products such as coal and oil, while increasing the price competitiveness of low-carbon products	**Dissemination of renewable energy (increase in sales) (electric power)** ・Rising price competitiveness of low-carbon products and increased sales of renewable energy such as solar power generation	Large
		Addressing GHG emission regulations	**Strengthening of GHG emission regulations (higher operating costs and lower asset values)** ・Regulations on total emissions will be introduced and strengthened, resulting in the cost of purchasing credits through asset impairment, early retirement, installation of equipment to reduce emissions, and emissions trading. ・If the proposed power supply structure is revised without progress in the restart of nuclear power plants, capital investment and the cost ratio will be adversely affected. ・Difficulty in recovery of investment due to a lack of approval for a planned coal-fired power plant	**Increase in electrification ratio (increase in sales)** ・Electricity consumption increases as household sector demand increases	Large
		Compliance with disclosure regulations	—	—	Small
	Industry / Market	Energy mix, etc.	**Dissemination of renewable energy (Decrease in revenue and increase in operating costs)** ・The market for fossil fuels shrinks due to the transition to a low-carbon society, and sales prices decline along with a decrease in sales of oil, coal, and gas. ・If the energy mix plan, such as oil and coal-fired power generation, focuses on sources whose share is declining, the operating rate of the company's high-GHG-emitting power generation facilities will decline. ・As incentives and subsidies for low-carbon power sources increase and subsidies for conventional energy are abolished, business continuity becomes difficult. ・With the shift to renewable energy, the number of vehicles equipped with engines will decrease and demand for gasoline and diesel oil will decrease.	—	Large
	Technology	Dissemination of low-carbon technologies	**Transition to low-carbon technologies (Decrease in sales, increase in R & D expenses, and increase in operating costs)** ・Lower demand for conventional energy as new low-cost, high-efficiency technologies (Hydrogen technology and microgrids) become more prevalent ・Increased funding for technology development that contributes to reducing GHG emissions in the area of products using fossil fuels and petrochemicals ・Costs are incurred for the development and introduction of low-carbon technologies such as CCS and the use of patents for next-generation technologies. ・If the power generation method is not adjusted to reflect peak power consumption due to the spread of storage, power generation losses will occur, resulting in inefficient production and increased power generation costs.	**Promotion of low-carbon technologies (increase in sales)** ・Increase share of project finance for renewable energy projects and green bond market ・Demand for electricity and hydrogen will increase due to the spread of EVs and FCVs ・The shift from using city gas to electrification is expanding due to the improvement of energy saving efficiency.	Medium

*Considering the importance in the image of medium- to long-term Transition risk/physical risk (Example: Climate change in 2030/2050)

[Draft Assessment of Climate Change Risks and Opportunities in the Energy Sector (2/2)]
The impact of customer behavior changes and extreme weather are considered high

①Real estate
② Energy
③ Transportation

Type	Evaluation item		Business Impact Analysis (qualitative information)		Proposal of importance
	Major group	Subclassification	Risk	Opportunity	
Transition	Reputation	Changes in customer behavior	**Raising environmental awareness (Decrease in sales and increase in operating costs)** ・Increased demand for non-fossil fuels reduces sales of conventional energy to individuals ・Sales volume decreases due to energy conversion and re-eneration shift (RE 100, etc.) by corporate customers ・there is a growing trend to avoid procuring energy from utilities with high grid power emission factors ・It is difficult to secure land for new development projects from the viewpoint of adverse effects on the ecosystem	**Raising environmental awareness (increase in sales)** ・Sales of low-carbon energy will increase due to increased demand for renewable energy and distributed energy and increased environmental awareness.	Large
		Reputation from investors	**Investor Diversification (Decline in asset value and increase in procurement costs)** ・accelerated divestment from oil and coal, reduce the value assets held, and rising interest rates make it difficult to raise new funds ・divestment undermines company valuations and undermines share prices	**Improved Assessment** ・Investor appreciation of advanced climate change disclosures	Medium
		litigation risk	**increased operating costs** ・Lack of information disclosure on climate change and investment in high GHG emissions projects are met with opposition and litigation by investors and surrounding communities, resulting in response costs	—	Medium
Physical	Chronic	Water shortages and drought	**Tight water supply and demand (increased operating costs)** ・Additional installation of water-saving equipment at sites is required ・swater and groundwater prices at production sites soar ・production is stopped due to water shortages and restrictions on water intake	—	Small
		Temperature variation	**Declining Utilization and Worsening Labor Environment (Decrease in sales and increase in operating costs)** ・Extremely high or low temperatures will result in loss due to facility closures and a reduction in production utilisation. ・a rise in average temperature would reduce the energy demand for heating ・Higher temperatures will worsen working conditions for outdoor workers, resulting in shorter working hours and costs for measures against heat stroke ・In order to maintain comfort levels in plants and offices, it is necessary to strengthen the operation of air conditioners and increase the number of facilities	**Increased demand for cooling due to rising temperatures (increase in sales)** ・demand for air conditioning in summer increases and power consumption increases	Small
		Sea level rise	**Disaster prevention measures (increased operating costs)** ・Costs will be added for equipment investment in response to storm surges and sea-level rises at storage facilities	—	Medium
	Acute	Intensification of extreme weather	**Strengthening disaster prevention measures (increased operating costs)** ・Requires capital investment to improve disaster prevention performance ・It is necessary to double-track the supply chain in order to improve the resilience against the interruption of physical distribution. **Occurrence of property damage (increased operating costs)** ・Receiving bases and power plants in coastal areas are damaged by storm surges and floods, and operations are suspended ・Rising raw material procurement costs due to adverse sea conditions ・Higher premiums and additional costs due to increased natural disasters	—	Large

*Considering the importance in the image of medium- to long-term Transition risk/physical risk (Example: Climate change in 2030/2050)

[Draft Assessment of Climate Change Risks and Opportunities in the Transport Sector]

The impact of Carbon taxes, energy prices, electric vehicles, and catastrophic disasters are expected to be high.

①Real estate
② Energy
③ Transportation

Type	Evaluation item		Business Impact Analysis (qualitative information)		Proposal of importance
	Major group	Subclassification	Risk	Opportunity	
Transition	Policy / Regulation	Carbon tax and price	**Introduction of a carbon tax (rising operating costs)** • The introduction of a carbon tax would require the payment of a tax on GHG emissions from corporate activities	**Shift to alternatives through the introduction of a carbon tax (increase in sales)** • Modal shifts (Shift from automobile to rail transport) may accelerate as a carbon tax is introduced	Large
		Addressing GHG emission regulations	**Strengthening of GHG emission regulations (rising operating costs)** • Fuel efficiency regulations will become stricter, requiring the payment of fines for unmet emissions.	**NA**	Medium
		Fossil fuel subsidy	**Abolition of fossil fuel subsidies (rising R & D costs)** • If fossil fuel subsidies are eliminated, support projects for the development of low-carbon technologies may be terminated, resulting in high R & D costs.	**NA**	Small
	Market	Increase or decrease in the price of important products/products	**Rising demand for raw materials (rising operating costs)** • If the price of materials and parts (Batteries, etc.) rises due to the progress of EV shift, the manufacturing cost will rise.	**NA**	Medium
		Energy price	**Higher energy prices (rising operating costs)** • Higher energy prices lead to higher electricity and fuel costs in transport, resulting in higher transport and overhead costs	**Increased use due to changes in modes of transport (increase in sales)** • may choose rail or other transportation over trucks during periods of high gasoline prices	Large
	Technology	Dissemination of electric vehicles (Dissemination of next-generation technologies)	**Conversion to electric vehicles (increase in capital investment)** • Conversion cost from internal combustion trucks to EV trucks is high due to the spread of EVs throughout the market and requests from customers.	**Expansion of electric vehicles and low-carbon technologies (higher sales and lower operating costs)** • Advances in technology will lower the cost of introducing EVs • The development of transportation technologies will increase the maximum load per vehicle and the spread of low-carbon technologies will reduce transportation costs.	Large
		Spread of renewable and energy-saving technologies	**NA**	**Lower energy costs (lower operating costs)** • Technological progress reduces capital investment costs for CO2 reduction • Expanding services through the development of energy-saving technologies and the procurement of renewable energy through self-generation	Medium
	Reputation	Changes in customer behavior	**Changing customer preferences (decline in sales)** • Increased customer awareness of environmental considerations (CO2 reduction, etc.) may result in less companies being chosen for their environmental efforts	**NA**	Medium
		Changing investor reputation	**Poor investor reputation (higher funding costs)** • The trend of divestment accelerates, and the tide turns for enterprises that do not practice environmental management. As a result, the cost of financing increases.	**NA**	Medium
Physical	Chronic	Changes in precipitation and weather patterns	**Lower demand for existing products (decline in sales)** • Changes in weather patterns and increased frequency of flooding will result in sales of amphibious vehicles in some areas, which will impact sales.	**NA**	Medium
		Increase in mean temperature	**Thermal expansion of the line (Increase in capital investment and operating costs)** • Thermal waves cause thermal expansion and breakage of lines, leading to delays in rail transport and higher response costs	**NA**	Large
	Acute	Intensification of extreme weather	**Damage to operations due to severe disaster (Increase in capital investment and operating costs)** • When abnormal weather occurs frequently and manufacturing bases and warehouses are damaged, operations are suspended or restoration costs are incurred, and existing assets are damaged.	**NA**	Large

*Considering the importance in the image of medium- to long-term Transition risk/physical risk (Example: Climate change in 2030/2050)

3. Practical examples of scenario analysis

3-1. Shiga Bank

3-2. Hachijuni Bank

3-3. Higo Bank

① Assess materiality of climate-related risks

② Identify and define range of scenarios

③ Evaluate Qualitative Business Impact

④ Quantitative assessment of transition risk

⑤ Quantitative assessment of physical risk

Regarding the risks and opportunities narrowed down in the importance evaluation (something of great importance), Predicted data for 2 ° C/4 ° C scenarios were collected as parameters.

Important Items (object of analysis)	Configured Parameter	Current	4 ° C		2 ° C	
			Before 2030	2040 and later	Before 2030	2040 and later
Carbon tax and price	(1) Carbon tax	Japan: None Overseas: Some	(2030) Japan: N/A EU: 33 USD/t	(2040) Japan: N/A EU: 43 USD/t	(2030) Developed Countries: 100 USD/t Developing countries: 75 USD/t	(2040) Developed Countries: 140 USD/t Developing countries: 75 USD/t
Addressing GHG emission regulations	(2) Carbon emission reduction target	(base year) 4 ° C - Varies by country 2 ° C: 2018 years	(2030) High targets limited to some countries	N/A	(2030) **▲30%**	N/A
Energy mix, etc.	(3) Energy mix	Primary energy (base year) 2018	N/A	(2040) **dependent on fossil fuels**	N/A	(2040) **Shift to renewable energy**
	(4) Crude oil price	(base year) 2018	(2025) + 10%	(2040) + 35%	(2025) - 10%	(2040) - 16%
	(5) Power Configuration	(base year) Japan: 2018	(2030) Fossil fuels Down 32%	(2040) Fossil fuels Down 44%	(2030) Fossil fuels Down 48%	(2040) Fossil fuels Down 76%
	(6)Vehicle sales with engines	(base year) 2015	(2030) + 16%	(2060) + 49%	(2030) - 29%	(2060) - 86%
Changes in customer behavior	(3) Energy mix	Same as item (3)				
	(7) Household energy consumption	(base year) 2017	N/A	N/A	N/A	(2040) Petroleum - 75% Gas ▲ 25%
Intensification of extreme weather	(8) Flood damage amount	(base year) Japan: 2010	(2030) + 121%	N/A	N/A	N/A
	(9) Typhoon	(base year) Japan: 2016	N/A	(2100) Observations are highly uncertain and typhoon numbers are uncertain	N/A	N/A

Definition of scenario groups: Expanded use of renewable energy for decarbonization

①Real estate
② Energy
③ Automobiles and transportation

: What You Need to Do to Address Risk
:What you need to do to get the opportunity

2 ° C world view @ 2050s (example)

Energy

New entrant

- Entry of companies involved in renewable energy such as solar and wind power generation

Strengthening cooperation (Alliances, M & As, etc.)

Seller (Suppliers)

- promote the development of renewable energy
- A carbon tax is imposed on raw materials used in production facilities, resulting in additional costs
- Carbon tax increases the cost of producing fossil fuels and electricity derived from fossil fuels

Secure suppliers using raw materials and equipment with low environmental impact

Industry/Company

- Higher carbon taxes and carbon prices on operating costs increase sales prices and reduce price competitiveness, resulting in lower sales
- Fossil fuel demand declines and market prices decline as demand for renewable energy increases
- High carbon taxes and high carbon prices make businesses unprofitable, reducing profit margins and stranding assets
- The external pressure of decarbonization is strong, requiring product and technology development and capital investment to reduce environmental impact.

Review of the business entity's portfolio

Investment in renewable energy projects

Substitute

- Increase demand for renewable energy

Investment in renewable energy projects

Strengthening of cooperation (Alliances, M & A)

Buyer (customer)

- Increasing price competitiveness of energy with low environmental impact and decreasing demand related to fossils
- Fossil fuels and fossil fuel-derived electricity consumption in households decreases as awareness increases
- Lower demand for fuel for passenger cars due to lower demand for engine-powered vehicles

Review of the business entity's portfolio

Investment in renewable energy projects

Strengthening of cooperation (Alliances, M & A)

Government

- Promote the introduction of carbon taxes and emissions trading, and set high carbon taxes and carbon prices
- An ambitious carbon emissions target may be set and fossil fuel projects may not be licensed
- Incentives and subsidies for renewable energy are increased and established
- Stricter emission regulations for gasoline, diesel and other engine-powered vehicles will affect fuel demand.

Prompt access to policy information
Cooperation with the Government

Lobbying for a new policy

In the renewable energy business securing subsidies

Definition of scenario groups: Demand for fossil fuels increases steadily, increasing physical risks such as severe disasters

①Real estate
② Energy
③ Automobiles and transportation

: What You Need to Do to Address Risk
:What you need to do to get the opportunity

Energy

4 ° C world view @ 2050s (example)

New entrant

Seller (Suppliers)

- Crude Oil Prices Rise as Decarbonization Fails and Oil Demand Grows
- Increasing need for disaster prevention measures due to intensification of natural disasters

Promoting renewable energy procurement and private power generation

Reinforcing the Supply Chain for Abnormal Weather

Industry/Company

- Increased demand for fossil fuel-based energy will increase demand for fossil fuels
- Although there is a movement toward decarbonization, there is little progress in the development and utilization of technologies to reduce environmental impact.
- Additional capital investment is required to cope with storm surges and sea level rise.
- Because of the flood damage, the supply relay facilities will be flooded, disrupting the supply of energy and incurring restoration costs.

Additional investment in disaster prevention equipment

Study of weather derivatives (insurance)

substitute

- Growth in demand for renewable energy is limited

Buyer (customer)

- Without a carbon tax and price (at a low price even if), traditional fuel and electricity demand remains largely unchanged
- Demand for passenger car fuel increases as the number of vehicles equipped with gasoline engines increases

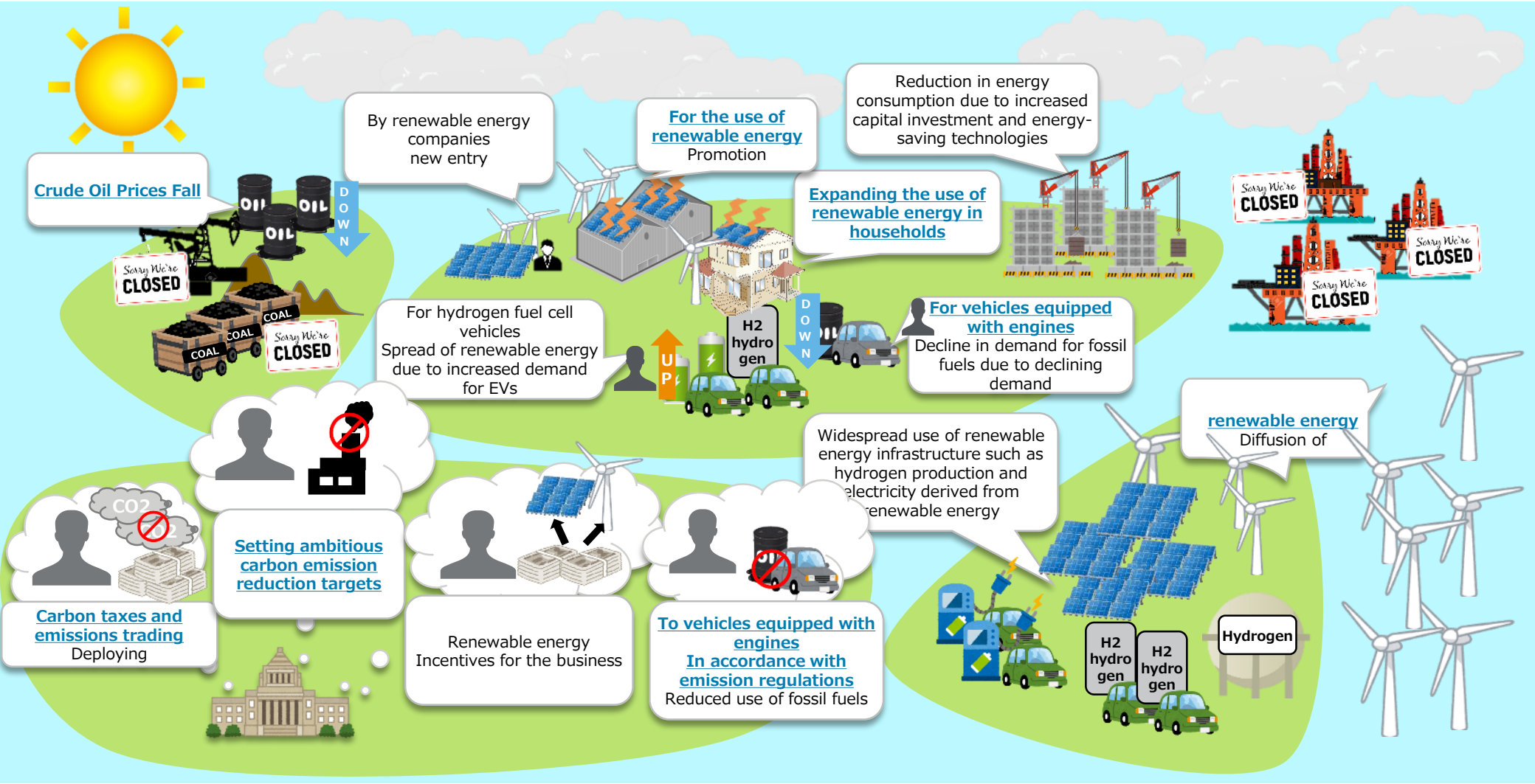
Government

- Low-Cost carbon taxes and prices are introduced in some countries
- Most countries remain passive in setting carbon targets
- Incentives and subsidies for renewable energy remain largely unchanged
- Fossil fuel subsidies continue or are phased out

[Vision of Future Society under the 2 ° C Scenario]

Decarbonization will be strongly promoted and a carbon tax will be introduced. Introduction and use of renewable energy will be widespread

①Real estate
② Energy
③ Automobiles and transportation



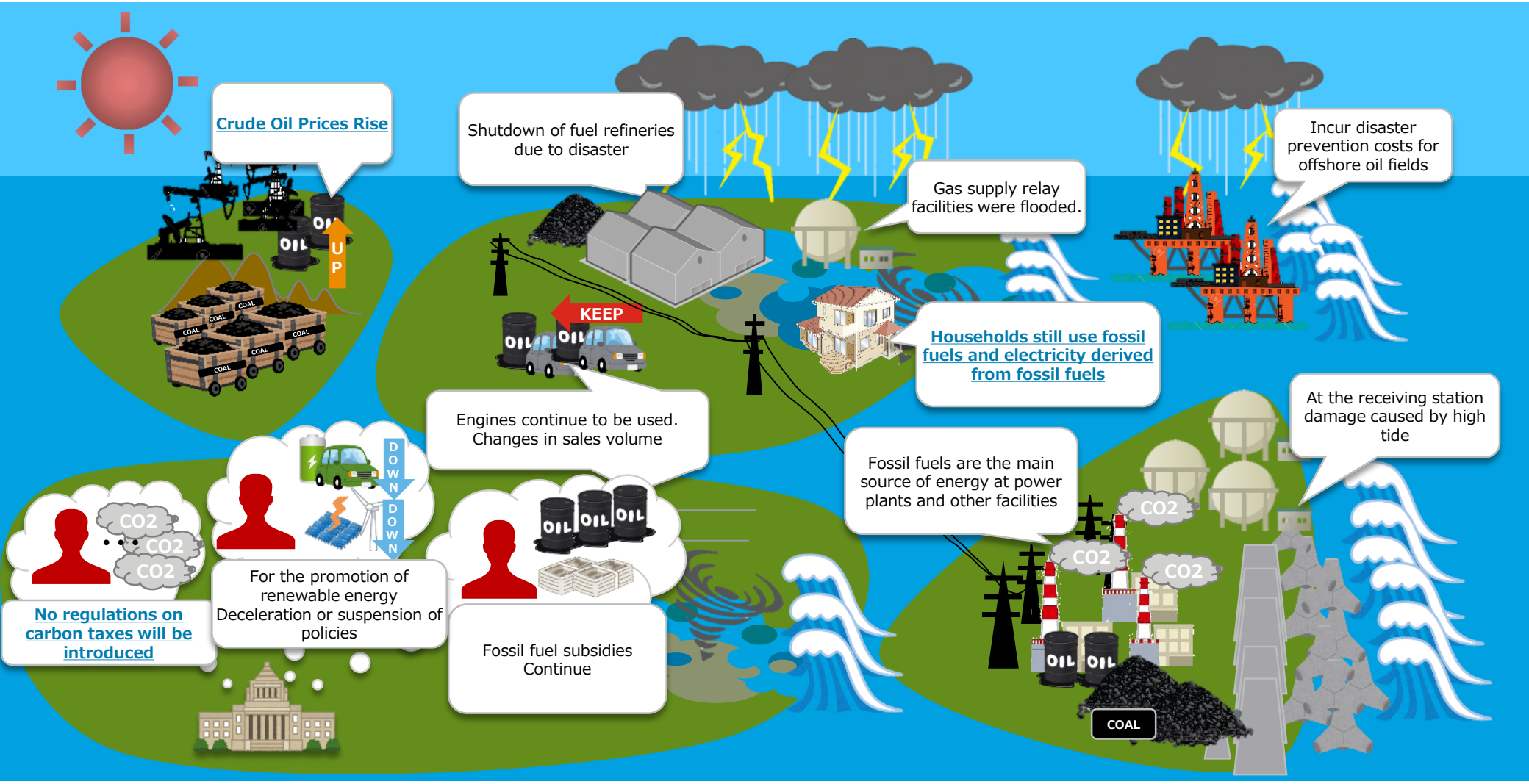
[Vision of Future Society under the 4 ° C Scenario]

Still dependent on fossil fuels, increasing physical risk

①Real estate

② Energy

③ Automobiles and transportation



[(3) List of parameters in the automobile and transport sectors]

For critical risk and opportunity, the forecast data for the 2 ° C/4 ° C scenario were collected as parameters

Important Items (object of analysis)	Configured Parameter	Current	4 ° C		2 ° C	
			Before 2030	2040 and later	Before 2030	2040 and later
Carbon tax and price	(1) Carbon tax	Japan: N/A	(2030) Japan: N/A	(2040) Japan: N/A	(2030) Developed Countries: 100 USD/t Developing countries: 75 USD/t	(2040) Developed Countries: 140 USD/t Developing countries: 75 USD/t
	(2) Impacts on the transportation system	N/A	Rate of change in cargo volume in the introduction of a carbon tax For 10,000 yen/t-CO2 Motor vehicles: -5% Railway: + 10% For 30,000 yen/t-CO2 Motor vehicles: -10% Railway: + 30%			
Energy price	(3) Crude oil price	(base year) 2019 **63 USD/barrel**	(2030) **76 USD/barrel**	(2040) **85 USD/barrel**	(2030) **56 USD/barrel**	(2040) **53 USD/barrel**
	(4) Vehicle sales with engines	(base year) 2015	(2030) **+16%**	(2060) **+49%**	(2030) **▲29%**	(2060) **▲86%**
Dissemination of next-generation technologies	(5) Dissemination of electric vehicles	(base year) 2016 Japan: 28000 (EV, PHV and FCV)	**PHV/ZEV: 5% increase**	**PHV/ZEV: 7% increase**	**PHV/ZEV: 39% increase**	**PHV/ZEV: 63% increase**
Increase in mean temperature	(6) Increase in midsummer days in Japan	N/A	**(2020 – 2039) Average 1.1 ° C (2020 – 2039) + 14.7 days ***		N/A	
	(7) Cost arising from buckling of tracks	(base year) 2016 **1,800 mil USD**	(2030) **2,200 mil USD**	(2090) **9,000 mil USD**	(2030) **2,100 mil USD**	(2090) **7,000 mil USD**
Intensification of extreme weather	(8) Flood damage amount	(base year) 2010	(2030) **+67%**	N/A	N/A	N/A
	(9) Typhoon	N/A	N/A	(2100) All typhoons ▲ 5.7% Fierce typhoon + 3.6%	N/A	N/A

Definition of scenario groups: Accelerating the modal shift through expansion environmentally-friendly railcars and railcars for decarbonization

: What You Need to Do to Address Risk

: What you need to do to get the opportunity

Transportation and automobile

2 ° C world view @ 2050 (example)

New entrant

- Companies involved in the use of renewable energy and environmentally friendly railcars enter the market in China and other countries.

Strengthening cooperation (Alliances, M & As, etc.)

Seller (Suppliers)

- Development of low-carbon transportation equipment
- Increasing demand for products to reduce vehicle weight and improve energy efficiency
- Carbon tax results in need to pass on higher production costs in sales prices

Strengthening Cooperation with Suppliers (Price negotiations, securing products, etc.)

Seller (Energy, etc.)

- Increasing share of renewable energy in energy demand and decreasing demand for oil
- Crude Oil Prices Fall

Industry/Company

- Withdrawal of production of gasoline vehicles and shift to production of ZEVs
- Promoting the use of renewable energy and environmentally friendly railcars and railcars
- Increasing need for additional energy-efficient capital investment
- Modal shift increases low-carbon freight traffic

Promoting investment in low-carbon technologies

Improving Production Plans for Low-Carbon Production

(Substitute)

- Decarbonization Helps Modal Shift

Buyer (customer)

- Increasing demand for EVs for a decarbonized society
- On the other hand, demand for vehicles with engines declines due to the expansion of ZEVs, etc.
- In addition to increasing demand for EVs, cost reduction will be promoted and the barrier to EV purchase will be lowered.
- Shift from automobile to rail freight is accelerated

Introduction of environmentally friendly vehicles and sales expansion

**Expanding freight transportation services such as railways and ZEV *

Government

- To achieve the 2 ° C target, the government is promoting the introduction of carbon taxes and emissions trading, and carbon prices are rising.
- Implementation of preferential policies for domestic EV manufacturers
- Stricter regulations on internal combustion vehicles
- Expanding charging infrastructure to promote EVs

Prompt access to policy information; and securing subsidies

Promoting renewable energy and next-generation vehicles in cooperation with the government

*ZEV ・・・ zero-emission vehicles (Electric and hydrogen vehicles)

Definition of scenario groups:
The traditional market environment is maintained while increases physical risks such as severe disasters is assumed

①Real estate
② Energy
③ Automobiles and transportation

: What You Need to Do to Address Risk

: What you need to do to get the opportunity

Transportation and automobile

4 ° C world view @ 2050 (example)

New entrant

- As ICE cars continue to be the core, the presence of new EV manufacturers is limited.

Seller (Suppliers)

- Slow development and interest in low carbon technologies and products
  Increasing need for countermeasures due to intensification of natural disasters

Reinforcing the Supply Chain for Abnormal Weather

Seller (Energy, etc.)

- Crude Oil Prices Rise as Decarbonization Fails and Oil Demand Grows

Promoting renewable energy procurement and private power generation

Industry/Company

- Significant increases in costs, delays, and cancellations due to damage to transportation equipment, railcars, and infrastructure caused by abnormal weather
- Increased risk of line buckling due to rising temperatures, resulting in delays and increased repair costs
- Increase in energy costs for cooling vehicles and transport facilities
- Production of ICE in manufacturing has continued and business portfolio is maintained

Changes in transport methods in response to local risks

(Substitute)

Buyer (customer)

- The lack of a product lineup for infrastructure and next-generation vehicles remains an issue.
- In addition, the subsidy policy has not progressed, and the product cost is high, so the customer's desire to purchase the next generation car has not increased, and as a result, the market centering on ICE cars * has continued.

