3. Scenario Analysis - Practice Cases by Sector

Chapter 3. Scenario Analysis - Practice Cases by sector

This chapter explains how scenario analysis is carried out based on the support cases of the Ministry of the Environment (13 companies supported in FY2020 and FY2021).

The numerical information in each case is based on the information at the time of support.

【Cases of scenario analysis by sector (FY2020, FY2021) 】
For beginning scenario analysis

Sector		Company	For beginning scenario analysis			
			Preparation① Gaining understandings from managements	Preparation② Establishing an organizational structure for scenario analysis	Preparation③ Setting target analysis	Preparation④ Setting timeline for analysis
Financial	Asset Management	ORIX Asset Management Corporation	—	—	3-12, 3-13	3-15
Non-Financial	Energy	Fuji Oil Company, Ltd.	—	—	3-30	3-33
	Transportation	Kyushu Railway Company	—	—	3-42	3-46
		Nishi-Nippon Railroad Co., Ltd.	—	—	3-54	3-57
	Materials	GUNZE LIMITED	—	—	3-68	3-71
		Shin-Etsu Chemical Co., Ltd.	—	3-82	3-81, 3-86, 3-87	3-84
		Nippon Paper Industries Co., Ltd.	—	—	3-93	3-97
		Mitsui Mining & Smelting Co., Ltd.	—	—	3-108, 3-109, 3-110	3-112
		UACJ Corporation	—	—	3-125	3-129
	Agriculture, Food, and Forest Products	Maruha Nichiro Corporation	—	—	3-141	—
	Electronic Equipment	YASKAWA Electric Corporation	—	—	3-154	3-157
	Information Technology	SCSK Corporation	—	—	3-168	3-172
	Retailing	ASKUL Corporation	—	—	3-179, 3-180	3-181

【Cases of scenario analysis by sector (FY2020, FY2021) 】
STEP2. Assess materiality of climate-related risks

Sector		Company	STEP2. Assess materiality of climate-related risks		
			Stage 1 Listing risk items	Stage 2 Identifying potential impact on business	Stage 3 Assessing materiality of risks
Financial	Asset Management	ORIX Asset Management Corporation	3-14	3-14	3-14
Non-Financial	Energy	Fuji Oil Company, Ltd.	3-32	3-32	3-32
	Transportation	Kyushu Railway Company	3-44, 3-45	3-44, 3-45	3-44, 3-45
		Nishi-Nippon Railroad Co., Ltd.	3-55, 3-56	3-55, 3-56	3-55, 3-56
	Materials	GUNZE LIMITED	3-69, 3-70	3-69, 3-70