Minimizing investment in EV development (Concentrate resources on improving ICE performance)

Government

- As the low carbon/decarbonization trend weakens and external pressure from the international community weakens,
  Slow or stop the spread of ZEVs and renewable energy policies
- No regulations on carbon taxes will be introduced
- Subsidies (Breakwater, etc.) for increased physical risks such as floods

Prompt access to policy information; and securing subsidies

*ICE cars ･･･ internal combustion engines (gasoline and diesel vehicles)

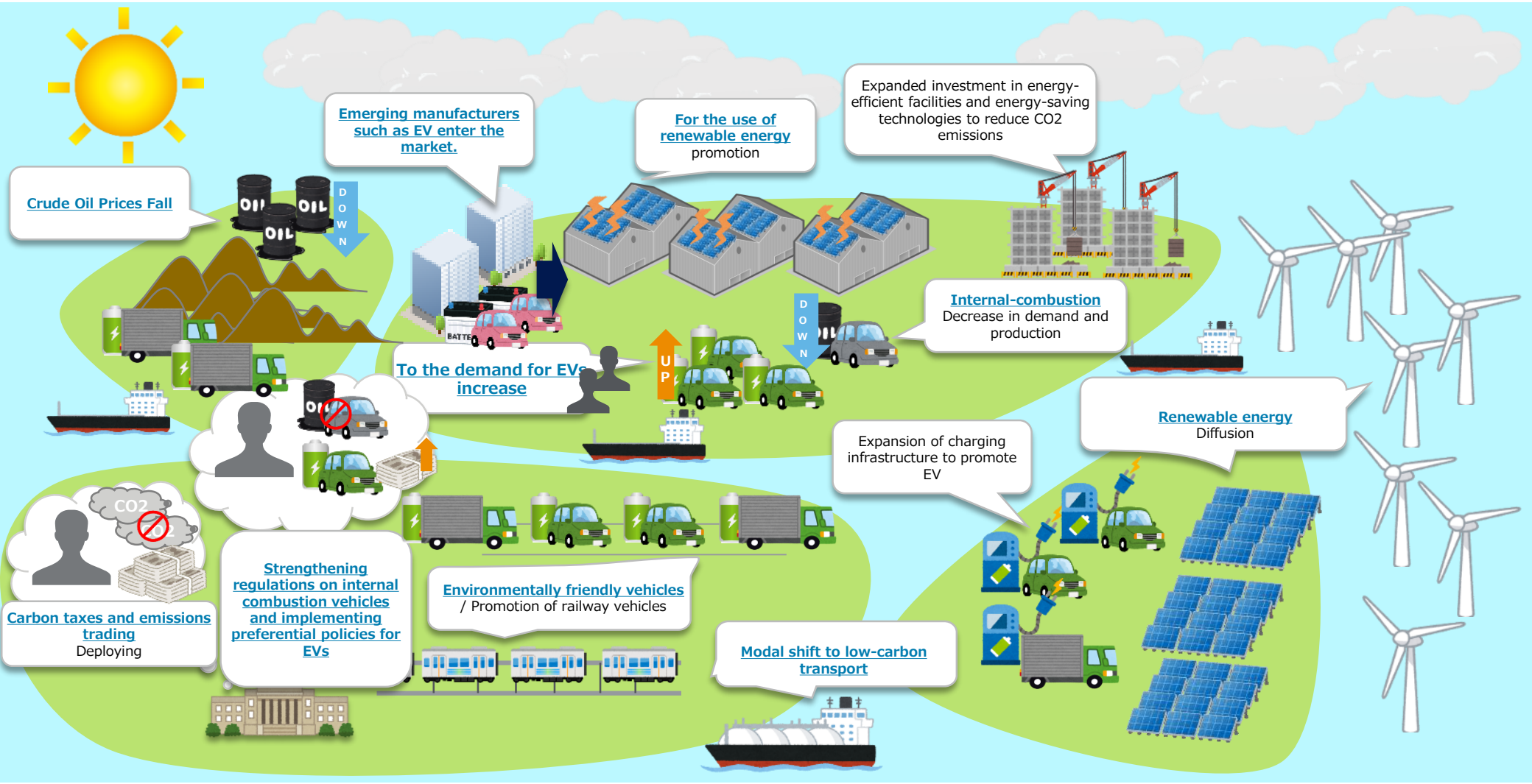
[Vision of Future Society under the 2 ° C Scenario]

Decarbonization will be strongly promoted and a carbon tax will be introduced. Increasing use of renewable energy and EVs accelerates modal shift in transportation

①Real estate

② Energy

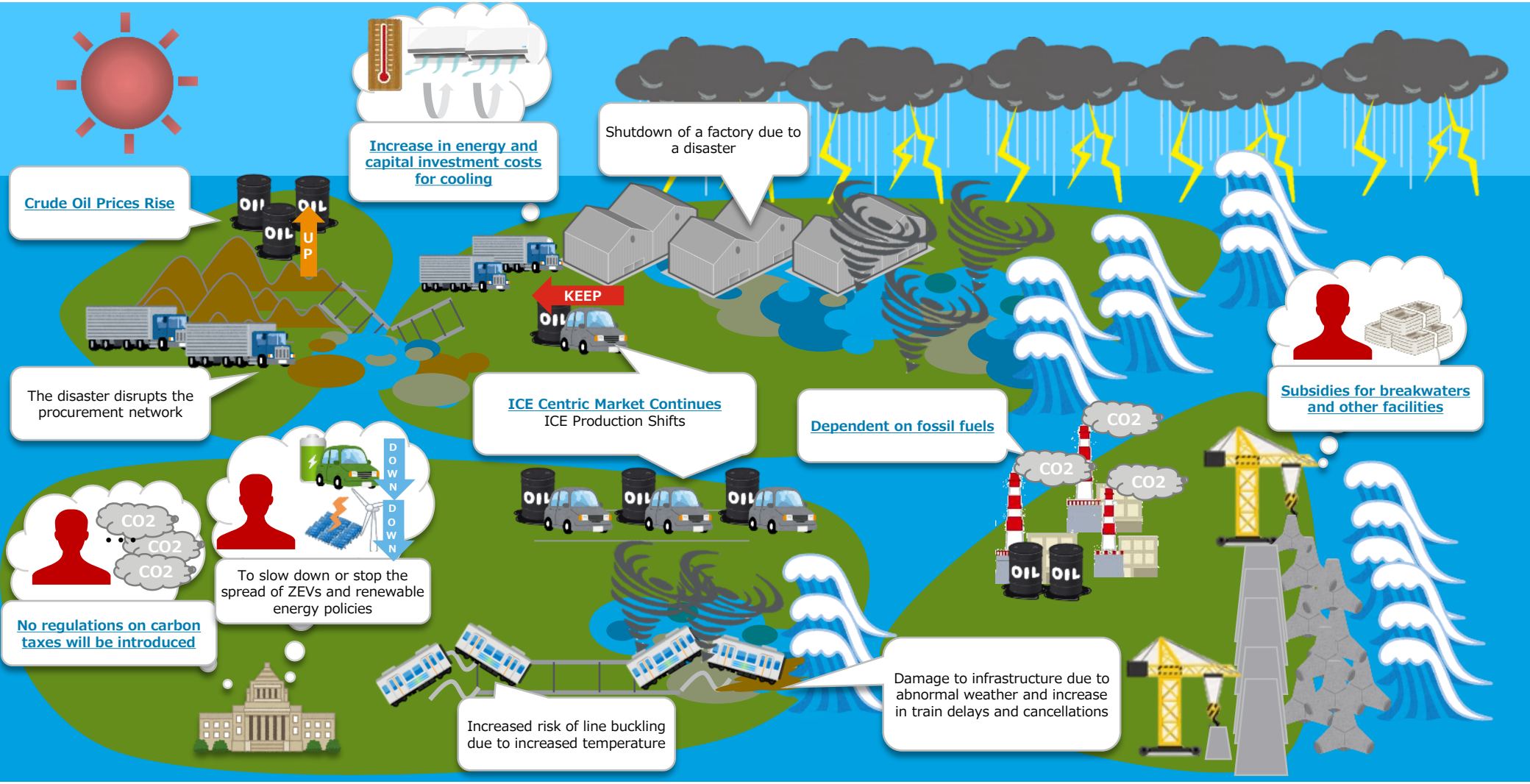
③ Automobiles and transportation



[Vision of Future Society under the 4 ° C Scenario]

Low carbon/decarbonization remains at an unacceptable level, increasing physical risk

①Real estate
② Energy
③ Automobiles and transportation



3. Practical examples of scenario analysis

3-1. Shiga Bank

3-2. Hachijuni Bank

3-3. Higo Bank

① Assess materiality of climate-related risks

② Identify and define range of scenarios

③ Evaluate Qualitative Business Impact

④ Quantitative assessment of transition risk

⑤ Quantitative assessment of physical risk

[(2) Business impact of energy x 2 ° C]

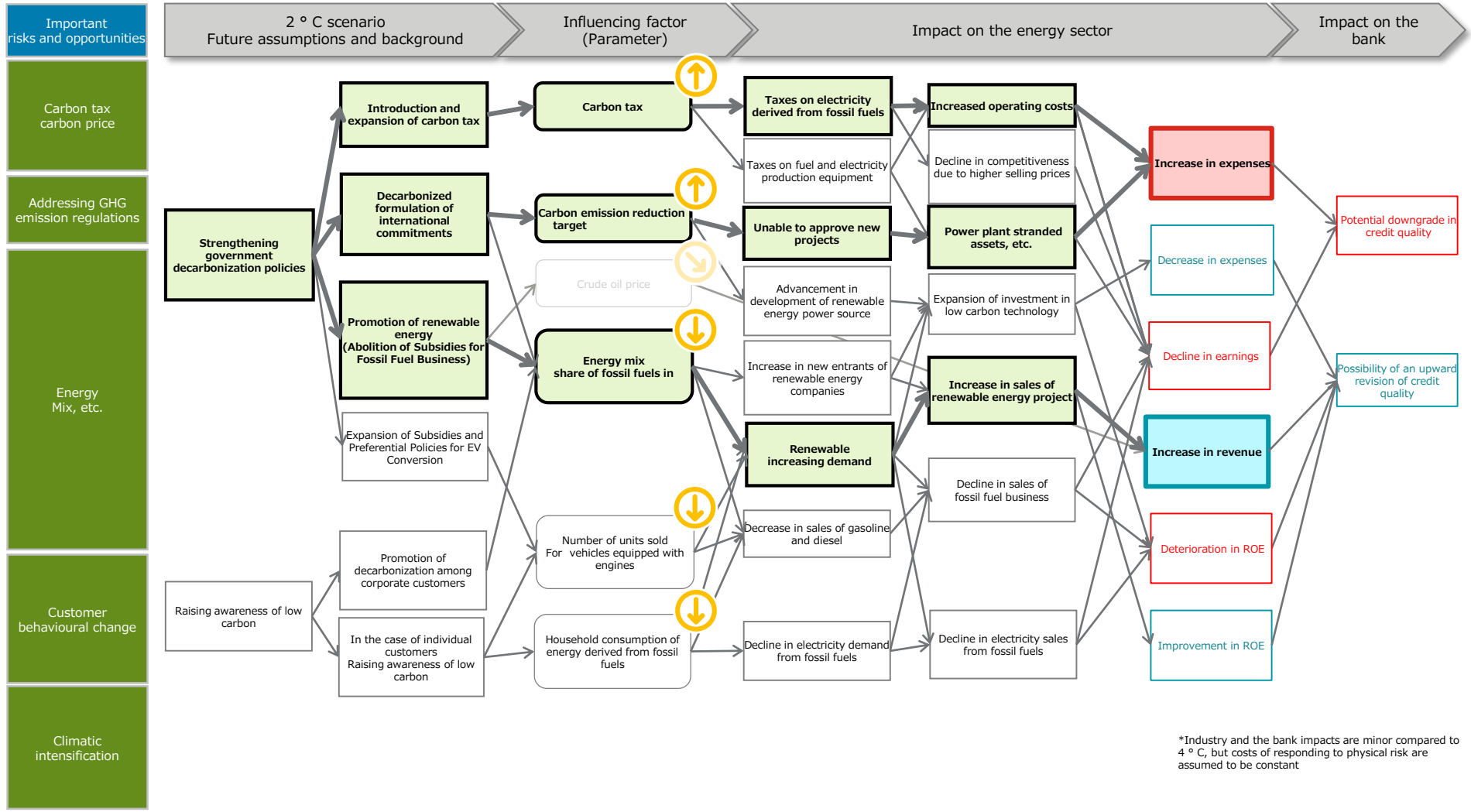
Decarbonization policies will be promoted and the introduction and use of renewable energy will be accelerated.

4 ° C | 2 ° C

①Real estate
② Energy
③ Automobiles and transportation

Climate Change Impacts flow chart

Legend: **Bold** Be particularly influential | Gray Impact considered relatively small | Direction of change | Risk | Opportunity



*Industry and the bank impacts are minor compared to 4 ° C, but costs of responding to physical risk are assumed to be constant

[(2) Business impact of energy x 4 ° C]

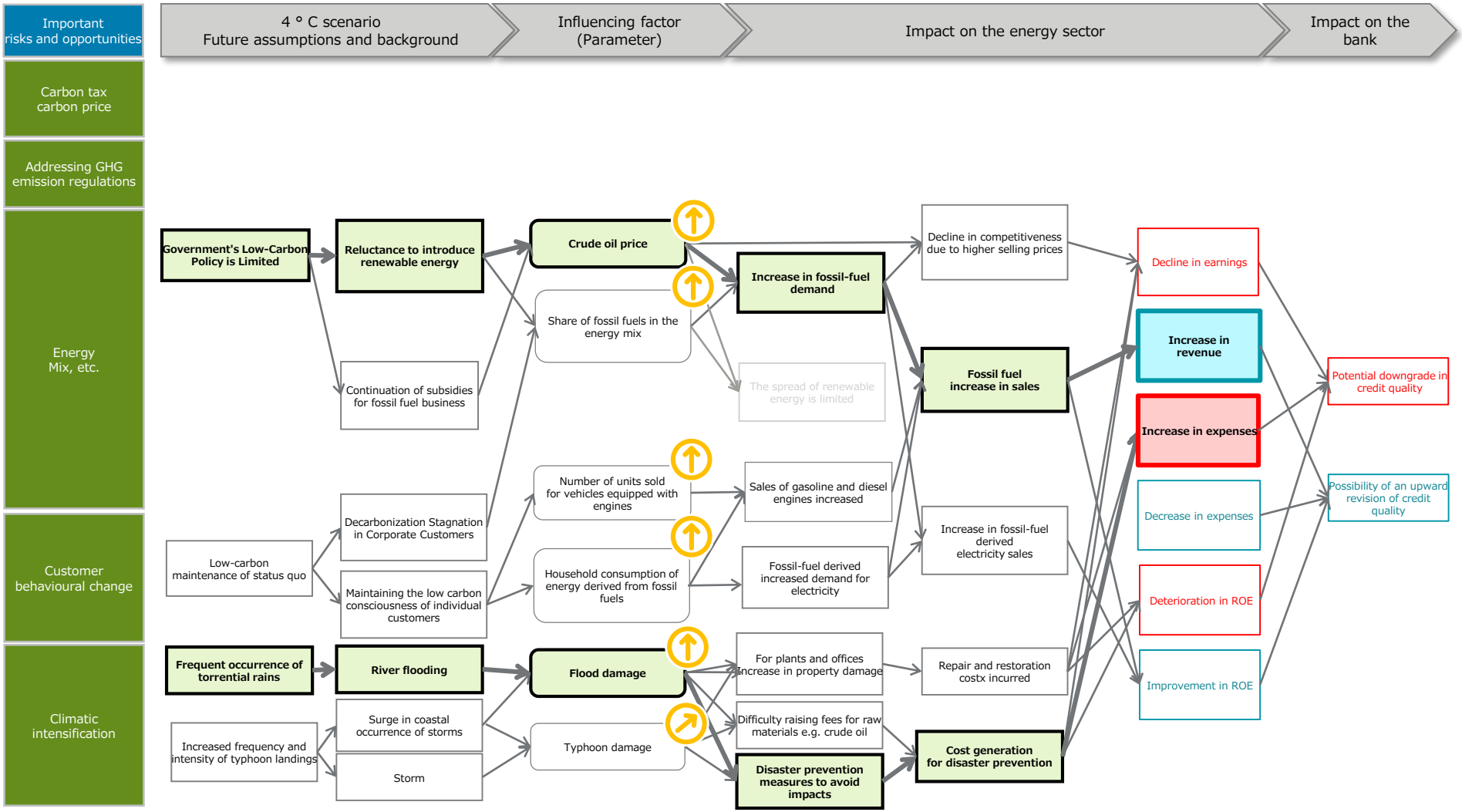
Increased costs from extreme weather events while maintaining dependence on fossil fuels

4 ° C | 2 ° C

①Real estate
② Energy
③ Automobiles and transportation

Climate Change Impacts flow chart

Legend: **Bold** Be particularly influential | Gray Impact considered relatively small | Direction of change | Risk | Opportunity



[(3) Vehicle and transportation x 2 ° C business impact]

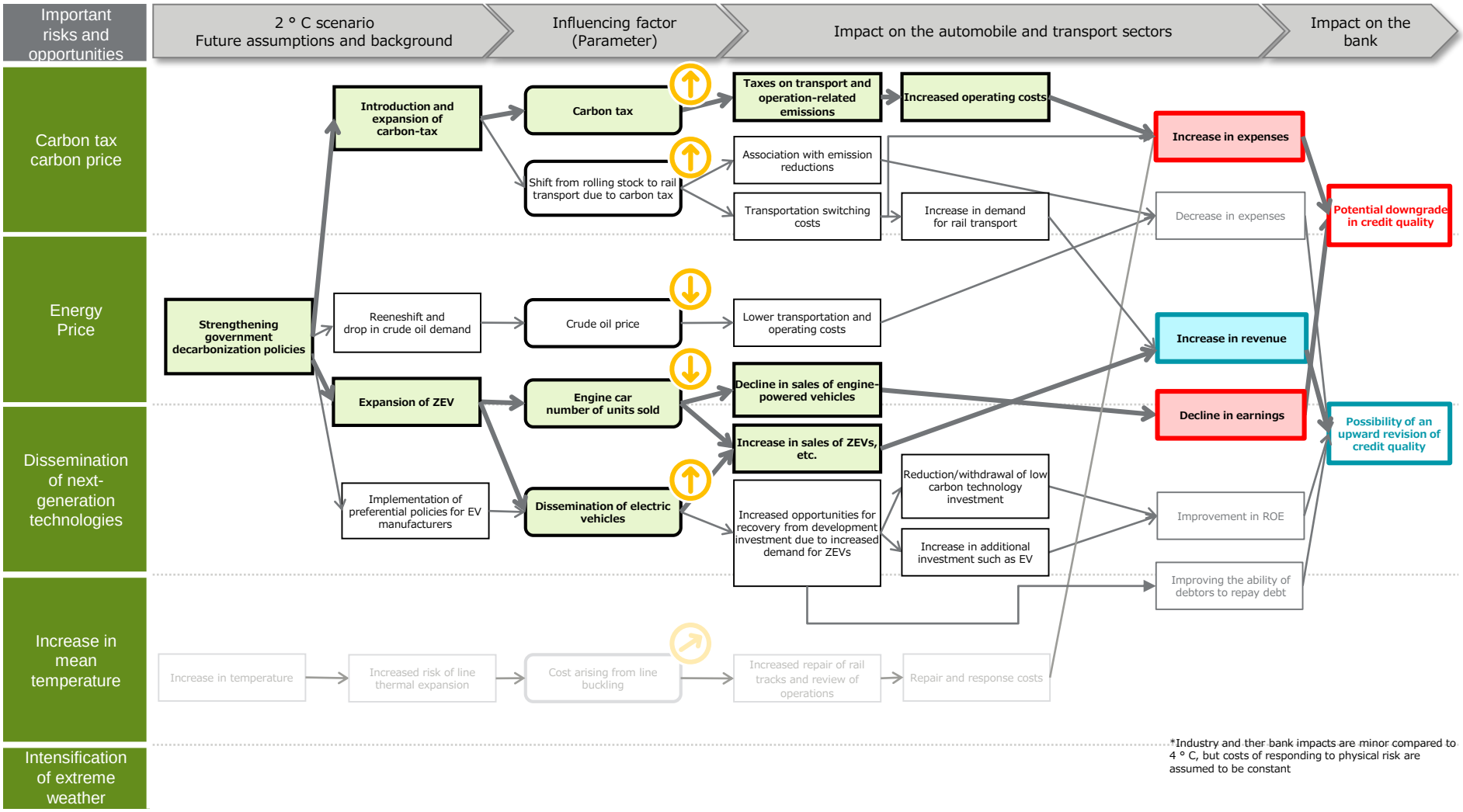
Decarbonization policy is promoted and modal shift and EV shift are accelerated.

4 ° C | 2 ° C

①Real estate
② Energy
③ Automobiles and transportation

Climate Change Impacts flow chart

Legend: **Bold** Be particularly influential | Gray Impact considered relatively small | Direction of change | Risk | Opportunity



*Industry and ther bank impacts are minor compared to 4 ° C, but costs of responding to physical risk are assumed to be constant

[(3) Vehicle and transportation x 4 ° C business impact]

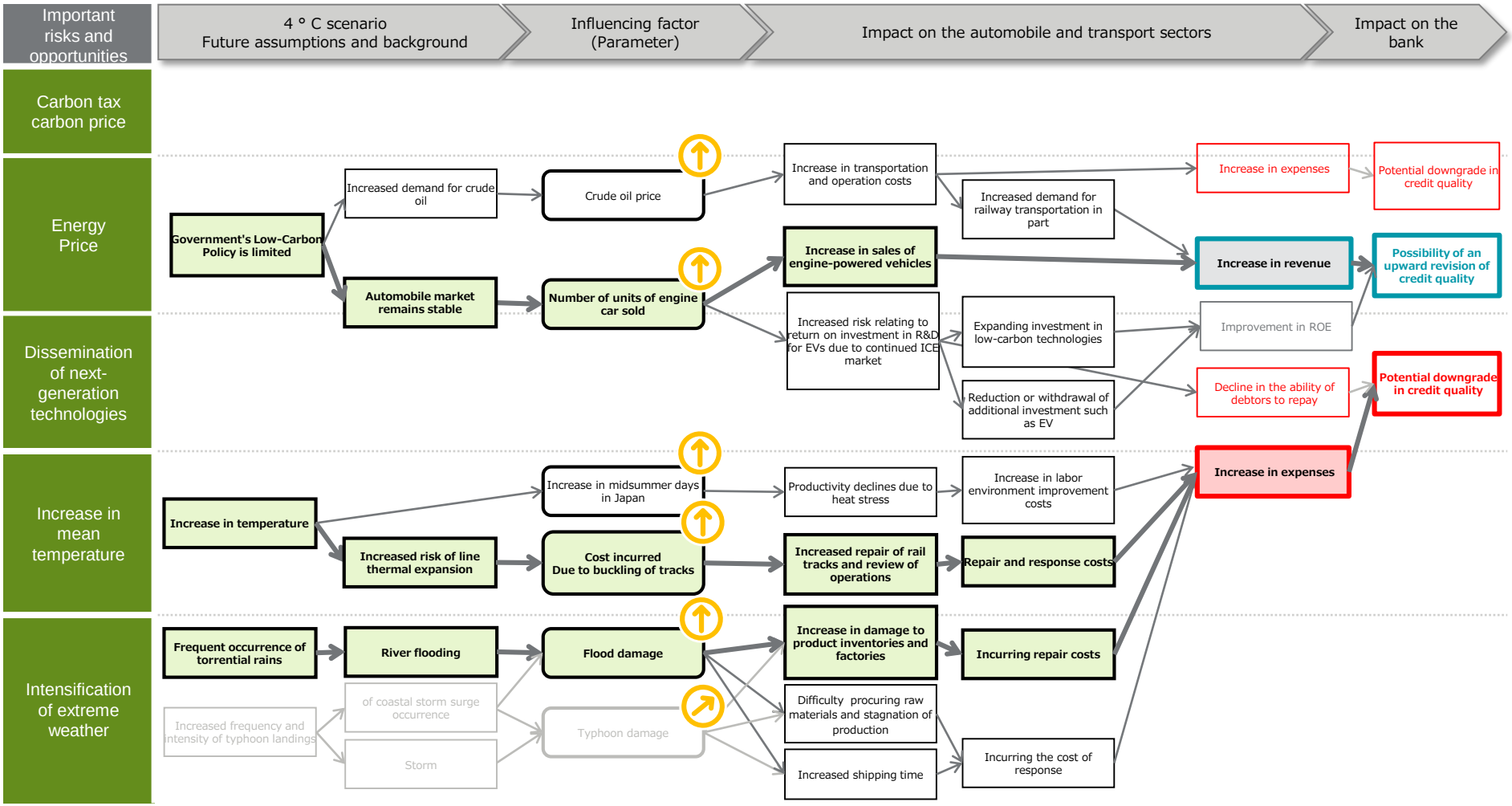
The current regulatory and market environment will continue, while the costs of extreme weather will increase

4 ° C | 2 ° C

①Real estate
② Energy
③ Automobiles and transportation

Climate Change Impacts flow chart

Legend: **Bold** Be particularly influential | Gray Impact considered relatively small | Direction of change | Risk | Opportunity



3. Practical examples of scenario analysis
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① Assess materiality of climate-related risks
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③ Evaluate Qualitative Business Impact
④ Quantitative assessment of transition risk
⑤ Quantitative assessment of physical risk

Approach to Analysis of the Impact of Transition Risk on Financial Statements

Example of analysis
(1): Energy sector (Electric Power Company (3))

If CO2 emissions are kept constant under the assumption of maintaining the status quo, and only the carbon tax scenario is included, the country would become insolvent.

STEP 1: Carbon Tax Considerations

Item	Value	Remarks
CO2 emissions	approximately XX, X00,000 [t-CO2]	ESG Report 2019
Exchange rate	105 yen/$	Level at the end of January 2020

2 ° C Scenario	A carbon tax is introduced regardless of country or region.

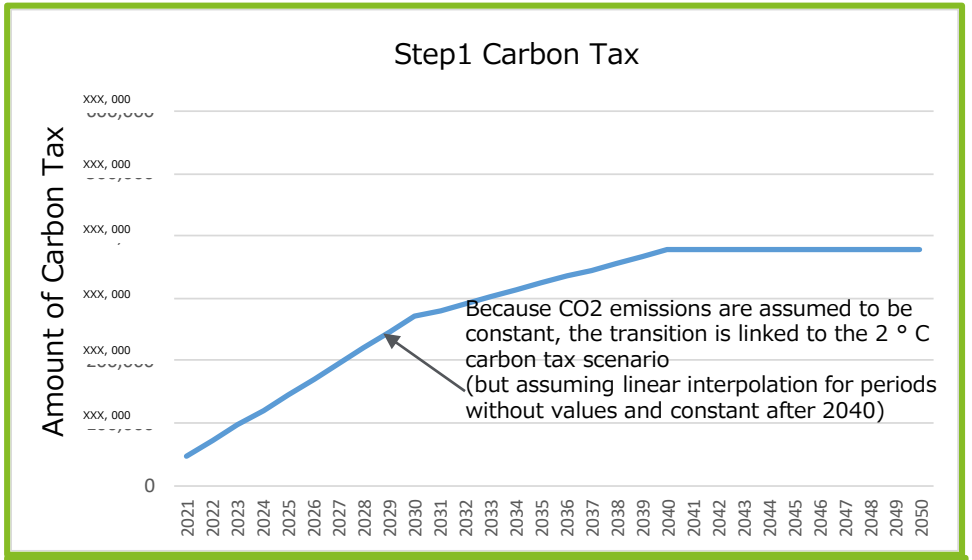
	Developed country	Developing country
Current situation	(Reference) Average successful bid price in EU-ETS in Europe: approximately US $/ t *"Implementation and Review of Emissions Trading in Other Countries" From (Ministry of the Environment Report 2016)	N/A
2030	100 US $/ tCO2	75 US $/ tCO2
2040	140 US $/ tCO2	125 US $/ tCO2

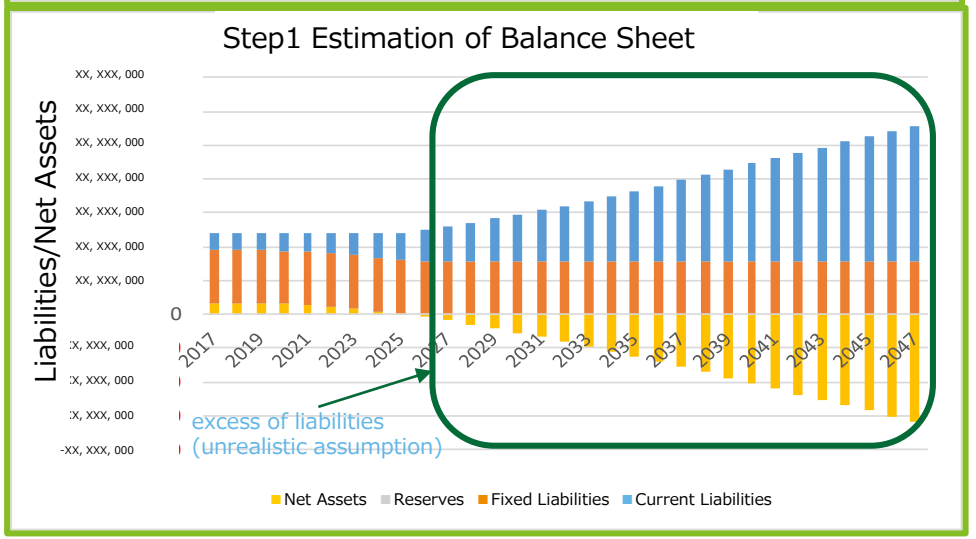
consideration

- (whole) As global carbon prices rise to achieve the 2 ° C target, the government is promoting the introduction of carbon taxes and emissions trading. On the other hand, companies with high GHG emissions are more likely to be asked to do so by governments and business partners, and more likely to be engaged by investors.
- (Real Estate) Due to rising steel and cement prices and transportation costs, green buildings utilizing new low-carbon materials have become popular.
- (Tenants/Residents) Tenants will see an increase in decarbonization and demand for energy-efficient facilities

*Data source:

- Extracted from IEA "World Energy Outlook 2019" Sustainable Development Scenario numbers



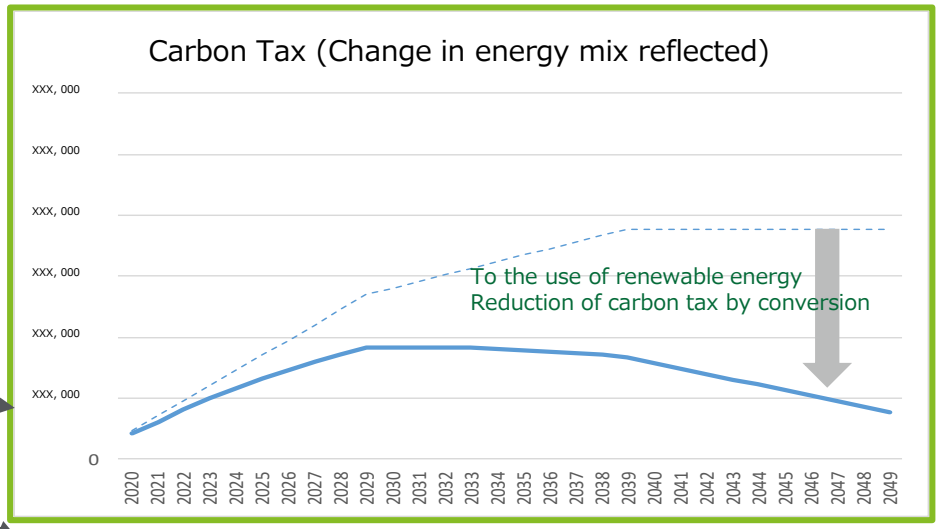


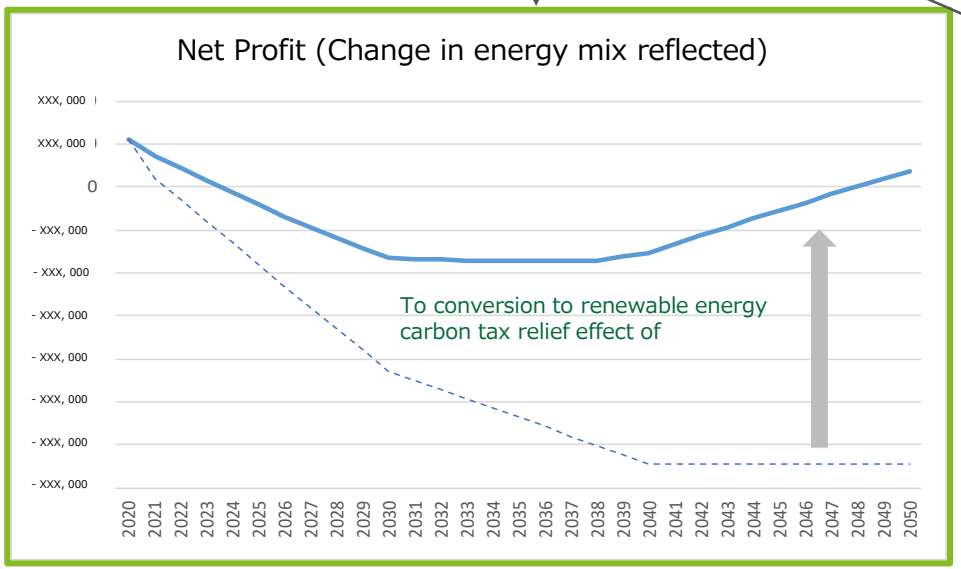
A decrease in the use of fossil fuels in favor of renewable energy is expected to lead to a reduction in the carbon tax burden and therefore an increase in net income

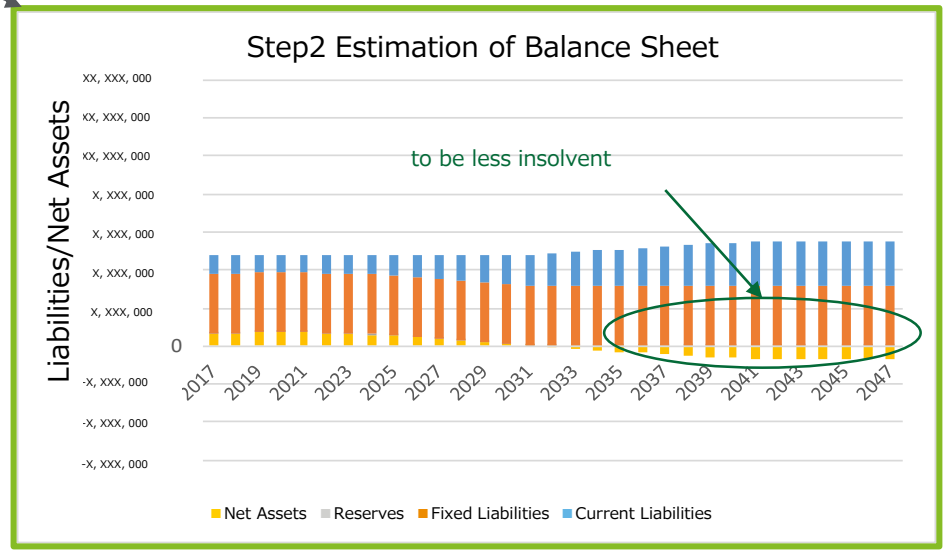
STEP 2: Estimating Financial Impact Based on Changes in Power Supply Composition

A reduction in carbon tax due to conversion to renewable energy is expected to increase net income and reduce excess liabilities

Although this estimate assumes that the conversion will take place in stages, depending on the timing of the conversion, as shown in Step 1, the deficit may widen or the excess debt may be avoided

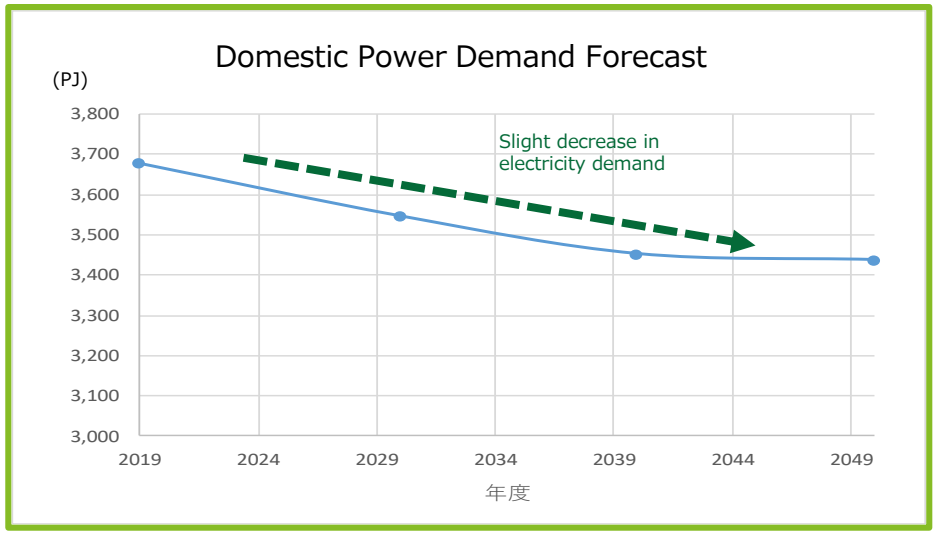


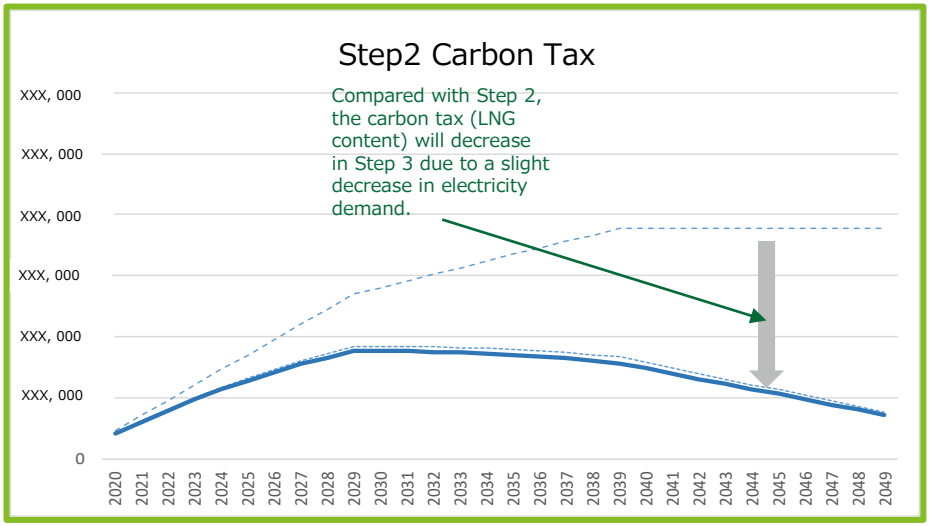


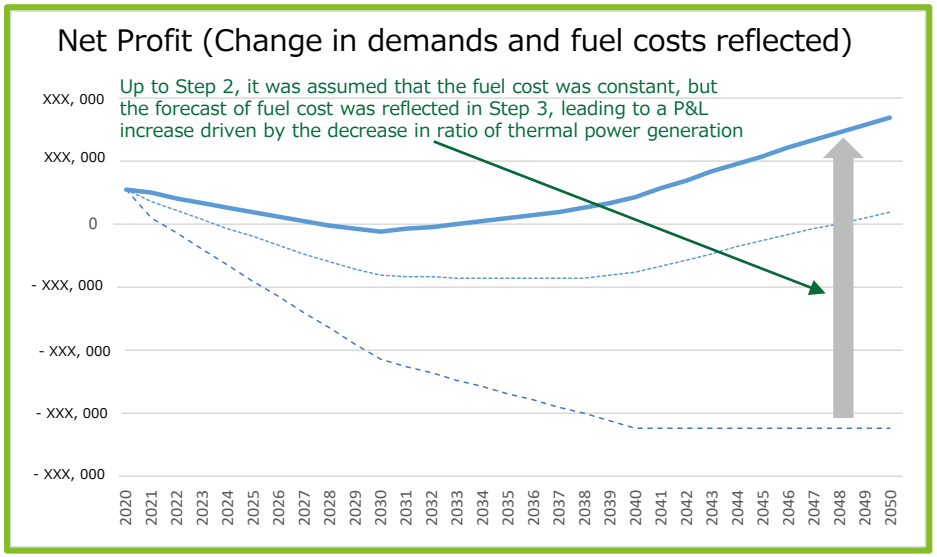


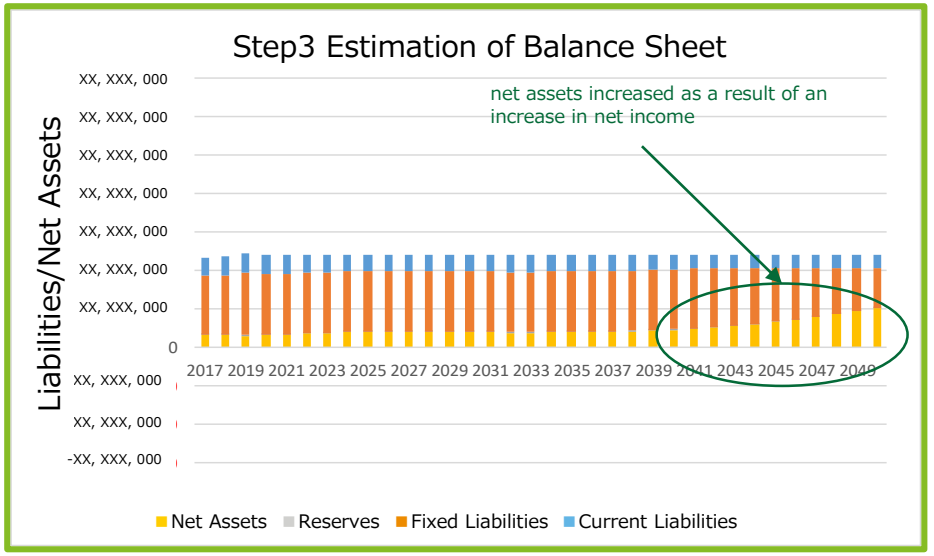
An increase in the unit price of fossil fuels is forecast, but an increase in net income is expected due to a decrease in thermal power generation.

STEP 3: Reflect Demand and Fuel Cost Forecasts









Example of analysis (2): Manufacture of automobile parts

Assumptions regarding changes in profit and loss and the size of assets and liabilities are based recent financial statements; the impact of the carbon tax is insignificant and net income is expected to continue

STEP 1: Carbon Tax Considerations (auto parts manufacturer)

Item	Value	Remarks
CO2 emissions	About X, X00,000 [t-CO2]	HP Disclosure *
Exchange rate	105 yen/$	Level at the end of January 2020

2 ° C Scenario	A carbon tax is introduced regardless of country or region.

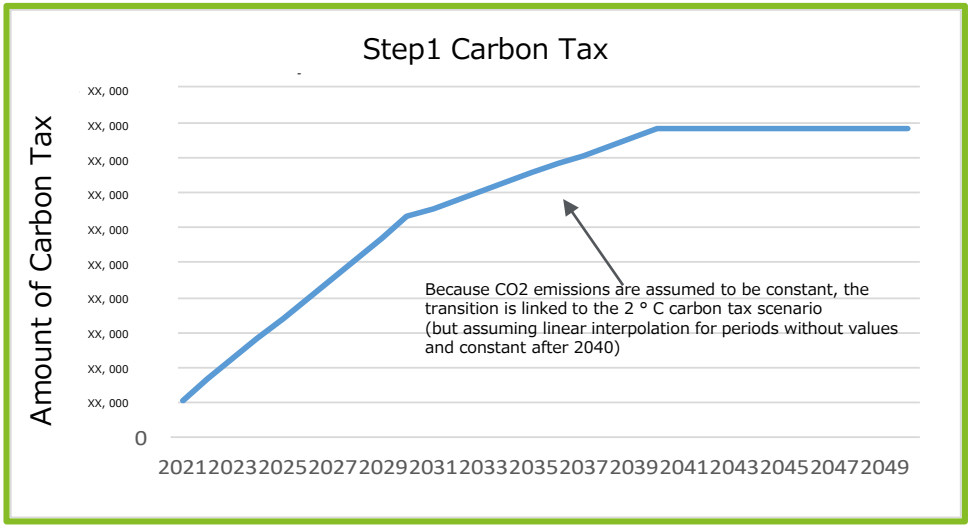
	Developed country	Developing country
Current situation	(Reference) Average successful bid price in EU-ETS in Europe: approximately US $/ t *"Implementation and Review of Emissions Trading in Other Countries" From (Ministry of the Environment Report 2016)	N/A
2030	100 US $/ tCO2	75 US $/ tCO2
2040	140 US $/ tCO2	125 US $/ tCO2

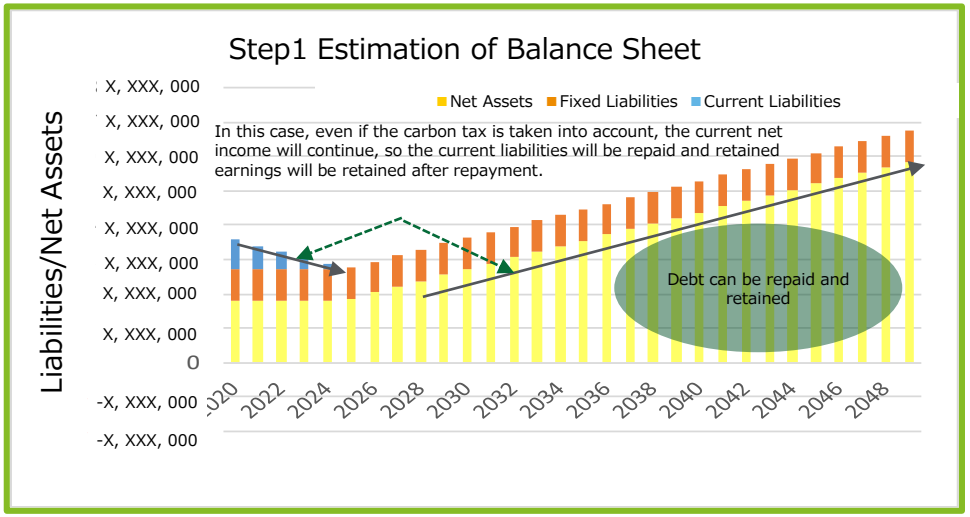
consideration

- (whole) As global carbon prices rise to achieve the 2 ° C target, the government is promoting the introduction of carbon taxes and emissions trading. On the other hand, companies with high GHG emissions are more likely to be asked to do so by governments and business partners, and more likely to be engaged by investors.
- (Real Estate) Due to rising steel and cement prices and transportation costs, green buildings utilizing new low-carbon materials have become popular.
- (Tenants/Residents) Tenants will see an increase in decarbonization and demand for energy-efficient facilities

*Data source:

- Extracted from IEA "World Energy Outlook 2019" Sustainable Development Scenario numbers



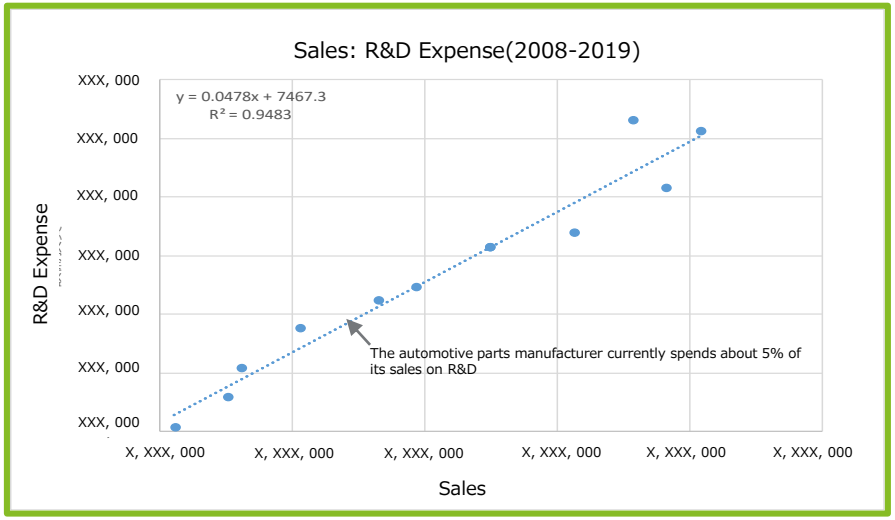


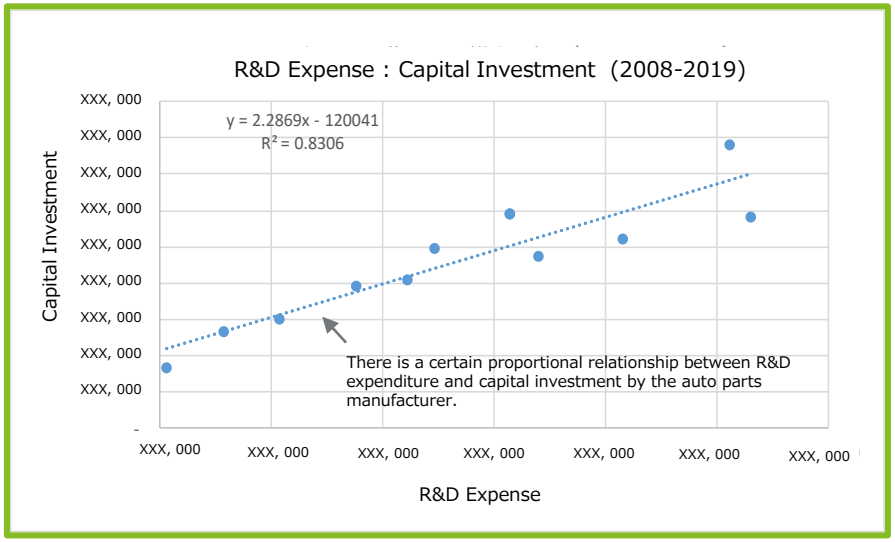
(*) Only CO2 emissions for Scope 1 and 2 are counted.

Parameters for R&D expenditure and capital expenditure were estimated based on data disclosed by automobile parts manufacturers.

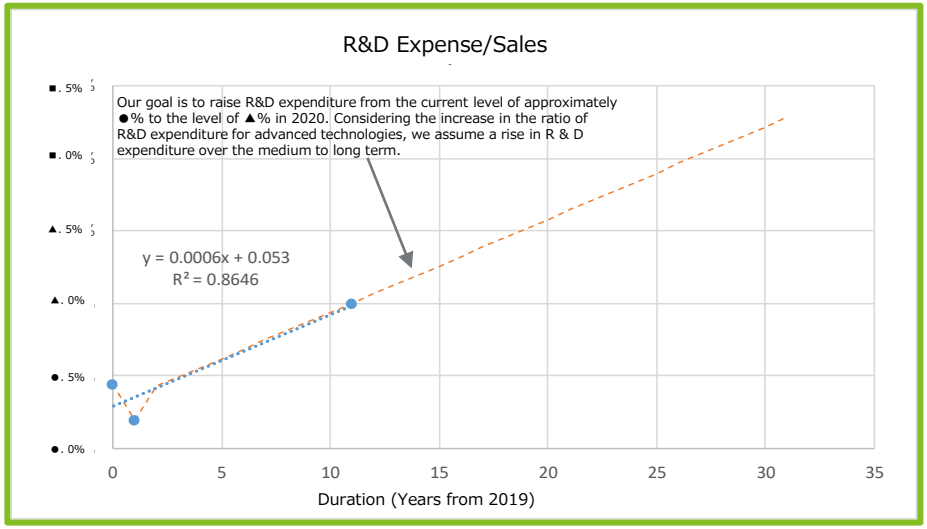
STEP 2: Future Forecast of Next-Generation Vehicle Development Costs (Estimates from data disclosed by auto parts manufacturers)

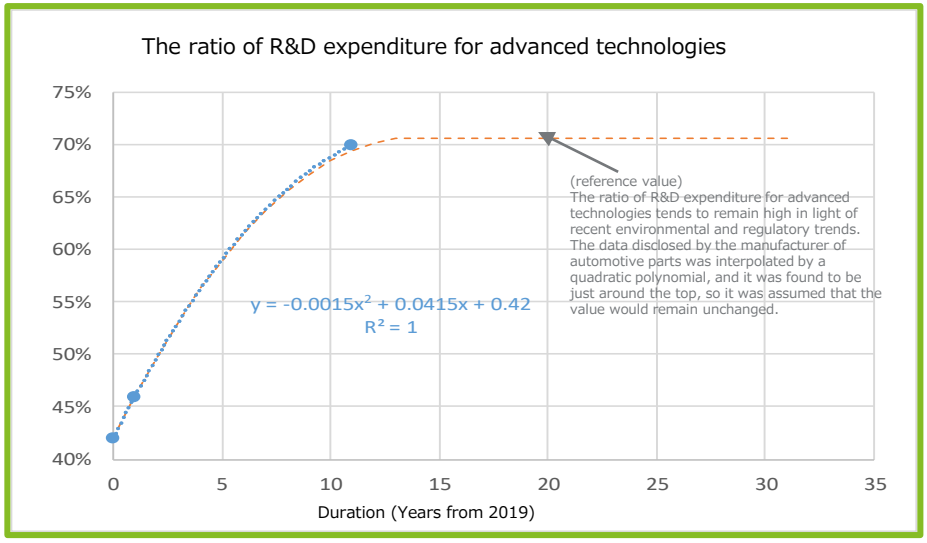
Estimates from prior year data





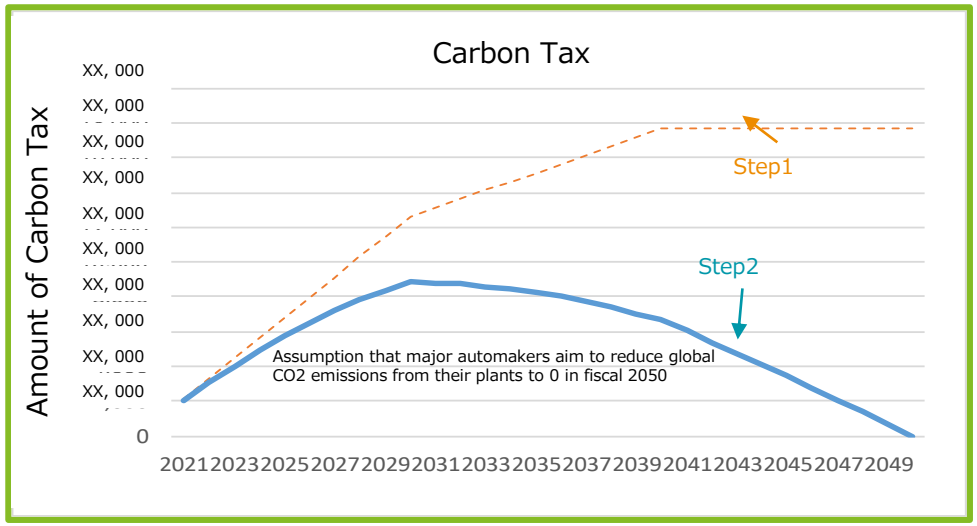
Future projections from disclosed targets

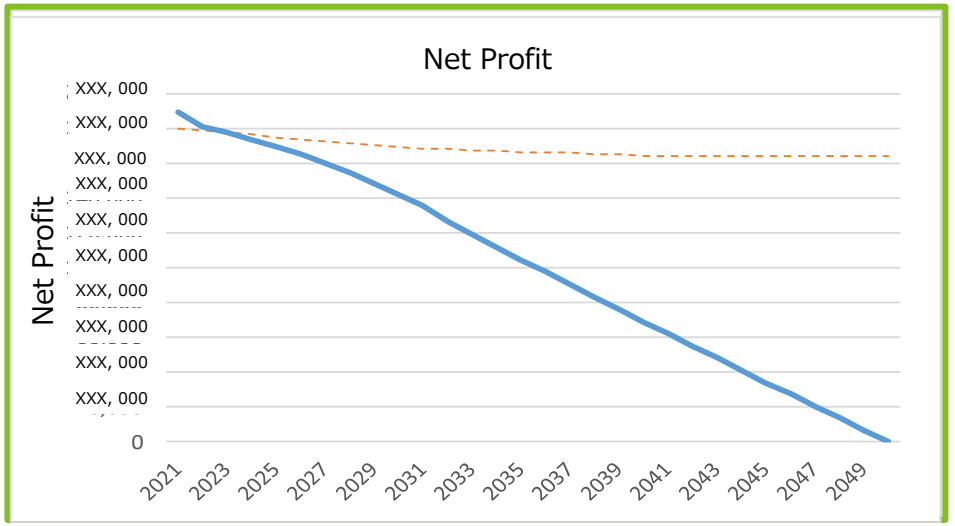


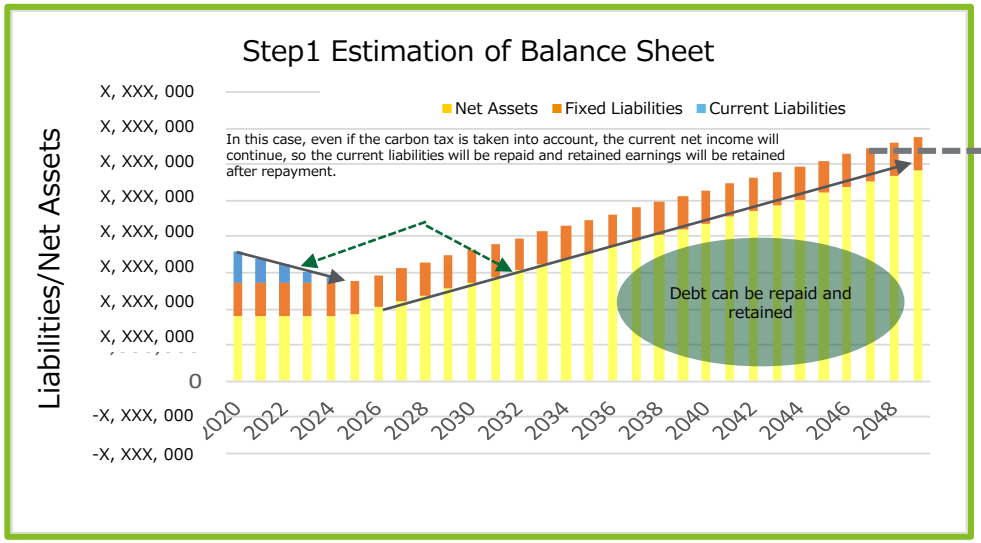


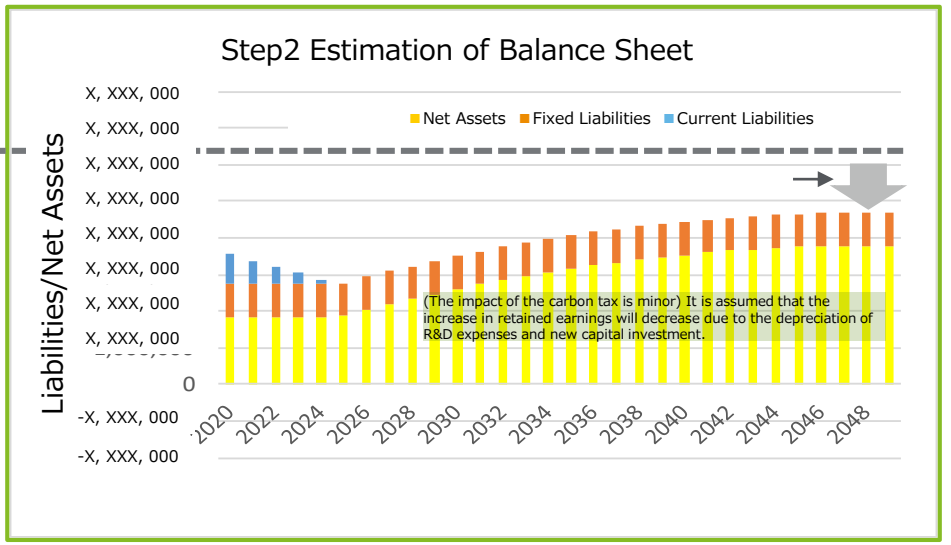
Net income and retained earnings are expected to decrease in order to achieve the reduction target for CO2 emissions. The R&D expenses and capital investments set forth in the previous page are also assumed to be required.

STEP 2: Taking into consideration R&D expenses and capital investment for achieving CO2 emission reduction targets



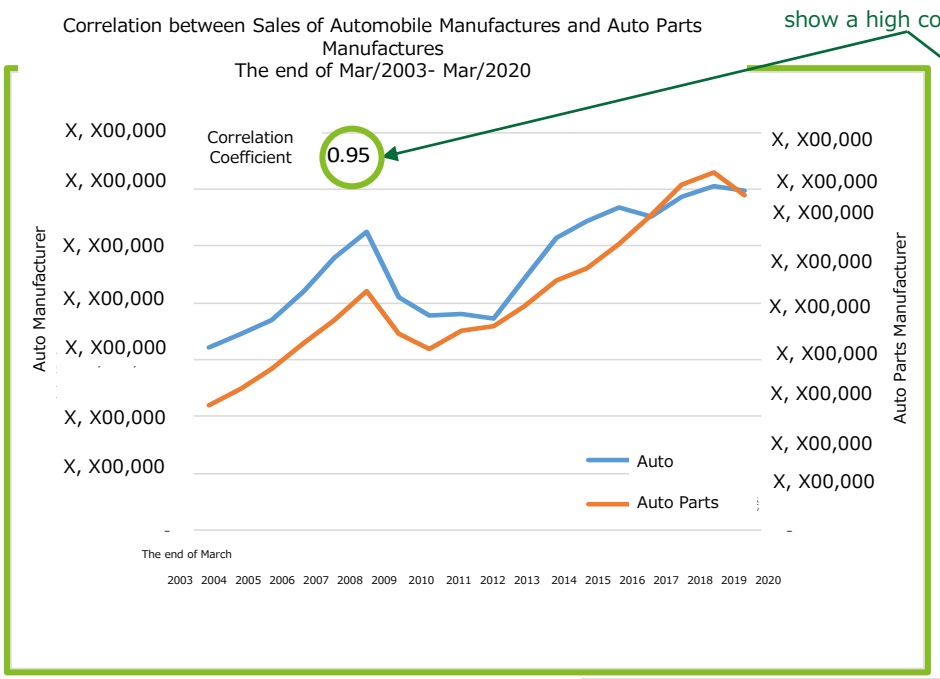




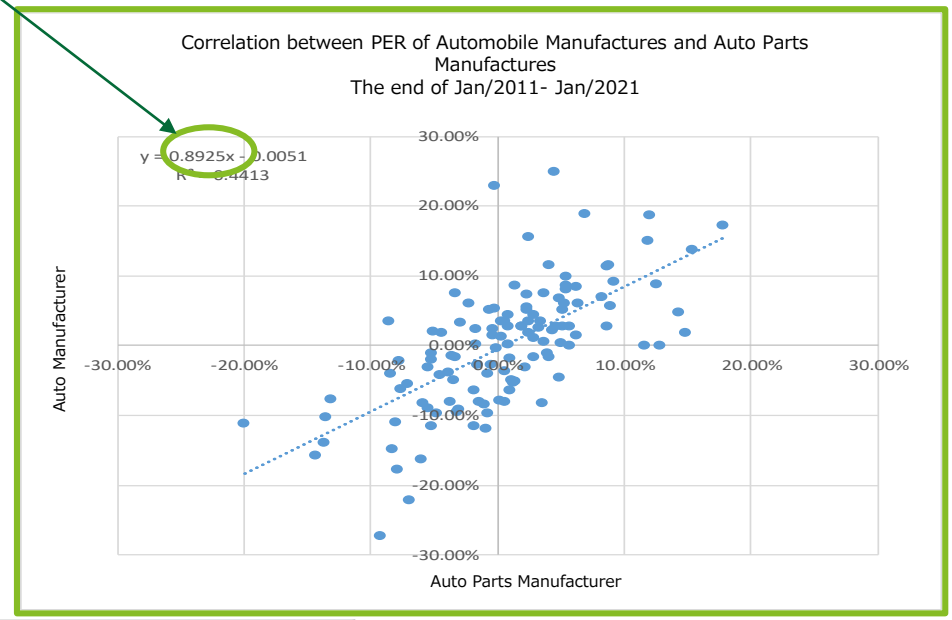


Since there is a high correlation between changes in sales of automobile manufacturers and auto parts manufacturers, we use simplified assumptions regarding auto parts manufacturers and apply them to automobile manufacturers

STEP 3: Concept of Sales Forecast



show a high correlation

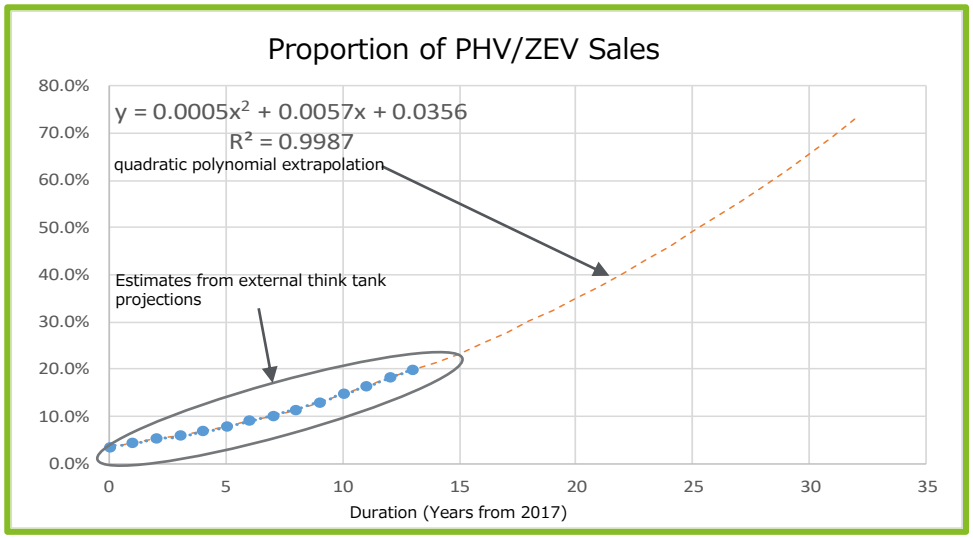


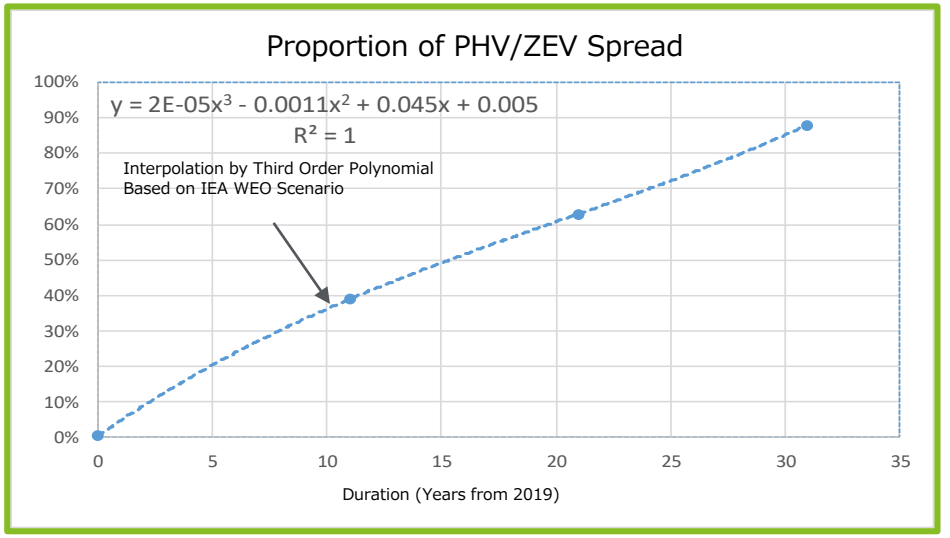
[simplified assumption]

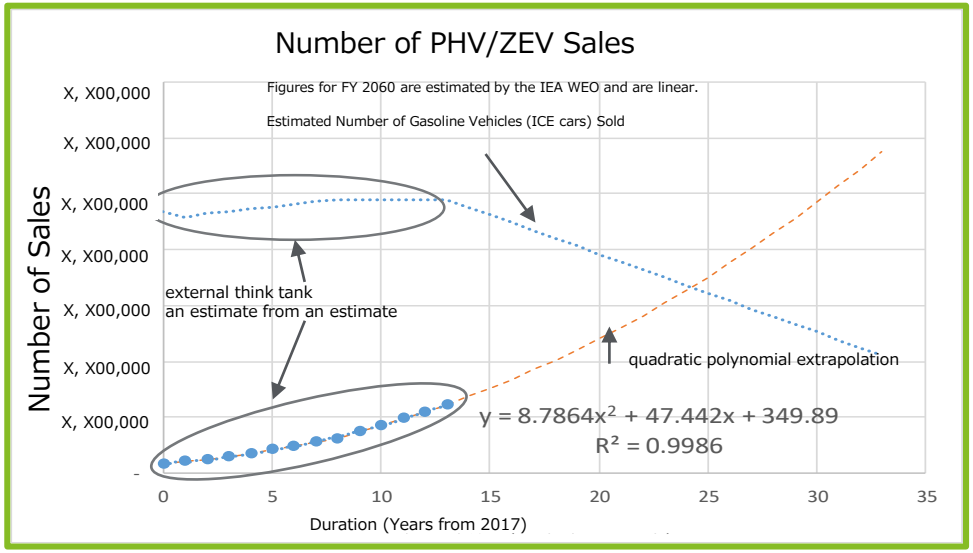
- The sales transition of automobile parts manufacturers is estimated to be linked with the sales transition prediction of automobile manufacturers.
- The sales transition forecast of automobile manufacturers is estimated from the sales transition forecast (Assuming that the unit price does not change significantly).
- Automobile manufacturers' sales are projected to be linked to the trend of the global automobile sales forecast (Use IEA WEO and private think tank values).
- R&D expenses and capital expenditures are expected to increase in line with sales forecasts

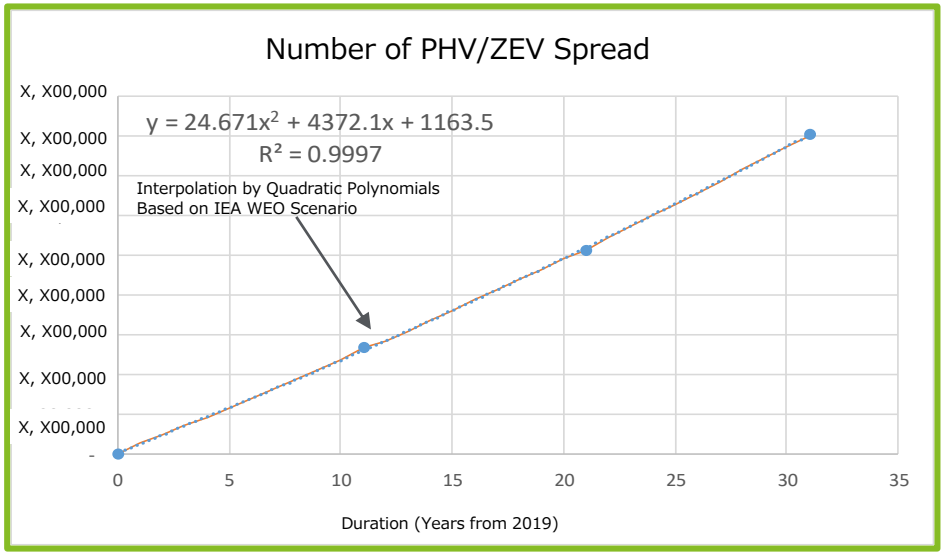
In order to take into account future changes in unit sales, calculations have been made from estimates of the "Percentage and number of units sold" and "Proportion of use and number of units" for next-generation vehicles, using scenarios developed by external think tanks and the IEA WEO

STEP 3: Forecasting the Future of Next-Generation Vehicles (≒ PHV or ZEV) in the Overall Automotive Market



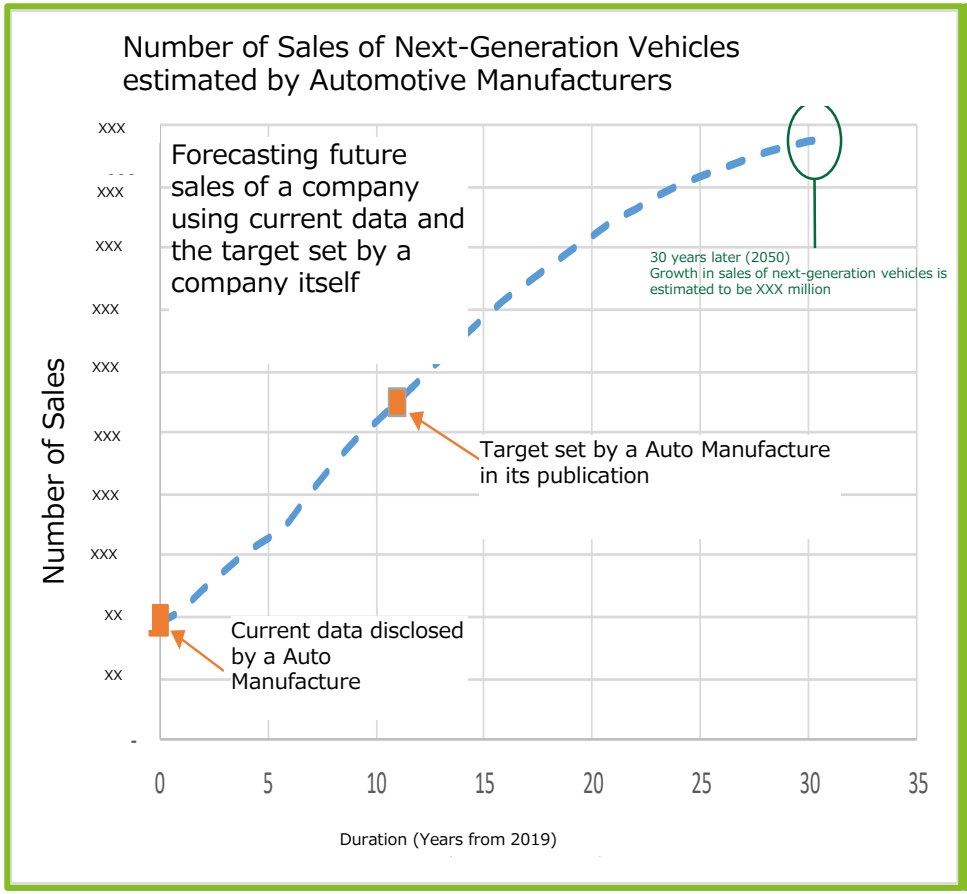


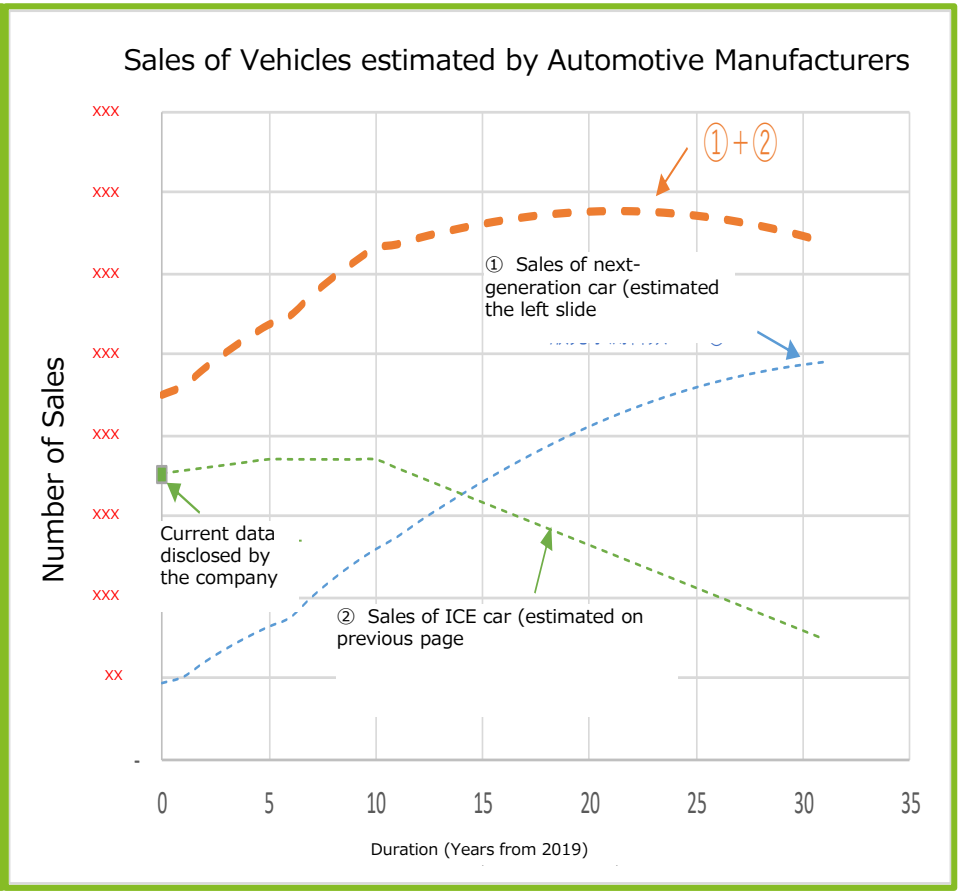




Based on the assumption that it will be linked to the market for next-generation vehicles as described in the previous page, we calculated the number of units sold by automobile manufacturers based on the actual and projected figures shown in our environmental and annual reports.

STEP 3: Automotive Manufacturers ' Forecasts for Future Sales of Next-Generation Vehicles (≒ PHV or ZEV)



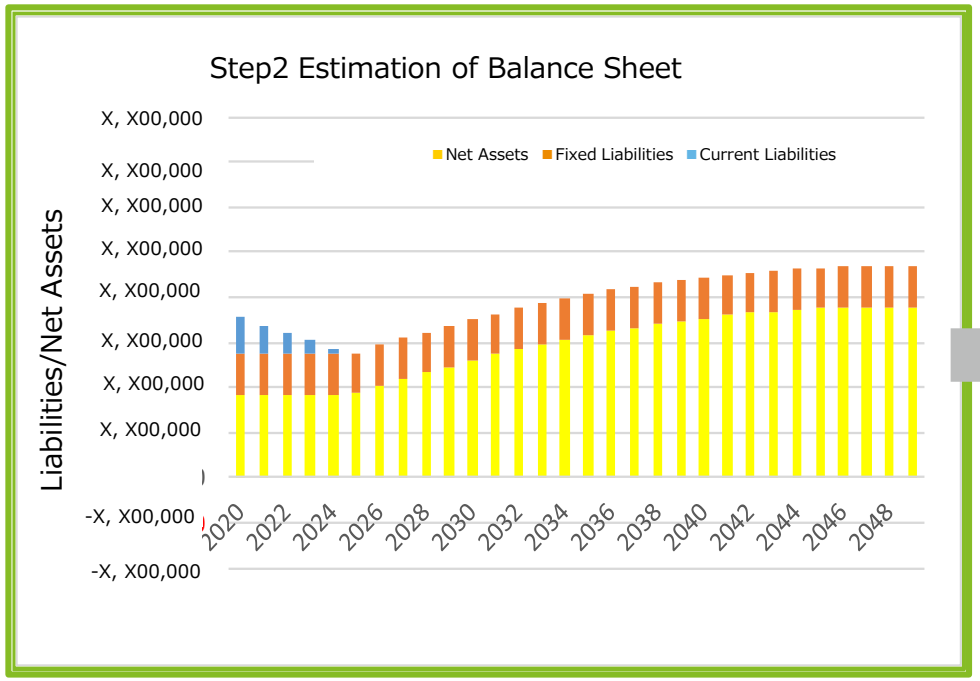


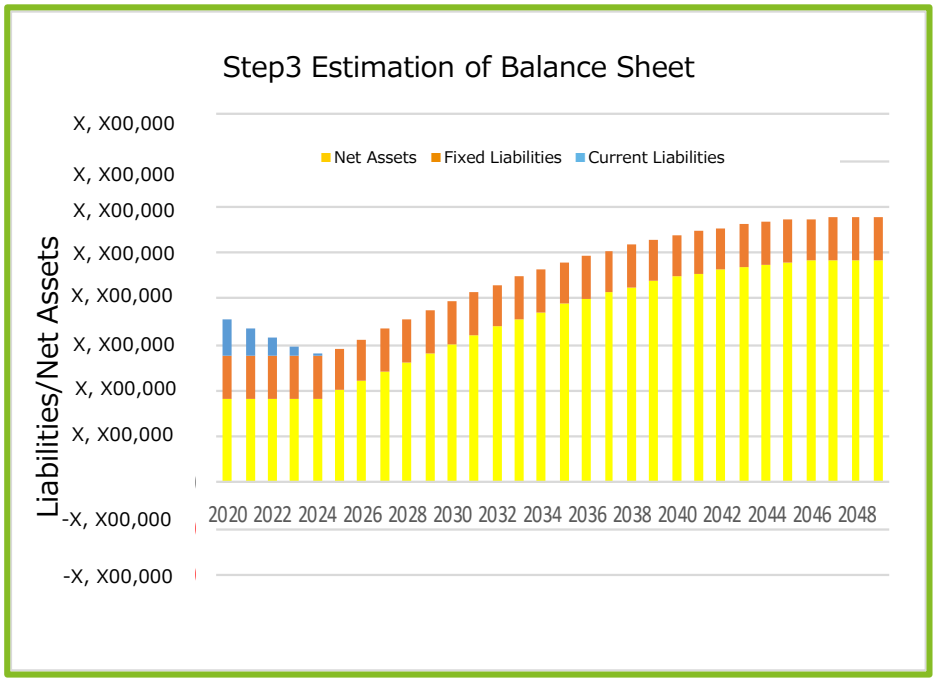
Based on the current scenario, it is expected that the growth of net assets will be restrained to a certain extent due to the increase in R & D expenses and capital investment (depreciation expenses associated with it).

STEP 3: Financial Impact of Automotive Component Manufacturers Based on Sales Forecasts

[Assumptions (Summary)]

- The sales of motor vehicle component manufacturers is assumed to be proportional to the sales of motor vehicle manufacturers.
- Automobile sales volume (Next-generation vehicles and gasoline-powered vehicles) is also assumed to be sold according to the scenario in accordance with the region and respective regulations. The unit selling price is assumed to be constant on average.
- R&D expenditure (and capital expenditure) increases in proportion to sales
- The ratio of ordinary income to sales shall remain constant over the last three years, excluding the increase in R&D expenses and the increase in capital investment.
- Global CO2 emissions at plants are assumed to be reduced to zero by 2050 as planned





Example of analysis (3):
Real estate (major player) (Omitted)

3. Practical examples of scenario analysis

3-1. Shiga Bank

3-2. Hachijuni Bank

3-3. Higo Bank

- ① Assess materiality of climate-related risks
- ② Identify and define range of scenarios
- ③ Evaluate Qualitative Business Impact
- ④ Quantitative assessment of transition risk
- **⑤ Quantitative assessment of physical risk**

① Collateral valuation

[Properties in scope]
- "Buildings" among all real estate properties held in Kumamoto City

[Prerequisites for the Property]
- Number of building floors: Since data on the number of floors of each property was unavailable, it was calculated uniformly.
- The variable used for the damage ratio is the one after the rank correction (Leveling of mixed floors).
- Building structure: The analysis was made by combining wooden and non-wooden construction. As above, the variable used for the damage ratio is not structure-specific..

[Damage ratio variable]
- Adjustment due to inundation depth zones that do not match the inundation depth classification and damage ratio classification on the hazard map

Hazard map inundation depth section	Flood control economic research manual		After adjustment loss ratio
	inundation depth section	loss ratio	
Less than 0 ~ 0.5 m	Less than 0 ~ 0.5 m	21.40%	21.40%
Less than 0.5 ~ 1.0 m	0.5 ~ 0.99 m	29.30%	29.30%
Less than 1.0 ~ 2.0 m	1.0 ~ 1.99 m	45.80%	45.80%
Less than 2.0 ~ 5.0 m	2.0 ~ 2.99 m	64.60%	83.6%
	3.0 m or more	83.60%	
5.0 m or more	—	—	100%

*According to the flood control economic survey manual, inundation depth of 3 m or more is assumed

In order to reduce the loss ratio to a uniform 83.6%, it is necessary to reduce assumptions regarding the damage caused.

The expected damage of an inundation depth of ≥5 m cannot be estimated. Inundation of ≥ 5 m is assumed to be a total loss (100%)

For a distance between 2 m and less than 5 m captured in the hazard map, it is assumed that the midpoint is 3.5 m

The Economic Survey Manual includes a ratio of loss caused by damage of 83.6% for 3m or more

[Calculation logic]
① Property identification: All collateral properties - land properties = buildings
② Understanding of inundation depth: building property address (latitude-longitude transformation) → inundation depth on hazard map
③ Damage Calculation: Collateral amount by inundation depth and building x Damage ratio by inundation depth = Loss on collateral due to flooding (Assumptions)

② Valuation of the company's decline in sales

[Properties in scope]
- Excerpts from enterprises located in the downtown (arcade) of Kumamoto City
- Understand the location and sales of each company

[Prerequisites for the Property]
- Number of building floors: Since data on the number of floors of each property was unavailable, it was calculated uniformly.
- The variable used for the damage ratio is the one after the rank correction (Leveling of mixed floors).
- Building structure: The analysis was made by combining wooden and non-wooden construction. As above, the variable used for the damage ratio is not structure-specific

[Number of days off work]
- Adjustment due to inundation depth zones that do not match the inundation depth classification and damage ratio classification on the hazard map

Hazard map inundation depth section	Flood control economic research manual		After adjustment number of days off work
	inundation depth section	number of days off work	
Less than 0 ~ 0.5 m	Less than 0 ~ 0.5 m	6.4 days	6.4 days
Less than 0.5 ~ 1.0 m	0.5 ~ 0.99 m	13.5 days	13.5 days
Less than 1.0 ~ 2.0 m	1.0 ~ 1.99 m	20.0 days	20.0 days
Less than 2.0 ~ 5.0 m	2.0 ~ 2.99 m	41.2 days	56.1 days
	3.0 m or more	56.1 days	
5.0 m or more	—	—	73 days

*According to the flood control economic survey manual, inundation depth of 3 m or more results in 56.1 days off work.

The number of business downtime days for inundation of 5m or more is based on the Dmap and interpolated linearly over the period (73 days).

For distances between 2 m and 5 m captured in the hazard map, it is assumed that the midpoint is 3.5 m.

Number of business suspension days by inundation depth = sales decrease due to flooding (Assumptions)

[Calculation logic]
① Understanding of inundation depth: building property address (latitude-longitude transformation) → inundation depth on hazard map
② Net Sales Decrease Calculation: Net Sales by Flood Depth and Property/Number of Business Days (Calculated for 242 days excluding holidays and national holidays)

Appendix

Appendix 1. Sector Climate Risk Assessment Materials

Appendix 2. Parameters used in the scenario group definition

Appendix

Appendix 1. Sector Climate Risk Assessment Materials

Appendix 2. Parameters used in the scenario group definition

GICS conducted a high-level evaluation of the impact of climate change for each of its 69 industries

Evaluation matrix excerpts

source of information / Sector	sectoral evaluation (Up to 34)	investor						ESG rating agency		Initiatives, etc.			
		TCFD Final Report	2 ii	EBRD	427	Calvert	GPIF	DJSI	FTSE	SASB	Climate Wise (* *)	GA Institute	Finch & Beak
Construction Materials	**30**	3	3	3	3	2	3	1	3	3	0	3	3
Metals & Mining	**28**	3	3	3	3	2	3						
Chemicals	**27**	3	0	3	3	2	3						
Paper & Forest Products	**25**	3	0	3	3	2	3						
Electric Utilities	**25**	3	3	3	3	2	3						
Gas Utilities	**22**	3	0	3	3	2	3						
Oil, Gas & Consumable Fuels	**22**	3	0	2	2	2	3						
Auto Components	**21**	3	3	2	1	1	1						
			3	2	1	1	1						

GICS based Sector classification.

. . .

Sources that cover only specific sectors

The source of the "*" mark shall be 3 points (Key sources of TCFD information) where there is a reference to the sector, 0 points where there is no reference;

Information sources for the "* *" mark are rated 1 point (Minor sources of TCFD information) if there is a sector reference, and 0 point if there is no reference.

Sources covering a wide range of sectors

For information sources that are not marked with an asterisk (*), the top 30% received 3 points, the next 31-60% received 2 points, and below 60% received 1 point. Roughness is evaluated on a scale of one to three (High/Medium/Low, etc.).

Climate-related risks evaluation matrix （1/2）

		Sectoral evaluation	Investor						ESG rating agency		Initiatives, etc.			
			TCFD Final Report	2ii	EBRD	427	Calvert	GPIF	DJSI	FTSE	SASB	Climate Wise	GA Institute	Finch & Beak
Code	Industry		Specific sector	Specific sector	Broad sector	Broad sector	Broad sector	Broad sector	Broad sector	Broad sector	Broad sector	Specific sector	Broad sector	Broad sector
151020	Construction Materials	30	3	3	3	3	2	3	1	3	3	0	3	3
151040	Metals & Mining	28	3	3	3	3	2	3	1	3	3	0	1	3
151010	Chemicals	27	3	0	3	3	2	3	1	3	3	0	3	3
151050	Paper & Forest Products	25	3	0	3	3	2	3	1	3	2	0	2	3
551010	Electric Utilities	25	3	3	3	3	2	3	1	1	2	0	2	2
551020	Gas Utilities	22	3	0	3	3	2	3	1	3	0	1	1	2
101020	Oil, Gas & Consumable Fuels	22	3	0	2	2	2	3	2	3	2	0	1	2
251010	Auto Components	21	3	3	2	1	1	1	3	2	1	0	3	1
251020	Automobiles	21	3	3	2	1	1	1	3	3	0	0	3	1
151030	Containers & Packaging	21	0	0	3	3	2	3	1	1	3	0	2	3
302010	Beverages	20	3	0	2	2	2	2	2	1	2	0	2	2
101010	Energy Equipment & Services	20	3	3	2	2	2	3	0	0	2	1	0	2
302020	Food Products	19	3	0	2	2	2	2	2	1	2	0	1	2
203020	Airlines	19	3	3	1	1	1	2	1	3	1	0	2	1
551040	Water Utilities	19	0	0	3	3	2	3	0	1	3	1	1	2
201010	Aerospace & Defense	18	0	0	2	1	1	2	3	2	1	0	3	3
551030	Multi-Utilities	18	0	0	3	3	2	3	1	3	0	0	1	2
203030	Marine	18	3	3	1	1	1	2	0	3	1	0	2	1
601020	Real Estate Management & Development	18	3	0	1	1	2	2	1	1	3	1	1	2
551050	Independent Power and Renewable Electricity Producers	17	0	0	3	3	2	3	0	1	0	0	3	2
203010	Air Freight & Logistics	17	3	3	1	1	1	2	1	1	1	0	2	1
203040	Road & Rail	17	3	3	1	1	1	2	0	2	1	0	2	1
201040	Electrical Equipment	16	0	0	2	1	1	2	2	1	1	0	3	3
401010	Banks	15	3	0	1	1	2	1	2	1	0	0	1	3
201060	Machinery	14	0	0	2	1	1	2	2	2	1	0	0	3
302030	Tobacco	14	0	0	2	2	2	2	2	1	0	0	1	2
401020	Thrifts & Mortgage Finance	14	3	0	1	1	2	1	2	0	1	0	0	3
201020	Building Products	13	0	0	2	1	1	2	3	0	1	0	0	3
201030	Construction & Engineering	13	0	0	2	1	1	2	3	0	0	0	1	3
301010	Food & Staples Retailing	13	0	0	1	1	1	2	2	1	2	0	2	1
403010	Insurance	13	3	0	1	1	2	1	1	1	1	0	1	1
201050	Industrial Conglomerates	12	0	0	2	1	1	2	3	0	0	0	0	3
252020	Leisure Products	12	0	0	2	1	1	1	2	1	0	0	3	1
352010	Biotechnology	12	0	0	2	3	1	1	1	1	0	0	1	2
352020	Pharmaceuticals	12	0	0	2	3	1	1	1	1	0	0	1	2

Source : Deloitte Tohmatsu

Climate-related risks evaluation matrix（2/2）

		Sectoral evaluation	Investor						ESG rating agency		Initiative, etc.			
			TCFD Final Report	2ii	EBRD	427	Calvert	GPIF	DJSI	FTSE	SASB	Climate Wise	GA Institute	Finch & Beak
Code	Industry		Specific sector	Specific sector	Broad sector	Broad sector	Broad sector	Broad sector	Broad sector	Broad sector	Broad sector	Specific sector	Broad sector	Broad sector
201070	Trading Companies & Distributors	**11**	0	0	2	1	1	2	2	0	0	0	0	3
202010	Commercial Services & Supplies	**11**	0	0	1	2	1	2	2	1	0	0	1	1
202020	Professional Services	**11**	0	0	1	2	1	2	2	1	0	0	1	1
253010	Hotels, Restaurants & Leisure	**11**	0	0	1	1	1	1	2	1	2	0	1	1
352030	Life Sciences Tools & Services	**11**	0	0	2	3	1	1	1	0	0	0	1	2
451020	IT Services	**11**	0	0	1	1	1	1	1	1	1	0	2	2
452010	Communications Equipment	**11**	0	0	1	2	1	1	1	1	0	0	3	1
452020	Technology Hardware, Storage & Peripherals	**11**	0	0	1	2	1	1	1	1	0	0	3	1
452030	Electronic Equipment, Instruments & Components	**11**	0	0	1	2	1	1	1	1	0	0	3	1
501010	Diversified Telecommunication Services	**11**	0	0	1	1	1	1	1	1	1	1	2	1
453010	Semiconductors & Semiconductor Equipment	**11**	0	0	1	2	1	1	1	1	3	0	0	1
252010	Household Durables	**10**	0	0	2	1	1	1	2	1	0	0	1	1
252030	Textiles, Apparel & Luxury Goods	**10**	0	0	2	1	1	1	2	1	0	0	1	1
351020	Health Care Providers & Services	**10**	0	0	1	1	1	1	2	0	2	0	1	1
451030	Software	**10**	0	0	1	1	1	1	1	0	1	0	2	2
601010	Equity Real Estate Investment Trusts (REITs)	**10**	0	0	1	1	2	2	0	1	0	0	1	2
203050	Transportation Infrastructure	**9**	0	0	1	1	1	2	0	0	0	1	2	1
255030	Multiline Retail	**9**	0	0	1	1	1	1	0	1	1	0	2	1
255040	Specialty Retail	**9**	0	0	1	1	1	1	0	1	1	0	2	1
303020	Personal Products	**9**	0	0	1	2	1	2	2	0	0	0	0	1
351010	Health Care Equipment & Supplies	**9**	0	0	1	1	1	1	2	1	0	0	1	1
402010	Diversified Financial Services	**9**	0	0	1	1	2	1	0	1	0	0	1	2
402030	Capital Markets	**9**	0	0	1	1	2	1	0	1	0	0	1	2
255020	Internet & Direct Marketing Retail	**9**	0	0	1	1	1	1	0	0	2	0	2	1
253020	Diversified Consumer Services	**8**	0	0	1	1	1	1	2	1	0	0	0	1
255010	Distributors	**8**	0	0	1	1	1	1	1	0	0	0	2	1
303010	Household Products	**8**	0	0	1	2	1	2	1	0	0	0	0	1
501020	Wireless Telecommunication Services	**8**	0	0	1	1	1	1	0	1	1	0	1	1
502010	Media	**8**	0	0	1	1	1	1	1	1	0	0	1	1
502020	Entertainment	**8**	0	0	1	1	1	1	3	0	0	0	0	1
402020	Consumer Finance	**7**	0	0	1	1	2	1	0	0	0	0	0	2
402040	Mortgage Real Estate Investment Trusts (REITs)	**7**	0	0	1	1	2	1	0	0	0	0	0	2
502030	Interactive Media & Services	**7**	0	0	1	1	1	1	1	0	1	0	0	1
351030	Health Care Technology	**6**	0	0	1	1	1	1	0	0	0	0	1	1

Source : Deloitte Tohmatsu

In the financial and non-financial sectors, the TCFD has also developed supplemental guidance for sectors that are particularly affected by recommendations for financial disclosure of climate-related risks and opportunities

Investors (1/6): TCFD Final Report

(Reference) Report of recommendations on disclosure of climate-related financial information

Outline of the Agency

- TCFD (Task Force on Climate-related Financial Disclosure): A task force to examine how financial institutions should consider climate-related issues. Established by the Financial Stability Board in 2015 at the request of the Group of 20 Finance Ministers and Central Bank Governors

Overview of Reports

- Recommendations for disclosure of governance, strategies, risk management, indicators and targets for climate-related risks and opportunities in financial reports
- In addition to guidance available for a wide range of industries, supplementary guidance is provided for industries that are likely to be particularly impacted

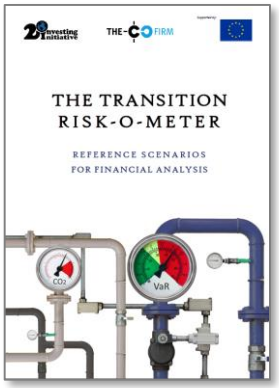
4 financial industries, 4 non-financial industries and 13 sectors are identified as industries and sectors that may be greatly affected by climate change.

Bank		Credit risk impacts on carbon-related assets, climate-related risk impacts on loans, and the positioning and classification of such risks in general risk analysis
Energy	✓ Oil and Gas ✓ coal ✓ Power	Assessment of legal compliance, changes in operating expenses, risks and opportunities, regulatory revisions, changes in consumer and investor trends, and changes in investment strategies, and disclosure of potential impacts
insurance		New insurance products and competitiveness, climate change scenario analysis results, business impacts, climate-related risk assessment and assessment models in the insurance portfolio
Transportation	✓ Air, marine, land motor vehicle transportation	Assessment and disclosure of potential impacts of financial risks to existing plants and equipment, investment in research and development of new technologies, and opportunities to use new technologies to meet low emission standards and fuel efficiency regulations, based on strengthened regulations and new technologies
asset owner		Investment strategy, scenario analysis, risk and opportunity assessment methodology, portfolio positioning for low-carbon energy transition, engagement practices, portfolio carbon share
Raw materials and buildings	✓ Metals/mining ✓ Chemistry ✓ Construction/ capital goods ✓ Real estate	Strengthen regulations on GHG emissions and carbon prices, assess risks to building materials and real estate due to worsening and increasing abnormal weather, evaluate opportunities for products that improve energy efficiency and use reduction, and disclose potential impacts
Asset Manager		Same as asset owner except for positioning
Agriculture, food and forestry products	✓ Beverages/food ✓ Agriculture ✓ Paper/forestry	Assessment of changes in business and consumer trends toward GHG emissions reduction, recycling and waste management, and low-GHG-emitting foods and textiles and disclosure of potential impacts

Source: TCFD, "Final Report: Recommendations of the Task Force on Climate-related Financial Disclosures"

The 2 ° C Investment Initiative provides transition risk parameters for risk assessment in highly affected sectors

Investors (2/6): 2 ° C Investment Initiative



(Reference) 2 ° C Investment Initiative Transition Risk Scenarios for TCFD Ready Enterprises (Including investment side)

Outline of the Agency

2 ° C Investment Initiative: A think tank that develops climate change risk indicators and policy options in financial markets

Overview of Reports

- Provide transition risk scenarios as required by TCFD for reference when performing financial risk and scenario analysis (ACT (ambitive climb transition) and 3 ~ 4 ° C LCT (limited climb transition)
- Key parameters for the carbon-intensive fossil fuel, electric power, automotive, steel, cement, aviation, and transport sectors based on existing scenarios such as the IEA

TABLE 0.2: KEY INDICATORS

Sector	riskfactor	index	Pagespage	Region	Mainsource
Cross Sector	Market Pricing	Crude oil price (USD/bbl)	22	World	IEA ETP
		Natural gas price (USD/MBtu)	23	US, EU	IEA ETP
		Coal prices (USD/ton)			
		Electricity prices (2015 EUR/MWh)			
	Policies costs and incentives	Carbon prices (2015 USD / T-Coeq)			
Power Company	Production & Technology	Electricity generation (TWh)			
		Electricity capacity (GW)			
	Market Pricing	Levelised costs of electricity (€/MWh)			
	Policies costs and incentives	Subsidies (€/Mwh)			
		Effective carbon rates ($/tCO$_2$)			
motorvehicle	Production & technology	Sales by powertrain (%)			
	Market Pricing	Carbon fibre (USD/pound)			
		Battery costs (USD/kWh)			
	Policy costs and incentives	Fuel efficiency standards (%)			
		Effective carbon rates(EUR/tCO$_2$)			
Steel	Production & technology	Crude Steel production (Mt)			
		Share of primary/secondary steel(%)			
		Energy Intensity (GJ / t crude steel)			
		Carbon Intensity (t CO$_2$ / t crude steel)			
	Market Pricing	Crude Steel Price (USD / ton)			
		Raw Materials Prices (USD / ton)			
	Policy costs and incentives	Allowances of free CO2 allowances(% of total CO$_2$ direct emissions)			
cement	Production & technology	Cement production (Mt)	54	World, BR, MX, USA, FR, DE, IT	IEA ETP, EC Trends 2050
		Clinker to cement ratio (%)	55	World, BR, MX, USA, FR, DE, IT	IEA ETP
		Energy intensity for clinker production (GJ / t clinker)	56	World, BR, MX, USA, FR, DE, IT	IEA ETP
		Share of alternative fuel use (%)	57	World, BR, MX, USA, FR, DE, IT	IEA ETP
		CCS deployment (%)	58	World, BR, MX, USA, FR, DE, IT	IEA ETP
		CO$_2$ Intensity (t CO$_2$ / t cement)	59	World, BR, MX, USA, FR, DE, IT	IEA ETP
	Market Pricing	Secondary Fuels (USD/ton)	60	World	Third-party source
	Policy costs and incentives	Allowances of free CO2 allowances(% of total direct emissions)	61	BR, EU, MX, USA	IEA ETP and Third-party source
aviation	Production & technology	Demand (passenger-km)	64	World, BR, MX, USA, EU	IEA ETP and Third-party source
		Fuel efficiency (g fuel burned /revenue passenger-km)	65	World	ICCT
		Biofuel penetration (%)	66	BR, MX, USA, FR, DE, IT	ICAO IEA ETP and Third-party source
	Market pricing	Jet fuel prices (USD / gallon)	67	World	IEA ETP
	Policy costs and incentives	Carbon credit mandates (USD/tCO$_2$)	68	World	ICCT, ENVI
		Fuel efficiency standards (kg/km)	69	World	ICCT
Transportation	Production & technology	Shipping Transport Demand (G ton km / year)	72	World	IMO
		Fuel efficiency (kJ/tonne-km)	73	World	Third-party source
		Alternative fuels penetration (%)	74	World	Third-party source
	Market Pricing	Marine Fuel prices (fraction to 2010 HFO price) and (USD/GJ)	75	World	Third-party source
	Policies costs and incentives	Efficiency Design Regulations	76	World	Third-party source
		Emission/Fuel standard	77	World	Rightship

Identify sectors with high carbon emissions that are highly affected by transition risks

- **electric power company**
- **motor vehicle**
- **Steel**
- **cement**
- **aviation**
- **Transportation**

Set up four risk factors

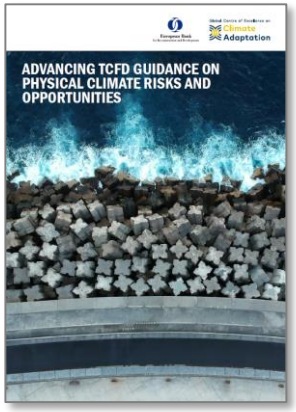
- Production & Technology
- market price
- Policy Obligations, Incentives and Taxes
- unconventional risk

Set indicators and parameters for each risk factor

Source: 2 ° Cinitiative, "The Transition Risk-O-Meter"

The EBRD evaluates the impact of climate change driven physical risk by sector

Investor (3/6): EBRD



(Reference) Assessment guidance for physical risks and opportunities from the TCFD Recommendation

Outline of the Agency

- The EBRD (European Bank for Reconstruction and Development) was established to develop market economies in Central and Eastern Europe after the Cold War. Promote "environmentally sustainable development" and actively invest in climate change.
- GCECA (Global Environment Adaptation Center) is an organization established by the United Nations and governments of countries such as the Netherlands. Partnership with NGOs and financial institutions to promote climate adaptation through sharing knowledge and developing evaluation methods

Overview of Reports

- Based on the TCFD, this document provides guidance on matters to be considered and reference indicators for each company's assessment of physical risks and opportunities. Compiled based on discussions in working groups involving financial institutions and companies
- Require analysis by value chain, geography based disclosure, and asset impact assessment

Public utilities (Electricity, gas, etc.) and the materials sector are considered to be highly affected by the physical risks of climate change.

	Acute			Chronic				
Industry	storm cyclone	torrential rain flood	intense heat	variation in precipitation	temperature fluctuation	water stress	sea level rise	Other
motor vehicle	High	High	High	Medium	High	Medium	High	Degraded air quality
durable consumer goods Apparel	High	High	High	Medium	High	Medium	High	Degraded air quality
consumer service	High	High	Low	Medium	Medium	Medium	High	
Media	High	High	Low	Low	Low	Low	High	
Retail	High	High	Low	Low	Low	Low	High	
food retail	High	High	Low	Medium	Medium	Medium	High	
Food, beverages, and tobacco	High	High	Medium	High	High	High	High	Soil degradation, ocean acidification
Home personal goods	High	High	Medium	Medium	High	Medium	High	

GICS applies a three-stage assessment of physical risk due to climate change across the 24 industry category groups.

The utility sector (Electricity, gas, etc.) and the materials sector are rated high for all risk categories.

The food, beverage, and tobacco sectors, as well as capital goods, also have a high number of risks that are rated high.

Risk Type

- storm cyclone
- Heavy rains and flooding
- intense heat
- variation in precipitation
- temperature fluctuation
- water stress
- sea level rise
- Others (air and soil pollution, melting of permafrost, forest fires, etc.)

Source: EBRD and GCECA, "Advancing TCFD guidance on physical climate risks and opportunities"

Analysis by German asset management firm on vulnerability to climate-related risks by sector

Investor (4/6): 427/DWS

(Reference) Guidance for investors in assessing physical risk

Outline of the Agency

- Four Twenty Seven: A market intelligence research firm specializing in the economic risks of climate change. Providing services, including climate risk assessment of financial portfolios and development of climate resilience strategies (Moody's Acquired)
- DWS (Deutsche Asset Management): an asset management company based in Germany

Overview of Reports

- Sets out the approach to climate-related physical risk scoring (Business risk, supply chain risk, and market risk) which is provided by industries industry and country
- reported that climate-related physical risks are particularly pronounced in Asia.

Four Twenty Seven's assessment is broadly divided into three risk types and developed climate-related risk indicators

- Assessment of climate-related risks across GICS 24 segment industry groups
- Each indicator included in the risk type is evaluated at 0 -100
- The numbers represent resilience, with lower numbers more vulnerable to climate-related risks

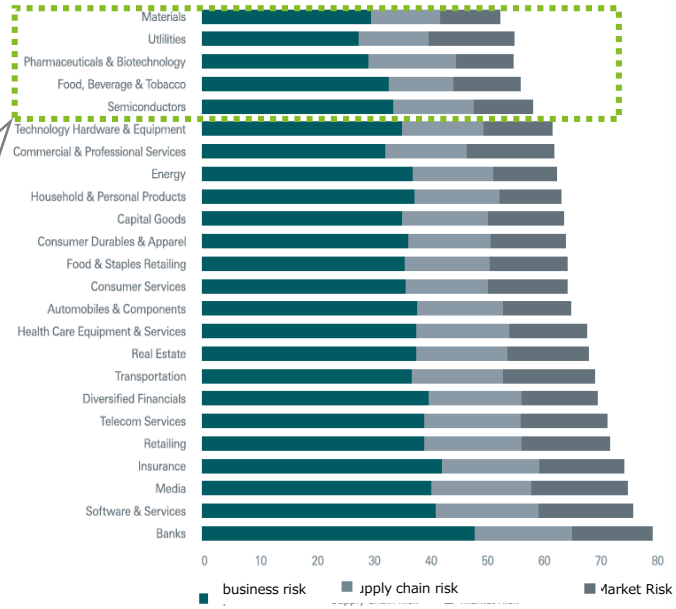
Risk Type	index
Business Risk	• Hot, • water stress • torrential rain • forest fire • sea level rise • tropical cyclone • socioeconomic vulnerability
supply chain Risk	• Countries with production and manufacturing bases • dependency on resources
Market Risk	• Countries where products and services are sold • sensitivity to weather

Market risk tends to be low in all sectors.

Overall, the top 20% of the least resilient sectors are:

- **Material**
- **Public utilities (Electricity, gas, etc.)**
- **Pharmaceutical and Biotechnology**
- **semiconductor**

Breakdown of Risk Results
(Industry Risk Assessment of 500 Asian Companies)



Source: "Measuring physical climate risk in equality portfolios" Four Twenty Seven, DWS

By linking the SASB materiality map for investors with the SDGs, Calvert's analysis assesses the long-term financial impact of each SDGs by sector

Investors (5/6): Calvert

Outline of the Agency

- Calvert Research and Management is a subsidiary of Eaton Vance, a U.S. investment management company, and a socially responsible investment (SRI: Socially Responsible Investment) management company. Asset value as of November 2017 is approximately USD 10 billion

Overview of Reports

- Mapping of SASB's sectoral materiality map * with sustainable development goals (SDGs) (SASB 71% meets SDGs)
- Clarifying the long-term financial impact by sector SDGs, with the aim of supporting investors make ESG investment decisions.

*Detailed on SASB description slides

- Expressing the financial impact of the SDGs by sector (The same color indicates the same sector, and the size of the box indicates the degree of influence.)
- See "SDG 13 Climate Change" for sector impacts on climate change
- high-impact sector
  - **non-renewable resource**
  - **Consumer Goods 1 (Crops, meats and dairy products, processed foods, non-alcoholic beverages, alcoholic beverages, tobacco, household goods and general consumer goods)**
  - **Infrastructure**
  - **Finance**
  - **Transportation**

Source: Calvert, "ESG Integration INSIGHTS"

The GPIF provides historical performance and future scenario data as the basis for TCFD disclosures. CO2 emissions by sector (Net sales to net sales) are calculated for carbon intensity

Investors (6/6): GPIF

Outline of the Agency

- GPIF: Government Pension Investment Fund. An organization whose purpose is to contribute to the stability of the employees' pension insurance business and the national pension business. Assets at the end of June 2019 were approximately 161 trillion yen
- Signed PRI (United Nations Principles for Responsible Investment) in September 2015. Focus on ESG investment

Overview of Reports

- Quantitative data on climate change analyzed by Trucost, the world's leading environmental assessment organization. Includes "Past Performance" and "forward looking scenario analysis"
- Provides data that can be used by GPIF asset owners and asset managers to disclose climate-related information in accordance with TCFD recommendations

セクター別カーボンインテンシティ (C/R) の内訳

	Communication Services	Consumer Discretionary	Consumer Staples	Energy	Financials	Health Care	Industrials	Information Technology	Materials	Real Estate	Utilities
Domestic Equities 16FY	0.43	0.82	2.00	3.10	0.07	0.46	1.76	0.90	8.55	0.78	16.68
TOPIX 16FY	0.42	0.82	2.01	3.07	0.07	0.46	1.70	0.90	8.56	0.70	15.97
Domestic Equities 17FY	0.39	0.94	2.26	4.59	0.07	0.50	1.98	1.01	8.69	0.77	16.91
TOPIX 17FY	0.39	0.94	2.26	4.51	0.07	0.49	1.92	1.02	8.74	0.69	16.80
Domestic Equities 18FY	0.40	0.89	2.12	4.55	0.07	0.48	1.80	0.98	7.96	0.67	17.35
TOPIX 18FY	0.40	0.90	2.13	4.33	0.07	0.48	1.77	1.00	8.08	0.62	17.72
Foreign Equities 16FY	0.44	0.84	1.81	6.65	0.30	0.39	1.72	0.69	11.19	1.05	20.71
ACWI 16FY	0.45	0.83	1.75	6.93	0.30	0.38	1.75	0.69	11.17	1.06	20.82
Foreign Equities 17FY	0.43	0.86	1.82	6.44	0.35	0.35	1.75	0.74	10.53	1.34	18.17
ACWI 17FY	0.44	0.86	1.79	6.46	0.36	0.35	1.73	0.73	10.69	1.37	18.30
Foreign Equities 18FY	0.43	0.81	1.78	6.21	0.35	0.37	1.72	0.71	10.28	1.25	19.33
ACWI 18FY	0.44	0.83	1.81	6.28	0.36	0.37	1.71	0.72	10.69	1.25	19.40
Domestic Bonds 16FY	0.42	0.94	1.61	3.10	0.08	0.51	1.80	0.63	14.14	0.74	22.36
Domestic Bonds 17FY	0.38	0.88	1.62	5.23	0.07	0.48	2.14	0.73	12.65	0.75	23.54
Domestic Bonds 18FY	0.39	0.84	1.69	5.13	0.07	0.43	2.10	0.85	10.89	0.86	21.16
Foreign Bonds 16FY	0.45	0.80	1.70	7.36	0.16	0.38	1.82	0.58	12.20	0.67	28.81
Foreign Bonds 17FY	0.35	0.86	1.39	7.69	0.12	0.44	1.94	0.43	9.13	0.91	28.35
Foreign Bonds 18FY	0.35	0.94	2.04	7.72	0.14	0.52	1.59	0.55	9.71	0.73	25.82

Less Carbon Intensive — More Carbon Intensive

- Calculate carbon intensity (C/R: CO2 emissions as a percentage of sales) by sector (t-CO2/1 million yen)
- Industry classification is based on the World Industrial Classification Standard.
  11 sectors of (GICS = Global Industry Classification Standard)
- high-intensity sector
  - **public utility**
  - **Material**
  - **Energy**

Source: GPIF, "Climate Change Risk Analysis of GPIF Portfolio"

DJSI's Corporate Sustainability Assessment looks at the importance of "climate strategy" as determined by industry participants

ESG Assessment (1/2) – DJSI/RobecoSAM

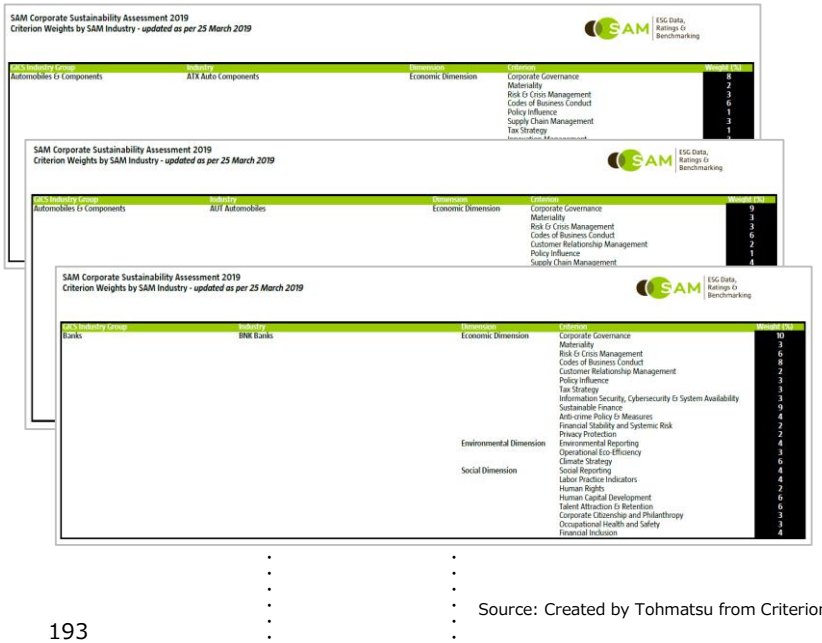
Outline of the Agency

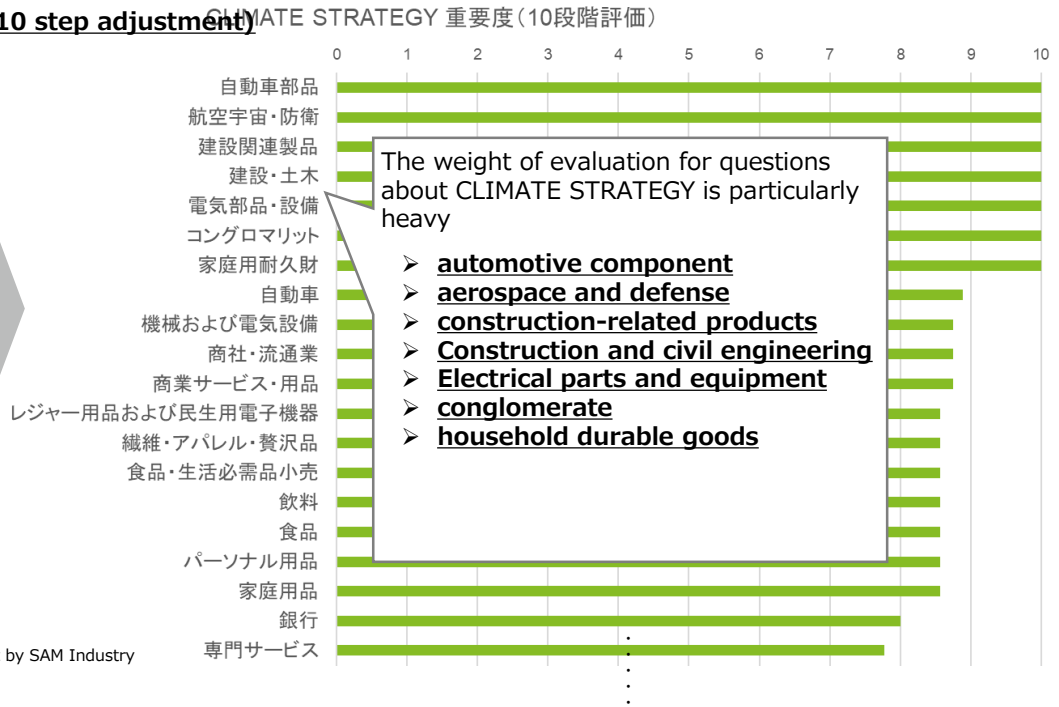
- Dow Jones Sustainability Index (DJSI): The Jones Sustainability Index is organized by Dow Jones and is aimed at sustainability investors. The results of RobecoSAM will be used to create the index.
- RobecoSAM: An ESG research organization based in Switzerland. The company has been conducting sustainability evaluations (Corporate Sustainability Assessment) of major listed companies since 1999.

Overview of Corporate Sustainability Assessment (CSA)

- Questionnaire ESG Survey Responded by Major Listed Companies
- The questions consist of three major sections: 1) economy, 2) environment, and 3) ESG structure of society.
- CSA 2018 evaluates 2,686 companies across 60 industry segments, covering approximately 3,500 global companies (Of which 381 are Japanese companies).

The industry weighting for climate strategy has been set at 2 ~ 10 (10 step adjustment)





Source: Created by Tohmatsu from Criterion Weight by SAM Industry

The ESG Data Model provides an industry assessment of climate change related risks

ESG Assessment (2/2) - FTSE

Outline of the Agency
- An independent company 100% owned by the London Stock Exchange that has been designing and maintaining indexes for more than 50 years and has worked on the governance of index r
- Leading global provider of benchmarking, analytics and data solutions for investors

ESG Data Model Overview
- Approximately 100 dedicated research analysts conduct ESG Data Model analysis and assessment
- The question consists of three pillars: (1) Environment, (2) Society, and (3) ESG Structure of Governance.
- About 4,100 companies were surveyed (Of which 750 are Japanese companies)

Industry Weighting of Climate Change Questions

The sectors with high climate change-related risks as the first impact sector *

- **fossil fuel**
- **Mining**
- **Forestry**
- **Agriculture**
- **Energy**
- **Transportation, etc.**

*First impact sector = risk exposure set to high

first impact subsector	second impact subsector	third impact subsector
Oil and Gas Exploration and Development	oil crisis service	electronic equipment
integrated oil and gas	Pipeline	settlement and transfer services
basic chemistry	renewable energy crisis	home electronics
Construction materials and equipment	Electrical parts and equipment	Toys
Forestry	Railroads	clothing and accessories
paper industry	automotive component	healthcare provider
Aluminum	processed food	medical device
nonferrous	housing construction	medical supplies
Iron and Steel	defence	Biotechnology
coal	industrial equipment	Broadcasting and Entertainment
motor vehicle	Pharmaceuticals	Bank
shipping	entertainment goods	comprehensive insurance
motor vehicle	semiconductor	life insurance
:	:	:

Source: FTSE Russel, "ESG Data Model"

The SASB sets sustainability priorities for each industry, from which it identifies sectors where GHG emissions, energy management, and physical impacts of climate change are significant.

Initiatives (1/4): SASB

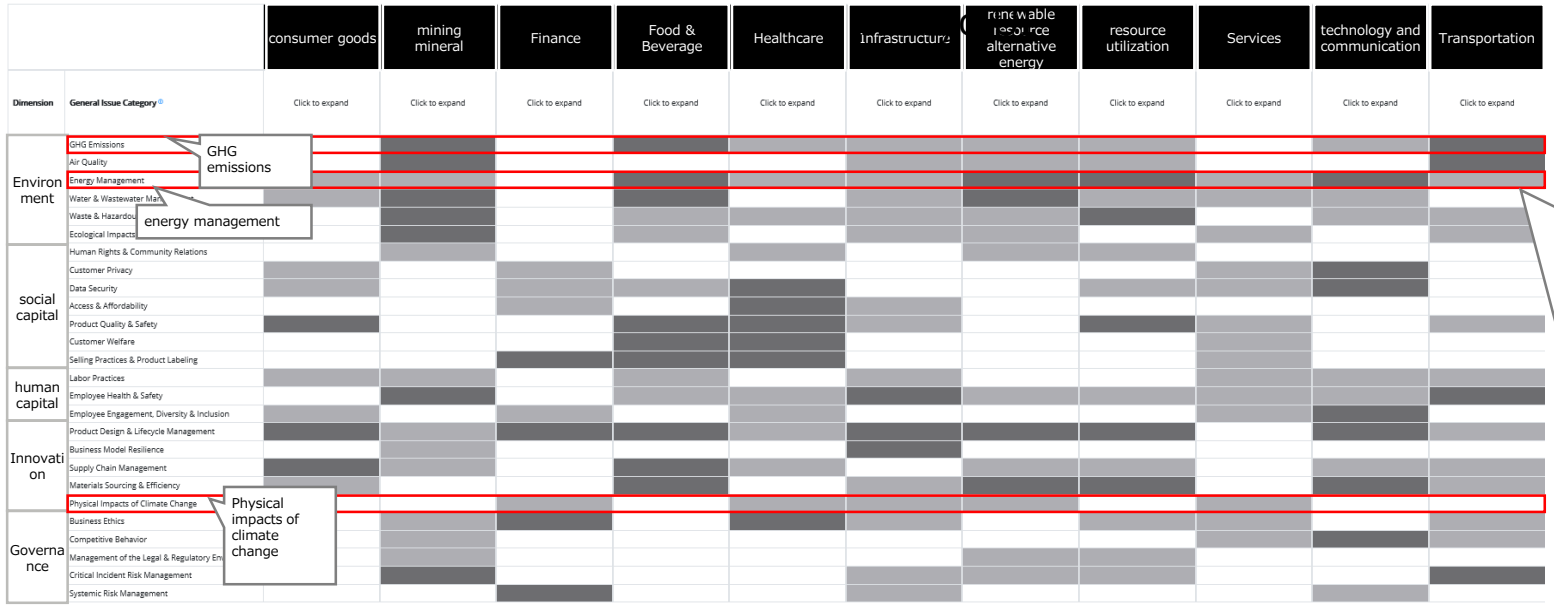
(Reference) SASB standards for disclosure of sustainability information to investors by industry

Outline of the Agency

- SASB (Sustainability Accounting Standard Board) is a non-profit organization that promotes the disclosure of sustainability information to meet investor needs.

Report Summary

- Establishment and publication of sustainability accounting standards for financial information disclosure for each industry
- Preparation of sustainability standards by presenting sector-specific items for sustainability disclosure items (GHG emissions, energy, water, occupational health and safety, environmental and social impacts of supply chains, raw material procurement, etc.)



The following are sectors where GHG emissions, energy management, and the physical impacts of climate change are key issues

- **Mining and Minerals**
- **Food and beverages**
- **Transportation**
- **Renewable resources and alternative energy**
- **resource utilization**
- **Technology & Communication**

Source: SASB, " Materiality Map "

ClimateWise identifies the infrastructure industry as particularly vulnerable to climate change risks and analyzes sectoral Transition risks in 2.7 ° C and 2 ° C scenarios

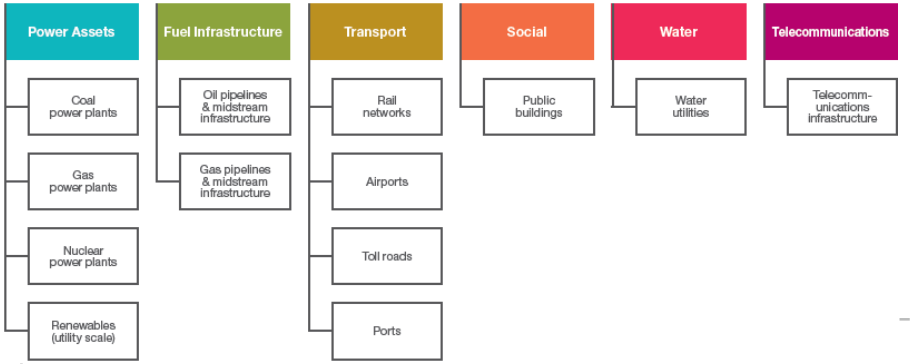
Initiatives (2/4): ClimateWise

Outline of the Agency

- ClimatWise: An insurance industry initiative led by the University of Cambridge. Participation by Tokio Marine & Nichido from Japan
- The Climate Wise policy is based on the TCFD recommendations, and participating institutions are required to submit reports in accordance with the policy every year.

Overview of Reports

- Providing an "open source modeling framework" as a support tool for calculating the financial impact on infrastructure investment, etc. associated with the transition to a low-carbon society
  - ➢ Insurance companies also conduct business as institutional investors, and it is necessary to understand the transition risks of the companies in which they invest.
  - ➢ Analysis of Transition risks in the infrastructure industry based on the perception that the infrastructure industry is particularly vulnerable to Transition risks



Infrastructure Risk Exposure Matrix

Transition risk by infrastructure asset type				Paris Agreement (NDCs)			2°C Scenario		
Sector	Sub-sector	Asset Types	Geography	2020	2030	2040	2020	2030	2040
Power Generation	Coal	Coal-fired power plants	U.S.	Minimal	Med Risk	Med Risk	Med Risk	High Risk	High Risk
			EU	Med Risk	Med Risk	High Risk	Med Risk	High Risk	High Risk
			India	Low Risk	Med Risk	Med Risk	Low Risk	Med Risk	High Risk
	Gas	Gas-fired power plants	U.S.	Minimal	Minimal	Minimal	Minimal	Low Risk	Med Risk
			EU	Minimal	Low Risk	Low Risk	Low Risk	Med Risk	High Risk
			India	Minimal	Minimal	Minimal	Minimal	Minimal	Minimal
			U.S.	Med Risk	Med Risk	Med Risk	Med Risk	Low Risk	Low Risk

- Assessment of 2020, 2030, and 2040 Transition risks by sector and region (United States, EU and India) in the infrastructure industry
- Evaluated in Paris Agreement scenario (2.7 ° C) and 2 ° C scenario
- Sectors identified as high risk in 2040 under the 2 ° C scenario are "coal-fired power generation" "gas-fired power generation" "Oil pipelines and midstream sector infrastructure" and "Gas supply facility"

Source: Cambridge ClimateWise "Transition risk framework", Japan Institute for Environmental Finance website

GA Institute analyzes more than 1,000 sustainability reports and aggregates sectoral disclosures linked to SDGs. Sectors with high exposure to climate change are identified

Initiatives (3/4): GA Institute

Outline of the Agency

- Governance & Accountability Institute is a U.S. consulting firm specializing in sustainability. Conducted analysis of sustainability reports for companies that comply with GRI guidelines

Report Summary

- Analyzes the sustainability reports of 1,387 companies in the GRI's sustainability report database
- Industry category: FTSE Russell's "industry classification benchmark" (ICB = Industry Classification Benchmark) 41 sectors
- Heat map of sustainable development goals (SDGs) and industrial sector matrix. It is intended to be used for materiality analysis by companies and ESG investment decisions by investors.

SDGS / SECTOR (# companies)	1	2	3	4	5	6	12	13
ALL SECTORS (1387)	20.16	24.3	27.04	33.37	27.48	19.74	23.59	27.46
Aerospace & Defense (6)	24.28	22.37	37.54	49.96	35.02	25.82	32.16	39.2
Alternative Energy (9)	21.51	26.82	48.65	49.96	41.97	41	40.78	36.61
Automobiles & Parts (29)	39.32	37.08	48.39	45.07	42.46	40.84	45.2	44.72
Banks (133)	30.34	29.54	8.48	42.47	30.44	-6.58	10.61	20.63
Beverages (23)	20.42	22.66	29.48	34.02	30.95	25.77	35.78	31.96
Chemicals (99)	18.82	26.01	42.85	36.94	31.76	38.87	38.66	36.96
Construction & Materials (76)	18.22	26.63	34.84	32.42	26.47	29.3	31.04	33.15
Electricity (53)	31.88	33.63	41.65	40.92	34.55	34.6	27.81	32.54
Electronic & Electrical Equipment (48)	21.68	23.2	34.61	43.19	33.4	26.3	33.34	35.52

- Tabulated disclosure status by sector for each SDG goal (The larger the number, the more companies disclose in their reports.)
- See "SDG 13 Climate Change" for sector impacts on climate change
- The sectors in the top 20% are:
  - **aerospace and defense**
  - **alternative energy**
  - **automobiles and parts**
  - **Chemistry**
  - **electrical and electronic equipment**
  - **leisure goods**
  - **oil and gas refining**

Source: GA Institute, "Sustainability Materiality of the SDGs Targets & GRI Indicators "

Finch & Beak aggregates market sizes (opportunity) by SDGs and industry sectors. Industries with large markets (opportunity) associated with climate change are identified

Initiatives (4/4): Finch & Beak

Outline of the Agency
- Finch & Beak is a sustainability consulting firm based in the Netherlands. Providing services mainly in Europe

Report Summary
- Market size (opportunity) calculated by sustainable development goals (SDGs) and industry sectors
- 24 sectors according to the World Industrial Classification Standard (GICS = Global Industry Classification Standard)
- It is intended to be used for materiality analysis by each company and ESG investment decisions by investors.

Estimation of potential market size by SDGs based on DJSI

GICS Industry Groups	1	2	3	4	5	6	12	13
Automobiles & Components			93				93	93
Banks	252		252		252		252	252
Capital Goods		324	324			324	324	324
Commercial & Professional Services	74		74	74	74		74	74
Consumer Durables & Apparel	110				110	110	110	110
Consumer Services	89	89	89	89	89	89	89	89
Diversified Financials	160				160		160	160
Energy	159	159	159			159	159	159
Food & Staples Retailing	67	67	67		67	67	67	67
Food, Beverage & Tobacco	157	157	157		157	157	157	157
Health Care Equipment & Services	127	127	127			127	127	127
Household & Personal Products	43	43	43			43	43	43
Insurance	139	139	139		139	139	139	139
Materials		282	282			282	282	282
Media	94		94	94			94	94
Pharmaceuticals, Biotechnology & Life Science	157	157	157			157	157	157
Real Estate	244		244			244	244	244
Retailing	115	115	115			115	115	115
Semiconductors & Semiconductor Equipment			68			68	68	68
Software & Services			185	185			185	185
Technology Hardware & Equipment			119	119		119	119	119
Telecommunication Services	91	91	91	91	91		91	91
Transportation	136	136	136			136	136	136
Utilities	165	165	165			165	165	165
Total	**2379**	**2051**	**3180**	**652**	**1139**	**2501**	**3450**	**3450**

- For each SDG goal, the market size (opportunity) is calculated for each sector of the industry segment used in DJSI.
- The sector impacts of climate change Refer to "SDG 13 Climate Change"
- The sectors in the top 20% by market size (opportunity)
  - **Bank**
  - **capital goods**
  - **Material**
  - **real estate**

Source: Finch & Beak, "SDG mapping with 2016 DJSI industries"

Appendix

Appendix 1. Sector Climate Risk Assessment Materials

Appendix 2. Parameters used in the scenario group definition

①Real estate sector

②Energy sector

③Automotive sector

For risk opportunities assessed as importance, predicted data for the 2 ° C/4 ° C scenario were collected as parameters.

important item (subject of analysis)	Configured Parameter	Current	4 ° C		2 ° C	
			Before 2030	After 2040	Before 2030	After 2040
Carbon tax and carbon price	(1) carbon tax	Japan: None Overseas: Some	(2030) Japan: N/A EU: 33 USD/t	(2040) Japan: N/A EU: 43 USD/t	(2030) Developed Countries: 100 USD/t In developing countries: 75 USD/t	(2040) **Developed Countries: 140 USD/t** In developing countries: 75 USD/t
Compliance with GHG emission regulations	(2)Energy consumption per unit of building	(base year) Global 2014	(2030) Improvement rate of 6%	(2040) Improvement rate of 21%	(2030) Improvement rate of 7%	(2040) **Improvement rate of 34%**
	(3)grid electricity emission factor	(base year) Japan: 2018 0.48 kg CO2/kWh	(2030) 0.31 kg CO2/kWh	(2040) 0.29 kg CO2/kWh	(2030) 0.19 kg CO2/kWh	(2040) **0.06 kg CO2/kWh**
	(4)Mandatory introduction of ZEB/ZEH (government target)	(base year) 2014	(2020) ZEB Total Floor Area 0 Billion m2	(2040) ZEB Total Floor Area 5 Billion m2	(2020) ZEB Total Floor Area 1 Billion m2	(2040) ZEB Total Floor Area **32 Billion m2**
changes in customer behavior	(5)Rent increase/decrease due to environmental performance	Increase rent by 4.4%	N/A	N/A	N/A	N/A
Extreme severity of abnormal weather	(6)flood damage	(base year) Japan: 2010	(2030) +121%	N/A	N/A	N/A
	(7) Changes in flood frequency	(base year) 2019	N/A	(2040) The frequency of flood occurrence is about 4 times	N/A	(2040) About twice the frequency of flooding
	(8)Occurrence of typhoons and cyclones	(base year) Japan: 2016	N/A	(2100) Observations are highly uncertain, and the number of annual typhoons is unclear.	N/A	N/A
	(9) sea level rise	(base year) 2015	(2030) 0.18 m	(2040) 0.25 m	(2030) 0.1 m	(2040) 0.15 m

[Carbon price/tax: (1) Carbon tax]

Carbon taxes will be introduced in both developed and developing countries under the 2 ° C scenario

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

4 ° C Scenario	The introduction of carbon tax is limited to some countries.

	Japan	EU
2018	N/A	8 US $/ tCO2
2030	N/A	33 US $/ tCO2
2040	N/A	43 US $/ tCO2

Discussion

- (Entire): Estimates of Japan's carbon tax are unclear, but high tax rates are not expected
- (Real Estate) Green buildings will not become widespread because conventional buildings with low environmental performance will continue to be used, and new low-carbon materials will remain expensive.

*Data Source:
- Ministry of the Environment "TCFD Management Strategy Planning Recommendations: A Practical Guide to Scenario Analysis Incorporating Climate-Related Risks and Opportunities 2019"
- Ministry of the Environment "Introduction of carbon taxes in other countries July 2018"
- Extracted from IEA "World Energy Outlook 2019" New Policies Scenario (NPS) numbers

2 ° C Scenario	Carbon tax will be introduced regardless of country or region

	developed country	developing country
current situation	(Reference) Average winning bid price in European EU-ETS: approximately US $8/t *"Implementation and review of emissions trading in other countries" From (Ministry of the Environment Report, 2016)	N/A
2030	100 US $/ tCO2	75 US $/ tCO2
2040	140 US $/ tCO2	125 US $/ tCO2

Discussion

- (Entire) As global carbon prices increase to reach the 2 ° C target, the government promotes the introduction of carbon taxes and emissions trading. On the other hand, companies that emit large amounts of GHGs are increasingly requested by governments and business partners and engaged by investors.
- (Real Estate) Due to rising steel and cement prices and transportation costs, green buildings using new low-carbon materials have become popular.
- (Tenant) The demand for energy-efficient facilities will increase as more companies promote decarbonization on the tenant side.

*Data Source:
- Extracted from IEA "World Energy Outlook 2019" Sustainable Development Scenario figures

[Addressing GHG emissions regulations: (2) Energy intensity of buildings]

Energy intensity of buildings targeted in the 4 ° C and 2 ° C scenarios are expected to make a difference of around 20%

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

4 ° C Scenario	Approximately 30% reduction in unit energy consumption

	Rate of improvement in unit energy consumption: Global
current situation (2014)	0%
2020	6%
2040	21%
2060	29%

Discussion

- (Entire) Energy efficiency continues to improve, but there is no active investment compared to 2 ° C
- (management and operation) The risk of fines and other penalties is small even if buildings with low energy efficiency are maintained, but it is possible that a certain level of efficiency standards will need to be met.
- (Real Estate) It is undeniable that the company may be exposed to a certain reputation risk, and it is also possible to add value to the company based on its high performance despite the low energy efficiency of other companies.

*Data Source:
- IEA "Energy Technology Perspective 2017" RTS Scenarios

2 ° C Scenario	Energy intensity of buildings halved

	Rate of improvement in unit energy consumption: Global
current situation (2014)	0%
2020	7%
2040	34%
2060	49%

Discussion

- (Entire) As energy efficiency improves globally, the real estate industry may require high standards (ZEB/ZEH + promotion, etc.)
- (Real Estate) Penalties, etc. shall be imposed on buildings that do not meet the requirements.
- (Real Estate) Buyers and renters will be excluded from buildings with insufficient environmental measures
- (Tenant) Energy efficiency of buildings becomes an important factor in purchasing decisions, and utilization of building environmental performance labeling system is activated.
- (management and operation) Expected to improve standards for new construction and renovation, resulting in higher construction and maintenance costs

*Data Source:
- IEA "Energy Technology Perspective 2017" RTS Scenarios

4 ° C | 2 ° C | ①Real estate | ② Energy | ③ Automotive

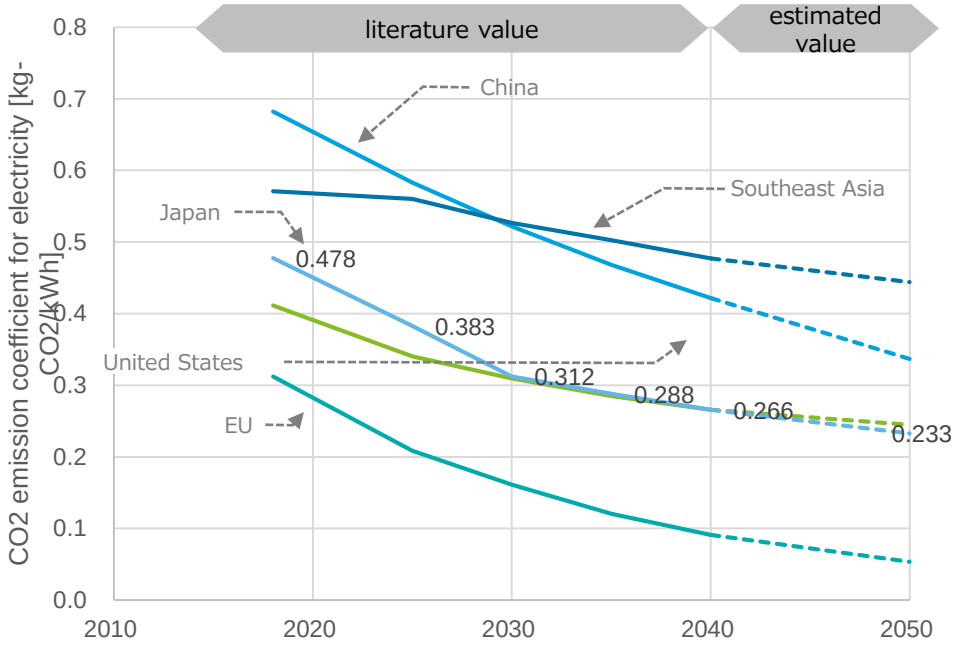
[Addressing GHG emissions regulations: (3) Grid-electricity emission factors]

GHG emissions reductions from electricity are limited in the 4 ° C scenario. The contribution of buildings to the reduction of unit energy consumption is small.

4 ° C Scenario	Emission factor for grid electricity halved

	CO2 emission factor for electricity: Japan [kg-CO2/kWh]
current situation (2018)	0.48
2025	0.38
2030	0.31
2035	0.29
2040	0.27
2050	0.23 (estimated value)

Deloitte Estimates



Discussion

- (Entire) A certain amount of renewable energy will be introduced, but the rise in carbon prices will be small and the improvement in the emission factor of electricity will be limited.
- (Property/Facility) The improvement in the grid electricity emission factor is small and does not significantly improve the energy intensity of buildings.
- No increase in electricity rates as seen in the (Tenant) 2 ° C scenario
- (Real Estate) CO2 reduction cannot be expected by improving the grid electricity emission factor, and other means of reduction must be sought.

(Source)
- IEA "World Energy Outlook 2019" STEPS Scenario

*Based on regional and national data available in World Energy Outlook 2019, the value of CO2 emissions from the power generation sector (t-CO2)/power generation (TWh) is treated as the regional power emission factor for convenience. Figures for power generation and CO2 emissions from the power generation sector by region and country are only available for the period up to 2040, figures for 2040 and beyond are estimated.

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

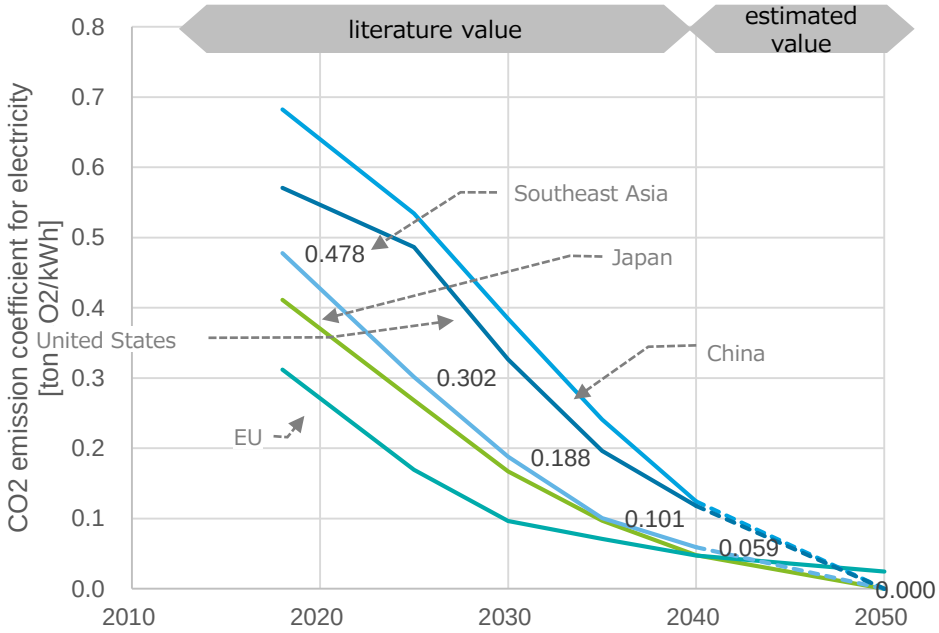
[Addressing GHG emissions regulations: (3) Grid-electricity emission factors]

In the 2 ° C scenario, the electric power emission coefficient is large due to the promotion of renewable energy measures, etc. and building energy intensity is expected to improve

2 ° C Scenario	Grid electricity emission factor to nearly 0 in 2050

	CO2 emission factor for electricity: Japan [kg-CO2/kWh]
current situation (2018)	0.48
2025	0.30
2030	0.19
2035	0.10
2040	0.06
2050	0.00 (estimated value)

Deloitte Estimates



Discussion

- (Entire) The introduction of renewable energy and an increase in carbon prices will lead to an improvement in the emission factor of electricity.
- (Property/Facility) Unit energy consumption of buildings is enhanced by improving grid electricity emission factors
- (Tenant) Higher grid stabilization costs and higher retail electricity prices
- (Real Estate) Although retail electricity prices are expected to rise, CO2 reduction through improved emission factors is expected.

(Source)
- IEA "World Energy Outlook 2019" SDS Scenario

*Based on regional and national data available in World Energy Outlook 2019, the value of CO2 emissions from the power generation sector (t-CO2)/power generation (TWh) is treated as the regional power emission factor for convenience. Figures for power generation and CO2 emissions from the power generation sector by region and country are only available for the period up to 2040, figures for 2040 and beyond are estimated.

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

[Compliance with GHG emission regulations: (4) mandatory introduction of ZEB/ZEH]

While the introduction of ZEB/ZEH did not proceed in the 4 ° C scenario, It is assumed that ZEB/ZEH conversion is mandatory in the 2 ° C scenario

4 ° C Scenario	Limited penetration of ZEB

	Total floor area of ZEBs: Global [billon m2]
current situation (2014)	0
2020	0
2040	5
2060	13

Discussion

- (Entire) The total floor area will not increase until around 2040, and will be used only in a limited number of countries/regions.
- (Real Estate) Demand for ZEB properties is low and the attractiveness and competitiveness of properties are low
- (Real Estate) ZEB will not be widely used, and the cost of construction, acquisition and operation management will remain high.

*Data Source:
- IEA "World Energy Outlook 2018" NPS Scenario

2 ° C Scenario	The spread of ZEB/ZEH will activate related markets.

	Total floor area of ZEBs: Global [billon m2]
current situation (2014)	0
2020	1
2040	32
2060	68

	ZEH diffusion target in Japan
2017	ZEH accounts for 16.0% of newly built detached houses Custom-built housing (Mochiie) 15.3% Houses built for sale (sale): 0.7%
2020	ZEH now accounts for more than 50% of new homes
2030	ZEH of 100% expected for new homes

Discussion

- (Entire) Japan will make ZEB/ZEH mandatory in order to achieve energy conservation targets
- (Real Estate) Construction and refurbishment costs will increase due to ZEB/ZEH construction
- (Real Estate) As companies aggressively introduce ZEB/ZEH, the presence of companies possessing more advanced technologies is expanding.
- (Tenant) Interest in ZEB/ZEH and the introduction of renewable energy will increase, and ZEB/renewable energy will become an important item in investment/purchase/occupancy decision making.

*Data Source:
- Ministry of Economy, Trade and Industry "Policy Trends for Promoting ZEH Dissemination and Proposed Fiscal 2018 Budget" (March 2018)
- Co-Creation Initiative for the Environment, Net Zero Energy House Support Project
- ZEH3 Joint Measures Briefing Session (Ministry of the Environment)
- IEA "Energy Technology Perspective 2017" 2DS Scenario

[Changes in customer behavior: (5) Rent increase/decrease due to environmental performance]

The trend varies depending on the scenario, but overall rent is higher for properties that have acquired building environment certification.

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

Parameter	Although there is no prediction that the difference in rent will fluctuate in the future, it may become significant in the 2 ° C scenario.

	Rent increase for properties with environmental certification
current situation (2015)	4.4%
future	N/A

Discussion

- (Entire) If the premium added to the rent increases by acquiring the building environment certification, the environmental certification will increase.
- (Real Estate) When demand for products with high environmental performance increases, companies that have been promoting the acquisition of environmental certification will have a competitive advantage.
- (Real Estate) The spread of environmental certification may lead to a relative decrease in the premium for environmental certification itself.

*Data Source:
- xymax "Economic analysis of environmental management"

4. 課題を解決するための分析手法および結果③

xymax

環境認証ダミーの係数推定値は+0.044(統計的に有意)

・環境認証ダミーの係数推定値は+0.044（t値3.816　95%信頼区間+0.021～+0.067）
・係数推定値の標準誤差は小さく、統計的に有意
・ 規模、新しさ、立地、成約時期、他の性能・設備などの影響を考慮した上でも、
【環境認証あり】の方が【なし】に比べ、4.4%程度成約賃料が高い

			係数推定値	標準誤差	t値	有意確率	95%信頼区間下限	95%信頼区間上限
（切片）	β0	定数項	9.196	0.029	317.335	0.000	9.139	9.253
規模	β1	延床面積（対数）	0.107	0.009	11.965	0.000	0.090	0.125
	β2	地上階数	0.003	0.001	4.356	0.000	0.002	0.004
	β3	基準階面積（対数）	0.003	0.010	0.265	0.791	-0.017	0.023
新しさ	β4	築年数	-0.009	0.000	-35.296	0.000	-0.009	-0.008
	β5	リニューアルダミー	0.033	0.008	4.219	0.000	0.018	0.049
性能・設備	β6	OAフロアダミー	0.004	0.006	0.702	0.482	-0.007	0.016
	β7	個別空調ダミー	0.005	0.007	0.766	0.444	-0.008	0.018
	β8	機械警備ダミー	-0.012	0.007	-1.766	0.078	-0.025	0.001
	β9	環境認証ダミー	**0.044**	0.012	**3.818**	0.000	0.021	0.067
立地	β10	徒歩分数	-0.024	0.001	-20.941	0.000	-0.026	-0.022
	β11_1	内幸町・霞が関・永田町ダミー	0.129	0.024	5.273	0.000	0.081	0.177
	…	…	…	…	…	…	…	…
	β11_58	その他　東京２３区ダミー	-0.415	0.017	-24.655	0.000	-0.448	-0.382
成約時期	β12_1	2013年第2四半期ダミー	-0.064	0.011	-5.789	0.000	-0.086	-0.043
	…	…	…	…	…	…	…	…
	β12_7	2014年第4四半期ダミー	0.008	0.009	0.836	0.403	-0.010	0.025

※自由度調整済み決定係数:0.677　※エリアダミーの係数推定値（β_{11}）、タイムダミーの係数推定値（β_{12}）については紙面の都合上割愛

[Extreme Weather: (6) Flood Damage]

At 4 ° C, domestic flood damage more than doubles

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

4 ° C Scenario (No data at 2 ° C)	Flood Damage Rises Nationwide

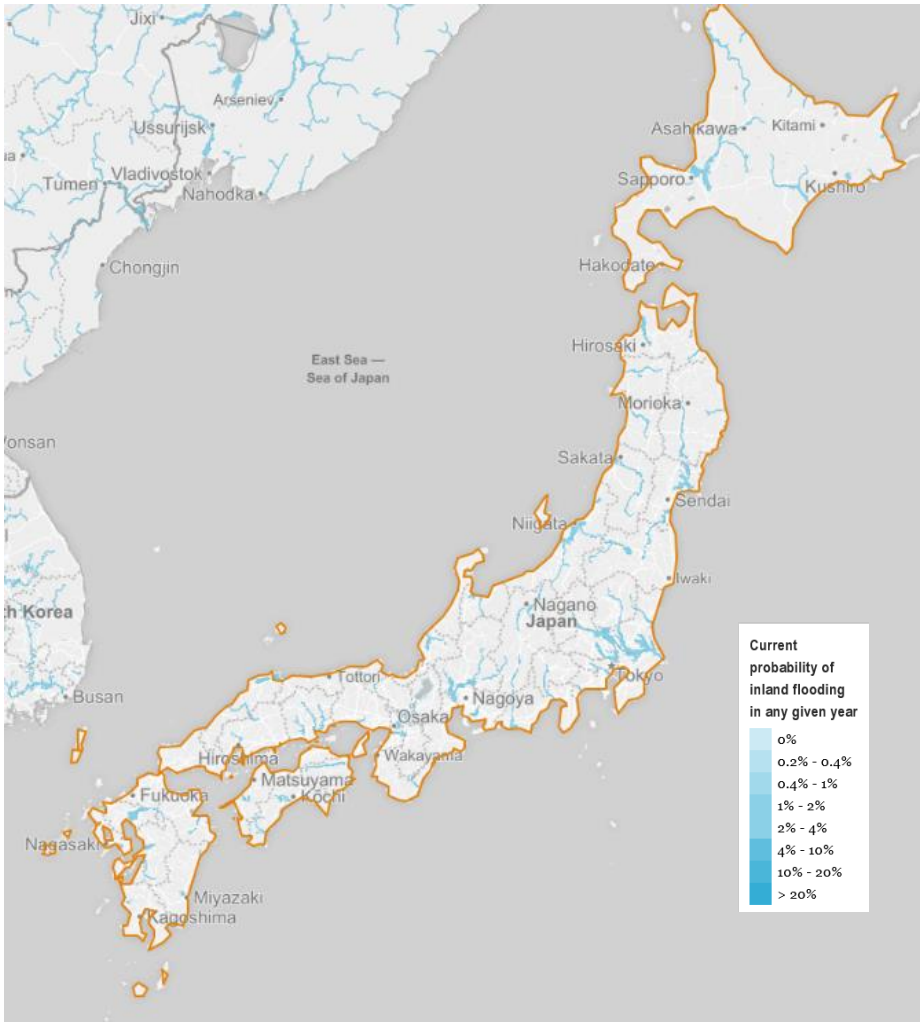
	Flood damage in urban areas (Japan)	
2010	3.3 billion USD/year	(base year)
2030	7.3 billion USD/year (Increase due to socioeconomic change 1.7 billion USD Increase due to climate change (USD 2.2 billion)	+121%

Discussion

- Inundation of inland water due to heavy rain increases and inundation occurs in low-lying areas
- Flooding damage frequently occurs in low-lying real estate, and land prices fall as repair costs increase
- Disaster-prevention buildings increase through policy guidance (Mandatory regulation of minimum height under floor level in inundation areas and measures against inundation)
- Customer Interest in Flood Control Performance Grows, and Location and Flood Control Measures Become Key Items in Investment/Purchasing Decisions
- Supply stoppage due to flooding in the building materials production area
- Delays in transportation of building materials and human resources due to flooding in transportation routes

*Data Source:
WRI "The Aqueduct Global Flood Analyzer"
(Scenario based on RCP 8.5 (4 ° C Scenario) and SSP2 (moderate socioeconomic fluctuations) with flood prevention measures implemented over a period of 50 years)

Estimating Flood Range and Damage (2030)



[Extreme Weather: (7) Changes in Domestic Rainfall, Flow Rate and Flood Frequency]

Rainfall, rate of change of flow rate, and frequency of flood occurrence are expected to increase in both the 2 ° C and 4 ° C scenarios

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

4 ° C/2 ° C Scenario	Rainfall, runoff and flood frequency increase at 4 ° C from 2 ° C

	amount of rainfall	Flow rate	flood occurrence Frequency
4 ° C (2040)	1.3 times	about 1.4 times	About 4 times
2 ° C (2040)	1.1 times	about 1.2 times	about twice

Discussion

- (Entire) Inundation of inland water due to heavy rain and frequent floods increases, causing inundation damage to low-lying properties
- (government) Review of disaster prevention and mitigation plans, revision of building standards, and promotion of disaster-response buildings guided by the government
- (Real Estate) Expected to improve standards for new construction and renovation, increasing construction and maintenance costs
- (Real Estate) Due to the frequent occurrence of heavy rain, field work is suspended and the construction period is delayed
- (Real Estate) incurs the costs of moving its portfolio of properties to areas with a lower probability of flooding, as well as the costs of safety measures
- (Real Estate) Inundated assets become inoperable and opportunity losses increase
- (Real Estate) higher weather insurance premiums increase costs and squeeze earnings
- (Real Estate) Lack of access to buyers and renters for buildings with inadequate disaster preparedness, leading to a long-term decline in earnings
- (Tenant) Flood damage frequently occurs in low-lying areas, and maintenance and repair costs of assets increase, which puts pressure on profits

(Source)

- Technical Review Committee on Flood Control Planning in Light of Climate Change "Proposals for flood control plans based on climate change" (p. 15), 2019

[Extreme Extreme Weather: (8) Occurrence of Typhoons and Cyclones]

Observations for storms, cyclones, and typhoons are highly uncertain and do not have clear projections

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

Parameter	Typhoons may decrease in number and increase in power

	Global	Japan
generation Frequency	• Overall, no change • Large tropical cyclones may decline in southern hemisphere	Past statistics show no clear long-term trend in the number of typhoons occurring, the number of typhoons approaching, and the power of typhoons. However, in the future, the frequency of typhoons may decrease or not change, while the power of typhoons may increase.
power	• Augmentation • Potential increase in large tropical cyclones (Categories 4 and 5) • Small tropical cyclones may decline	
precipitation	• increase	• + 8% to + 36% (Rate of future increases in precipitation due to heavy rain)

	Number of typhoons in Japan
current situation ('16 years)	26 (Nos.)
future (~ 2100 years)	Unknown (Global warming is expected to reduce the number of typhoons occurring in the Northwest Pacific and shift the area of typhoons to the east, resulting in a decrease in the number of typhoons approaching the area and changes in the route of typhoons, but there is high uncertainty.)

(Source)

- National Oceanic and Atmospheric Administration (NOAA)
- Japan Meteorological Agency "Extreme Weather Report 2014"
- Ministry of the Environment, Japan Meteorological Agency, "Climate of Japan at the end of the 21 century (2015)"
- Ministry of the Environment "Integrated Report on Observations, Forecasts and Impacts of Climate Change 2018: Japan's Climate Change and its Impacts" http://www.env.go.jp/earth/tekiou/report2018_full.pdf

Discussion

- (Entire) Technology for observing and predicting storms, cyclones, and typhoons is advancing, but it is difficult to completely avoid damage.
- (government) Establishment of incentives such as subsidies for technological development for observation and predictions concerning storms, cyclones and typhoons
- (Real Estate) If the scale of damage increases due to an increase in the power of storms, cyclones, and typhoons, the costs of maintaining and restoring assets may increase, and profits may be squeezed
- (Real Estate) Assets affected by storms, cyclones and typhoons are rendered inoperable and opportunity losses are increased.
- (Real Estate) higher premiums add to costs and squeeze earnings
- (Real Estate) Lack of access to buyers and renters for buildings with inadequate disaster preparedness, leading to a long-term decline in earnings

[Extreme weather events: (9) Sea level rise]

Although no significant sea level rise is expected until 2030, it is assumed that the risk of water disasters in coastal areas increases due to combined factors such as large typhoons and inland flooding.

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

Parameter	The average rise in global sea level will be higher depending on how long a 4 ° C scenario prevails.

	4 ° C	2 ° C
2030	0.1 (m)	0.1 (m)
2040	0.18 (m)	0.15 (m)
2050	0.25 (m)	0.2 (m)
2081 – 2100 years	0.45 ~ 0.82 (m)	0.26 ~ 0.55 (m)

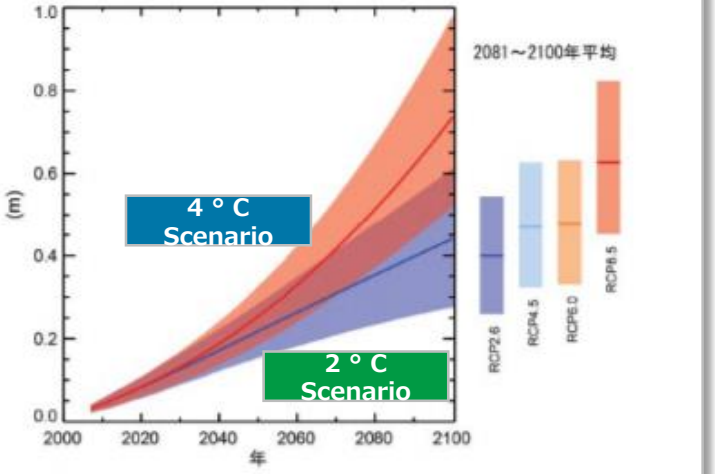


図 2.7.4 世界平均海面水位上昇

*Values for 2030, 2040, and 2050 are averages; values for 2081 through to 2100 represent the width of the forecast (Comparison with the average value from 1986 to 2005).

Common

- (Entire) Since rising sea levels are a factor of flood damage caused by typhoons, it affects the decision of property renewal (chronic risk but also affected by acute risk)
- (government) tightening of regulations on buildings in coastal areas;
- (Real Estate) Examination of coastal base portfolio and generation of breakwater installation costs
- (Real Estate) If the company's business base or assets are damaged by storm surges, maintenance and repair costs and relocation costs may increase, which may put pressure on profits.
- (Real Estate) Assets affected by storm surges will be unable to operate and opportunity losses will increase
- (Real Estate) Lack of access to buyers and renters for coastal buildings and buildings with inadequate disaster preparedness, leading to a long-term decline in earnings

(Source)

- Ministry of the Environment, Japan Meteorological Agency "Integrated Report on Observations, Forecasts and Impacts of Climate Change 2018", Japan Meteorological Agency website "Past and future sea level changes in the world"

Appendix

Appendix 1. Sector Climate Risk Assessment Materials

Appendix 2. Parameters used in the scenario group definition

①Real estate sector

②Energy sector

③Automotive sector

For risk opportunities assessed as importance, predicted data for the 2 ° C/4 ° C scenario were collected as parameters.

important item (subject of analysis)	Configured Parameter	Current	4 ° C		2 ° C	
			Before 2030	After 2040	Before 2030	After 2040
Carbon tax and carbon price	(1) carbon tax	Japan: None Overseas: Some	(2030) Japan: N/A EU: 33 USD/t	(2040) Japan: N/A EU: 43 USD/t	(2030) Developed Countries: 100 USD/t In developing countries: 75 USD/t	(2040) Developed Countries: 140 USD/t In developing countries: 75 USD/t
Compliance with GHG emission regulations	(2) carbon emission reduction target	(base year) 4 ° C: Varies by country 2 degrees C: 2018 years	(2030) High targets limited to certain countries	N/A	(2030) **▲30%**	N/A
Energy mix, etc.	(3) energy mix	primary energy (base year) 2018	N/A	(2040) **dependent on fossil fuels**	N/A	(2040) **Shift to renewable energy**
	(4) oil price	(base year) 2018	(2025) + 10%	(2040) + 35%	(2025) Down 10%	(2040) Down 16%
	(5) power configuration	(base year) Japan: 2018	(2030) Fossil fuels down 32%	(2040) Fossil fuels down 44%	(2030) Fossil fuels down 48%	(2040) Fossil fuels down 76%
	(6)sales of engine-powered vehicles	(base year) 2015	(2030) + 16%	(2060) + 49%	(2030) Down 29%	(2060) Down 86%
changes in customer behavior	(3) energy mix	Same as item (3)				
	(7) Household energy consumption	(base year) 2017	N/A	N/A	N/A	(2040) Petroleum Down 75% Gas Down 25%
Extreme severity of abnormal weather	(8) flood damage	(base year) Japan: 2010	(2030) + 121%	N/A	N/A	N/A
	(9) typhoon	(base year) Japan: 2016	N/A	(2100) Observations are highly uncertain, and typhoon figures are unclear	N/A	N/A

[Carbon price/tax: (1) Carbon tax]

Under the 2 ° C scenario Carbon taxes will be introduced in both developed and developing countries

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

4 ° C Scenario	The introduction of carbon tax is limited to some countries.

	Japan	EU
2018	N/A	8 US $/ tCO2
2030	N/A	33 US $/ tCO2
2040	N/A	43 US $/ tCO2

Discussion

- (Entire): Estimates of Japan's carbon tax are unclear, but high tax rates are not expected
- (Real Estate) Green buildings will not become widespread because conventional buildings with low environmental performance will continue to be used, and new low-carbon materials will remain expensive

*Data Source:
- Ministry of the Environment "TCFD Management Strategy Planning Recommendations: A Practical Guide to Scenario Analysis Incorporating Climate-Related Risks and Opportunities 2019"
- Ministry of the Environment "Introduction of carbon taxes in other countries July 2018"
- Extracted from IEA "World Energy Outlook 2019" New Policies Scenario (NPS) numbers

2 ° C Scenario	Carbon tax will be introduced regardless of country or region

	developed country	developing country
current situation	(Reference) Average winning bid price in European EU-ETS: approximately US $8/t *"Implementation and review of emissions trading in other countries" From (Ministry of the Environment Report, 2016)	N/A
2030	100 US $/ tCO2	75 US $/ tCO2
2040	140 US $/ tCO2	125 US $/ tCO2

Discussion

- (Entire) As global carbon prices rise to reach the 2 ° C target, the government promotes the introduction of carbon taxes and emissions trading. On the other hand, companies that emit large amounts of GHGs are increasingly requested by governments and business partners and engaged by investors
- (Real Estate) Due to rising steel and cement prices and transportation costs, green buildings using new low-carbon materials have become popular
- (Tenant) The demand for energy-efficient facilities will increase as more companies promote decarbonization on the tenant side

*Data Source:
- Extracted from IEA "World Energy Outlook 2019" Sustainable Development Scenario figures

[Responding to GHG emission regulations: (2) Carbon emission reduction targets]

4 ° C | 2 ° C

①Real estate | ② Energy | ③ Automotive

An annual CO2 emission reduction of about 2.5% is required in order to achieve the 2 ° C scenario

4 ° C Scenario	High GHG reduction targets limited to selected countries

	Japan	EU 28
base year	2013	1990
target year	2030	2030
reduction target	▲26%	▲40%

2 ° C Scenario	Down 30% by 2030 (2.5% per annum)

	SBT target (Global)
base year	2018
target year	2030
reduction target	▲30%

*Scope 1 + 2

Discussion

- Reduction targets vary from country to country, and many countries targets remain low Development and utilization of low-carbon materials are not promoted due to weak external pressure for low-carbon materials.

*Data Source:
- Draft Agreement Documents
  * EU 28: Belgium, Bulgaria, Czech Republic, Denmark, Germany, Estonia, Ireland, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Lithuania, Luxembourg, Hungary, Malta, Netherlands, Austria, Poland, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, United Kingdom

Discussion

- SBT requires a 30% reduction in Scope 1 + 2 from 2018 to 2030
- **It is necessary to strengthen activities to improve energy efficiency and to invest in energy-saving equipment**
- Demand for low-energy products increases

*Data Source:
- SBTi-tool WB2C Scenario

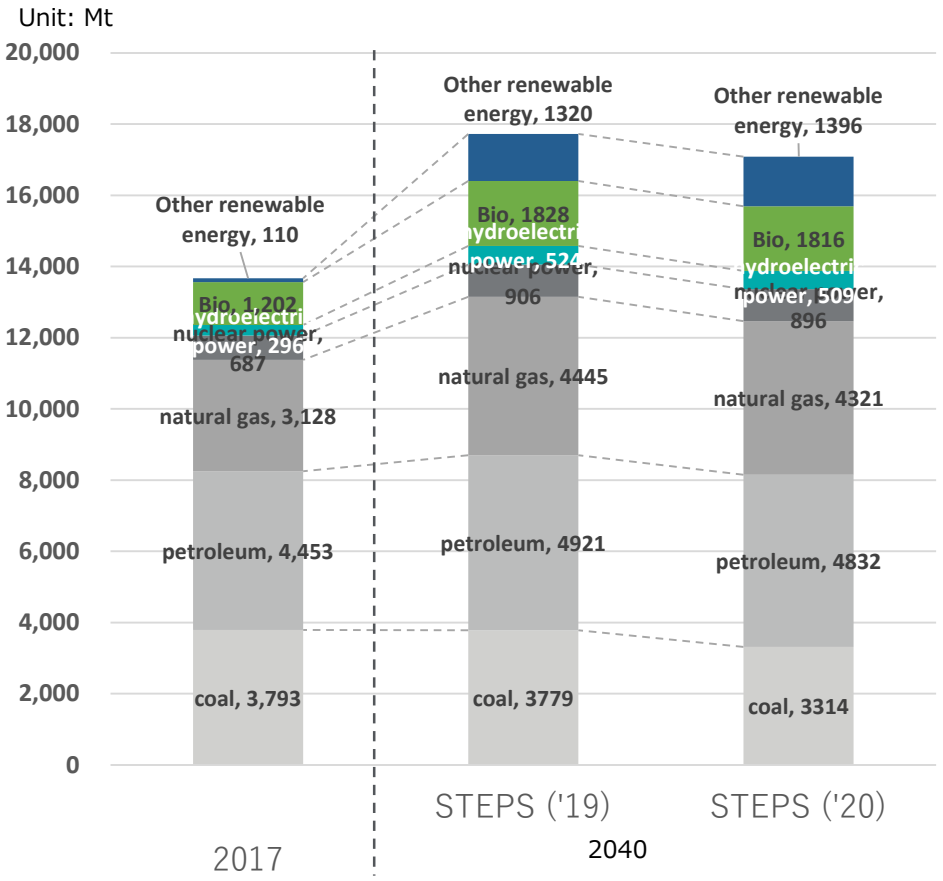
[Energy mix, etc.: (3) Energy mix]

In the 4 ° C scenario, a high global reliance on fossil fuels remains
In the 2 ° C scenario, there is a significant shift to renewable energy sources

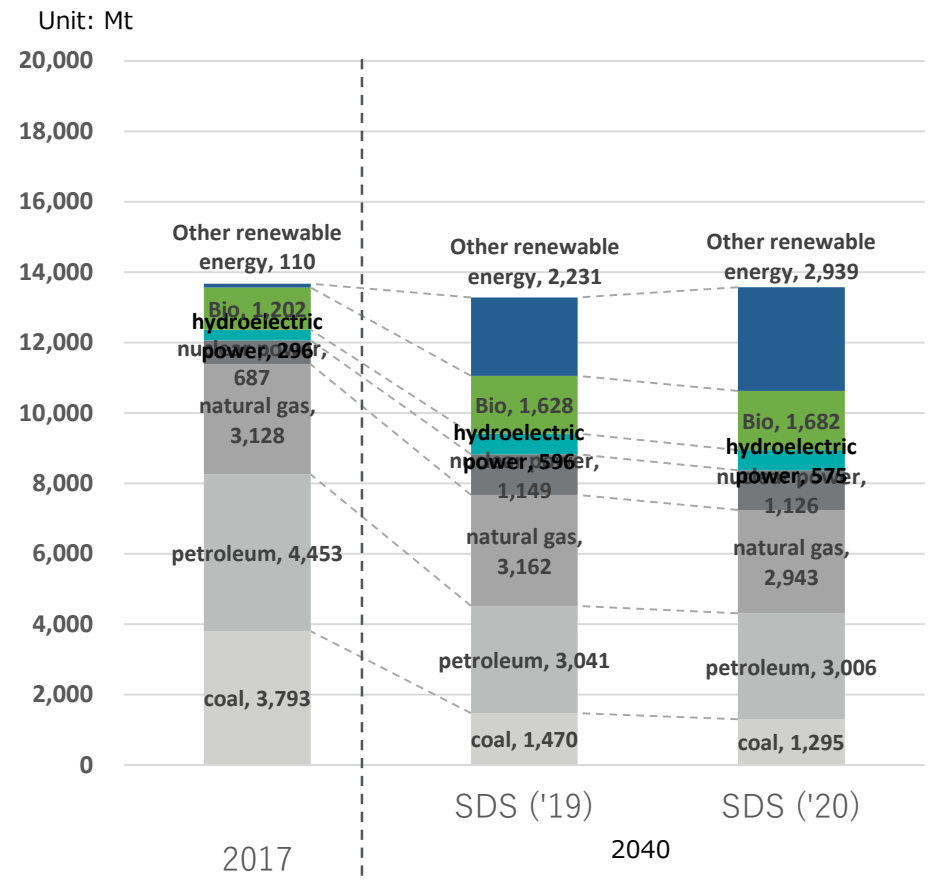
4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

4 ° C Scenario — dependent on petroleum fuel



2 ° C Scenario — Shift to renewable energy



*Other renewables include "solar heat" "geothermal power" "CSP" and "marine energy"

Source
・Extracted from IEA "World Energy Outlook 2018" New Policies Scenario and Sustainable Development Scenario numbers
・Extracted from IEA "World Energy Outlook 2019" Stated Policies Scenario and Sustainable Development Scenario numbers
・Extracted from IEA "World Energy Outlook 2020" Stated Policies Scenario and Sustainable Development Scenario numbers

[Energy price: (4) Crude oil price]

Crude oil prices rise under a 4 ° C scenario, and fall under a 2 ° C scenario

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

4 ° C Scenario	Crude oil prices continue to rise between 2019-2040

2 ° C Scenario	Crude Oil Prices Fall between 2019-2040

oil price	IEA member countries	
current situation (2019)	63 (USD/barrel)	(base year)
2025	71 (USD/barrel)	+13%
2040	85 (USD/barrel)	+35%

oil price	IEA member countries	
current situation (2019)	63 (USD/barrel)	(base year)
2030	57 (USD/barrel)	▲10%
2040	53 (USD/barrel)	▲16%

Discussion

- (Entire) Energy demand is increasing, particularly in developing countries. oil prices rise as decarbonization slows and demand for oil rises

*Data Source:
- Stated Policies Scenario (oil price) for IEA "World Energy Outlook 2020"

Discussion

- (Entire) Demand for oil decreased as the share of renewable energy in energy demand increased. Crude oil prices fall slightly

*Data Source:
- IEA "World Energy Outlook 2020" Sustainable Development Scenario (oil price)

[Energy mix, etc.: (5) Power supply configuration]

In both the 4 ° C/2 ° C scenarios, the proportion of fossil fuels share of the power mix declines

4 ° C | 2 ° C

①Real estate | ② Energy | ③ Automotive

4 ° C Scenario	In 2030, 35% less than in 2018

Fiscal year	Power configuration (TWh) (Japan)							
	fossil fuel					not fossil fuel		
	coal	petroleum	Gas	Subtotal	Change	atom Force	& Again energy source	Percentage of total
2018	339	96	326	761	base year	65	198	26%
2030	239	18	238	495	▲35%	210	278	50%
2040	202	7	238	447	▲41%	219	336	55%

Discussion

- (Entire) Demand for gas-fired power generation will remain at a certain level over the long term, although the shift to electricity with lower environmental impact will continue.
- (energy industry) The gas-fired power generation business will continue to meet a certain level of demand.

*Data Source:
- Stated Policies Scenario for IEA "World Energy Outlook 2020"

2 ° C Scenario	Approximately half the 2018 level by 2030

Fiscal year	Power configuration (TWh) (Japan)							
	fossil fuel					not fossil fuel		
	coal	petroleum	Gas	Subtotal	Change	atom Force	& Again energy source	Percentage of total
2018	339	96	326	761	base year	65	198	26%
2030	39	12	334	385	▲49%	229	324	59%
2040	22	4	183	209	▲76%	275	459	78%

Discussion

- (Entire) In 2030, demand for coal-fired and oil-fired thermal power plants, which have a large environmental impact, will decline significantly, but demand for gas-fired thermal power plants, which have a relatively small environmental impact will remain relatively small due to issues securing power sources.
- (Entire) The share of gas-fired power generation will decline at an accelerated pace in the long run due to stricter emission regulations at power plants and increased demand for environmentally friendly power.
- (Energy Industry) Shifting to nuclear power generation and renewable energy businesses due to stricter regulations and changes in demand

*Data Source:
- IEA "World Energy Outlook 2020" Sustainable Development Scenario

[Energy mix, etc.: (6) Engine sales]

Unit sales increase under the 4 ° C scenario but decrease under the 2 ° C scenario

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

4 ° C Scenario	Sales of Engine-Equipped Vehicles

	Global sales of engine-powered vehicles *	
2015	98.5 million units/year	base year
2060	147.08 million units/year	+49%

2 ° C Scenario	Sales of engine-powered vehicles declined sharply

	Global sales of engine-powered vehicles *	
2015	98.5 million units/year	base year
2060	14.04 million units/year	-86%

* Vehicles equipped with an internal combustion engine (Including HV, PHV, CNG and LNG vehicles), excluding EVs (electric (al) vehicle) and FCVs (fuel cell vehicle)

Discussion

- (Entire) The production volume of ZEV has been fluctuating. Production volume of in-vehicle engines as a percentage of new vehicle sales remain steady
- (Energy Industry) ZEV promotion support policies such as purchase subsidies will be phased out (The same goes for infrastructure policy.)

*Data Source:
- IEA "Energy Technology Perspectives 2017" RTS Scenarios
  * Deloitte estimates for 2030 are based on IEA projections

Discussion

- (Entire) Expanding market share of ZEV towards low-carbon society. As a result, sales of engine-powered vehicles declined substantially.
- (Energy Industry) Decreased production of in-vehicle engines and decreased demand for oil and natural gas

*Data Source:
- IEA "Energy Technology Perspectives 2017" B2DS Scenario
  * Deloitte estimates for 2030 are based on IEA projections

[Changes in customer behavior: (7) Energy consumption at home]

Household consumption of fossil fuels decreases substantially in the 2 ° C scenario

2 ° C Scenario	Dramatic decrease in household oil and gas consumption

	Household energy consumption in developed countries (1000 MJ)						
	Electrical		petroleum		Gas		Other
2017	10,655	base year	3,190	base year	10,817	base year	4,467
2040	10,867	+2%	787	▲75%	8,132	▲25%	4,688
2050	11,163	+5%	357	▲88%	6,974	▲36%	4,716

Discussion

- Policies for electrification of residential facilities is actively implemented to meet the government's ZEH target (Achieved average ZEH for new buildings by 2030)
- Demand for electricity is rising, while demand for gas is falling
- Demand for petroleum (kerosene) as an energy source has decreased by approximately 90% due to rising prices driven by the introduction of a carbon tax and a decline in re-energy costs.

*Data Source:
1. IEA "Energy Technology Perspectives 2017" 2 ° C Scenario

[Extreme Extreme Weather: (8) Flood Damage]

At 4 ° C, domestic flood damage more than doubles

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

4 ° C Scenario (No data at 2 ° C)	Flood Damage Rises Nationwide

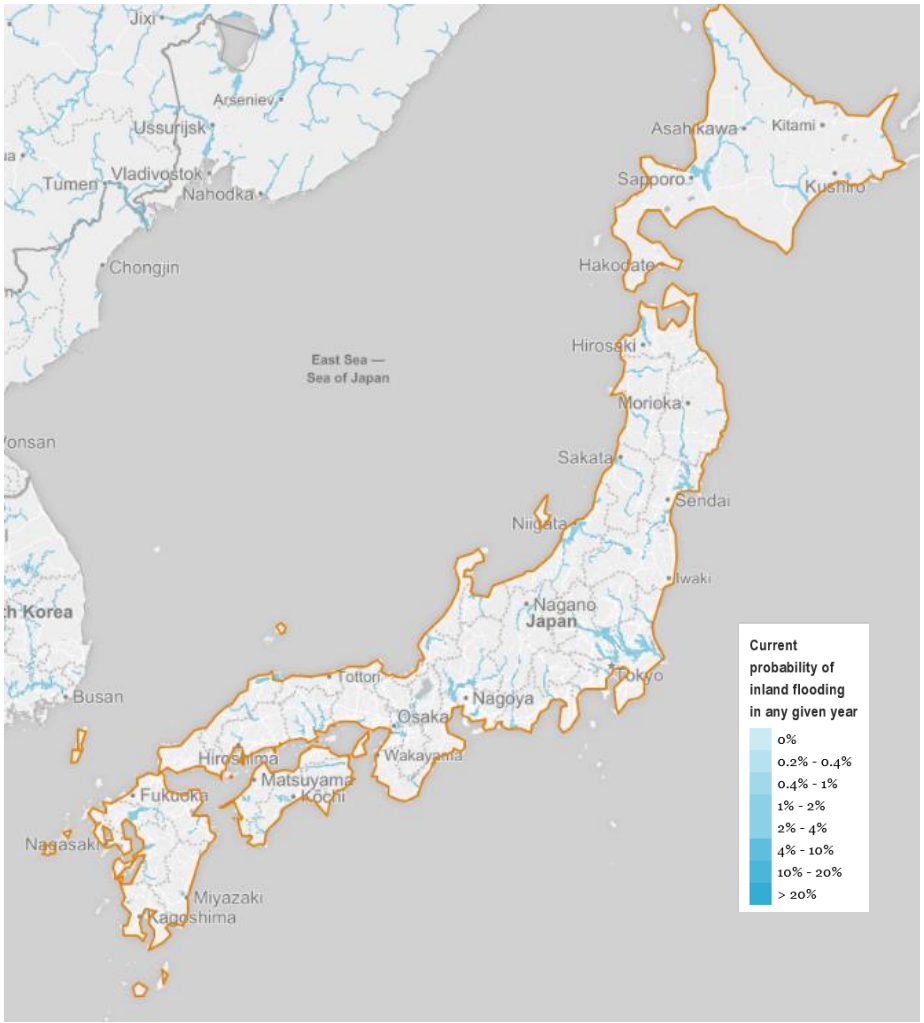
	Flood damage in urban areas (Japan)	
2010	3.3 billion USD/year	(base year)
2030	7.3 billion USD/year (Increase due to socioeconomic change 1.7 billion USD Increase due to climate change (USD 2.2 billion)	+121%

Discussion

- Inundation caused by heavy rain increases, and inundation damage in low-lying areas increases
- Inundation damage occurs at low ground around rivers, and if the relay facilities are inundated, there is a possibility that electricity and gas supply will be cut off

*Data Source:
WRI "The Aqueduct Global Flood Analyzer"
(Scenario based on RCP 8.5 (4 ° C Scenario) and SSP2 (moderate socioeconomic fluctuations) with flood prevention measures implemented over a period of 50 years)

Estimating Flood Range and Damage (2030)



[Extreme Extreme Weather: (9) Occurrence of Typhoons and Cyclones]

Observations for storms, cyclones, and typhoons are highly uncertain and do not have clear projections

4 ° C 2 ° C

①Real estate
② Energy
③ Automotive

Parameter	Typhoons may decrease in number and increase in power

	Global	Japan
generation Frequency	• Overall, no change • Large tropical cyclones may decline in southern hemisphere	Past statistics show no clear long-term trend in the number of typhoons occurring, the number of typhoons approaching, and the power of typhoons. However, in the future, the frequency of typhoons may decrease or not change, while the power of typhoons may increase.
power	• augmentation • Potential increase in large tropical cyclones (Categories 4 and 5) • Small tropical cyclones may decline	
precipitation	• increase	• + 8% to + 36% (Rate of future increases in precipitation due to heavy rain)

	In Japan Number of typhoons
current situation ('16 years)	26 (Nos.)
future (~ 2100 years)	Unknown (Global warming is expected to reduce the number of typhoons occurring in the Northwest Pacific and shift the area of typhoons to the east, resulting in a decrease in the number of typhoons approaching the area and changes in the route of typhoons, but there is high uncertainty.)

Discussion

- (Entire) Technology for observing and predicting storms, cyclones, and typhoons advances, but it is difficult to completely avoid damage.
- (government) Establishment of incentives such as subsidies for technological development of observation and prediction concerning storms, cyclones and typhoons

(Source)

- National Oceanic and Atmospheric Administration (NOAA)
- Japan Meteorological Agency "Extreme Weather Report 2014"
- Ministry of the Environment, Japan Meteorological Agency, "Climate of Japan at the end of the 21 century (2015)"
- Ministry of the Environment "Integrated Report on Observations, Forecasts and Impacts of Climate Change 2018: Japan's Climate Change and its Impacts" http://www.env.go.jp/earth/tekiou/report2018_full.pdf

Appendix

Appendix 1. Sector Climate Risk Assessment Materials

Appendix 2. Parameters used in the scenario group definition

①Real estate sector

②Energy sector

③Automotive sector

①Real estate
② Energy
③ Automotive

[(3) Automobile sector parameters]

For key risks and opportunities, forecast data for the 2 ° C/4 ° C scenario was collected as parameters for consideration

important item (subject of analysis)	Configured Parameter	Current	4 ° C		2 ° C	
			Before 2030	After 2040	Before 2030	After 2040
Carbon tax and carbon price	(1) carbon tax	Japan: N/A	(2030) Japan: N/A	(2040) Japan: N/A	(2030) Developed Countries: 100 USD/t In developing countries: 75 USD/t	(2040) Developed Countries: 140 USD/t In developing countries: 75 USD/t
Compliance with GHG emission regulations	(2) carbon emission reduction target	(base year) 4 ° C: Varies by country 2 degrees C: 2018 years	(2030) High targets limited to certain countries	N/A	(2030) **▲30%**	N/A
energy price	(3) oil price	(2019) **63 USD/barrel**	(2030) **76 USD/barrel**	(2040) **85 USD/barrel**	(2030) **56 USD/barrel**	(2040) **53 USD/barrel**
	(4) sales of engine-powered vehicles	(2015) base year	(2030) **+16%**	(2060) **+49%**	(2030) **▲29%**	(2060) **▲86%**
Dissemination of next-generation technologies	(5) diffusion of electric vehicles	(2016) Japan: 28000 (EV, PHV, FCV)	**PHV/ZEV: Up 5%**	**PHV/ZEV: Up 7%**	**PHV/ZEV: Up 39%**	**PHV/ZEV: Up 63%**
Extreme severity of abnormal weather	(6) flood damage	(2010) base year	(2030) **+67%**	N/A	N/A	N/A
	(7) typhoon	N/A	N/A	(2100) All typhoons - 5.7% Fierce typhoon + 3.6%	N/A	N/A

[Carbon price/tax: (1) Carbon tax]

Under the 2 ° C scenario, both developed and developing countries are introducing carbon taxes.

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

4 ° C Scenario	The introduction of carbon tax is limited to some countries.

	Japan	EU * Reference
current situation (2018)	N/A	8 US $/ tCO2
2030	N/A	33 US $/ tCO2
2040	N/A	43 US $/ tCO2

Discussion

- (Entire): Estimates of Japan's carbon tax are unclear, but high tax rates are not expected
- (automobile industry) Development and utilization of low-carbon materials are not promoted due to weak external pressure for low-carbon materials.
- (Buyer) It does not activate carbon trading, the carbon tax increase is small compared to 2 ° C, and conventional electricity and fuels are continuously utilized.

*Data Source:
- Extracted from IEA "World Energy Outlook 2019" New Policies Scenario (NPS) numbers

2 ° C Scenario	Carbon tax will be introduced regardless of country or region

	developed country	developing country
current situation (2018)	(Reference) Average winning bid price in European EU-ETS: approximately US $8/t *"Implementation and review of emissions trading in other countries" From (Ministry of the Environment Report, 2016)	N/A
2030	100 US $/ tCO2	75 US $/ tCO2
2040	140 US $/ tCO2	125 US $/ tCO2

Discussion

- (Entire) As global carbon prices rise in order to reach the 2 ° C target, the government promotes the introduction of carbon taxes and emissions trading. On the other hand, companies that emit large amounts of GHGs are increasingly requested by governments and business partners and engaged by investors.
- (Automobile Industry) Higher carbon taxes increase production costs and reduce price competitiveness
- (Automobile Industry) Requires additional energy efficient capital expenditures
- (Buyer) to buy low-carbon, low-cost energy with lower GHG emissions
- (Substitute) Mainstreaming low carbon energy with low GHG emissions

*Data Source:
- Extracted from IEA "World Energy Outlook 2019" Sustainable Development Scenario figures

4 ° C 2 ° C

①Real estate
② Energy
③ Automotive

[Energy price: (2) Crude oil price]

Crude oil prices rise under the 4 ° C scenario, and fall under the 2 ° C scenario

4 ° C Scenario	Crude oil prices rise in 2040 years

2 ° C Scenario	Crude Oil Prices Fall in 2040 Years

oil price	IEA member countries	
current situation (2019)	63 (USD/barrel)	(base year)
2030	76 (USD/barrel)	+21%
2040	85 (USD/barrel)	+35%

Deloitte Estimates

oil price	IEA member countries	
current situation (2019)	63 (USD/barrel)	(base year)
2030	56 (USD/barrel)	-11%
2040	53 (USD/barrel)	-16%

Discussion

- (Entire) Energy demand is increasing, particularly in developing countries. oil prices rise as decarbonization slows and demand for oil rises

*Data Source:
- Stated Policies Scenario (oil price) for IEA "World Energy Outlook 2020"

Discussion

- (Entire) Demand for oil decreases as the share of demand for renewable energy increases. Crude oil prices fall slightly.

*Data Source:
- IEA "World Energy Outlook 2020" Sustainable Development Scenario (oil price)

[Energy price: (3) Engine sales]

In the 4 ° C scenario sales of engine-powered vehicles continue to grow, while under the 2 ° C scenario they are expected to decrease substantially

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

4 ° C Scenario	Sales of Engine-Equipped Vehicles

	Global sales of engine-powered vehicles *	
2015	98.5 million units/year	base year
2060	147.08 million units/year	+49%

2 ° C Scenario	Sales of engine-powered vehicles declined sharply

	Global sales of engine-powered vehicles *	
2015	98.5 million units/year	base year
2060	14.04 million units/year	-86%

* Vehicles equipped with an engine: Vehicles equipped with an internal combustion engine (Including HV, PHV, CNG and LNG vehicles), excluding EVs (electric (al) vehicle) and FCVs (fuel cell vehicle)

Discussion

- (Entire) The production volume of ZEV has been fluctuating. Production volume of in-vehicle engines as a percentage of new vehicle sales remains steady
- (Automobile Industry) ZEV promotion support policies such as purchase subsidies will be phased out (the same goes for infrastructure policy.)

*Data Source:
- IEA "Energy Technology Perspectives 2017" RTS Scenarios
  * Deloitte estimates for 2030 are based on IEA projections

Discussion

- (Entire) The market share of ZEV towards low-carbon society is expanding. As a result, sales of engine-powered vehicles declined substantially.
- (Automobile Industry) There is decreasing production of in-vehicle engines and decreasing demand for oil and natural gas

*Data Source:
- IEA "Energy Technology Perspectives 2017" B2DS Scenario
  * Deloitte estimates for 2030 are based on IEA projections

[Dissemination of next-generation technologies: (4) Dissemination of electric vehicles]

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

Under the 4 ° C scenario, sales of PHVs and ZEVs increase slightly in 2030, whereas under the 2 ° C scenario thet are expected to increase significantly

4 ° C Scenario	5% of UIO base will be PHV/ZEV in 2030

	Japan	US * Reference	China * Reference
sales Achievements ('17 years)	28000 @ ' 16 (EV, PHV, FCV)	760,000 units (EV and PHV)	1.23 million units (EV and PHV)
2030	**PHV/ZEV: 5% (72.38 million units)** *Percentage and number of UIOs globally		
2040	**PHV/ZEV: 7% (123.81 million units)** *Percentage and number of UIOs globally		
2050	**PHV/ZEV: 8% (189.07 million units)** *Percentage and number of UIOs globally		

Discussion

- (Entire) Same as before
- (Government) Suspension of ZEV promotion support policies such as purchase subsidies *The same is true for infrastructure development support measures
- (Buyer) Due to infrastructure issues, a small product lineup for next-generation vehicles, and high costs, customers' willingness to purchase next-generation vehicles does not increase, and as a result, the ICE-centered market continued.

*Data Source:
- IEA Report (30 May 2018) * Japan: Statistics from Next-Generation Vehicle Promotion Center
- Global Calculator (Tools using IEA Energy Technology Outlook 2014 data)

2 ° C Scenario	Approximately 40% of UIO base will be converted to PHV/ZEV in 2030

	Japan	US * Reference	China * Reference
sales Achievements ('17 years)	28000 @ ' 16 (EV, PHV, FCV)	760,000 units (EV and PHV)	1.23 million units (EV and PHV)
2030	**PHV/ZEV: 39% (536.85 million units)** *Percentage and number of UIOs globally		
2040	**PHV/ZEV: 63% (1,023.44 million units)** *Percentage and number of UIOs globally		
2050	**PHV/ZEV: 88% (1,609.18 million units)** *Percentage and number of UIOs globally		

Discussion

- (Government) Implement favorable policies for domestic EV manufacturers
- (Automobile Industry) Automakers offer mobile services that make use of EVs in order to both promote EVs and monetize them (MaaS et al.).
- (Customer) Lower customer barriers to EV purchases

*Data Source:
- IEA Report (30 May 2018) * Japan: Statistics from Next-Generation Vehicle Promotion Center
- Global Calculator's IEA2DS Proactive ZEV Deployment Scenario (Tools using IEA Energy Technology Outlook 2014 data)

[Extreme Extreme Weather: (5) Flood Damage]

Under the 4 ° C scenario, domestic flood damage more than doubles

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

4 ° C Scenario (No data at 2 ° C)	Flood Damage Rises Nationwide

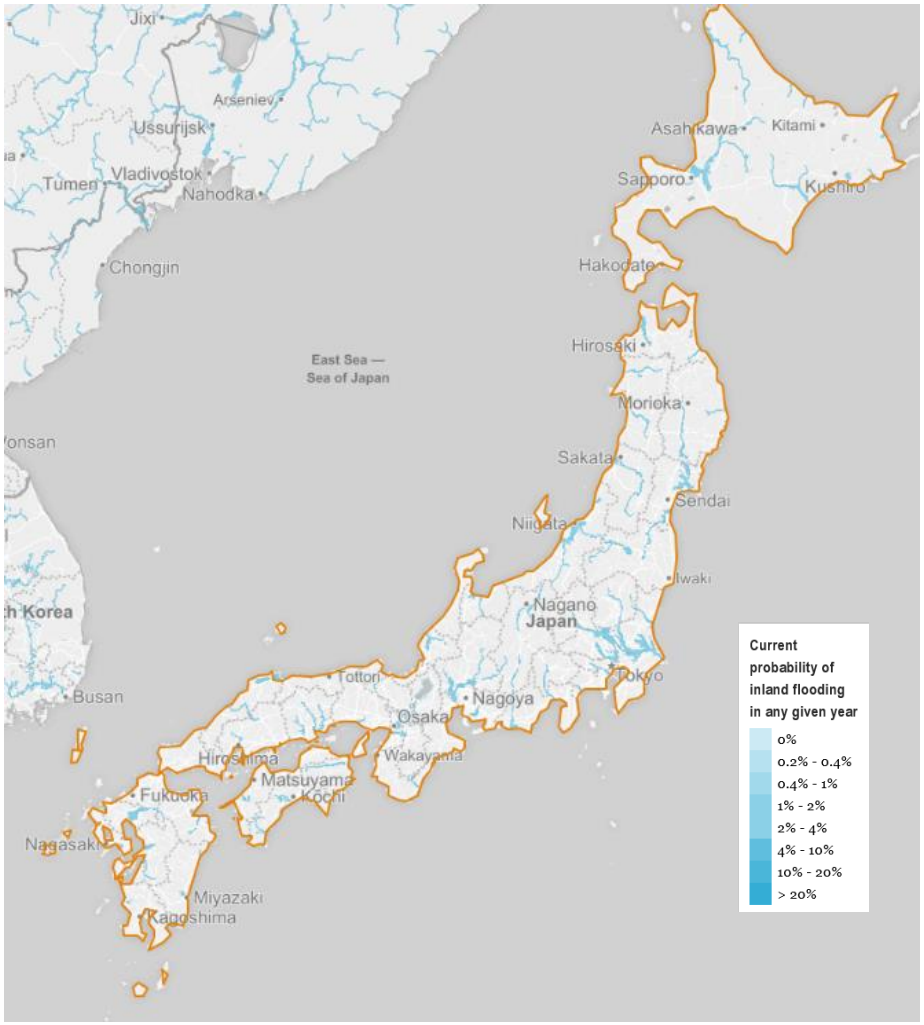
	Flood damage in urban areas (Japan)	
2010	3.3 billion USD/year	(base year)
2030	730 million USD/year (Increase due to socioeconomic change 1.7 billion USD Increase due to climate change (USD 2.2 billion)	+121%

Discussion

- Inundation caused by heavy rain increases, and inundation damage in low-lying areas also increases
- Inundation damage can occur in the low-lying areas around rivers, causing disruptions to the transport industry's supply network
- **In the event that a warehouse or manufacturing base for finished vehicles is flooded, facilities will be damaged and there will be an opportunity loss due to suspension of operations.**

*Data Source:
WRI "The Aqueduct Global Flood Analyzer"
(Scenario based on RCP 8.5 (4 ° C Scenario) and SSP2 (moderate socioeconomic fluctuations) with flood prevention measures implemented over a period of 50 years)

Estimating Flood Range and Damage (2030)



[Extreme Extreme Weather: (6) Occurrence of Typhoons and Cyclones]

Observations for storms, cyclones, and typhoons are highly uncertain and do not have clear projections

4 ° C | 2 ° C

①Real estate
② Energy
③ Automotive

Parameter	Typhoons may decrease in number and increase in power

	Global	Japan
generation Frequency	• Overall, no change • Large tropical cyclones may decline in southern hemisphere	Past statistics show no clear long-term trend in the number of typhoons occurring, the number of typhoons approaching, and the power of typhoons. However, in the future, the frequency of typhoons may decrease or not change, while the power of typhoons may increase.
power	• Augmentation • Potential increase in large tropical cyclones (Categories 4 and 5) • Small tropical cyclones may decline	
precipitation	• Increase	• + 8% to + 36% (Rate of future increases in precipitation due to heavy rain)

	In Japan Number of typhoons
current situation ('16 years)	26 (Nos.)
future (~ 2100 years)	Unknown (Global warming is expected to reduce the number of typhoons occurring in the Northwest Pacific and shift the area of typhoons to the east, resulting in a decrease in the number of typhoons approaching the area and changes in the route of typhoons, but there is high uncertainty.)

(Source)

- National Oceanic and Atmospheric Administration (NOAA)
- Japan Meteorological Agency "Extreme Weather Report 2014"
- Ministry of the Environment, Japan Meteorological Agency, "Climate of Japan at the end of the 21 century (2015)"
- Ministry of the Environment "Integrated Report on Observations, Forecasts and Impacts of Climate Change 2018: Japan's Climate Change and its Impacts" http://www.env.go.jp/earth/tekiou/report2018_full.pdf

Discussion

- (Entire) Technology for observing and predicting storms, cyclones, and typhoons advances, but it is difficult to completely avoid damage.
- (government) Establishment of incentives such as subsidies for technological development of observation and prediction concerning storms, cyclones and typhoons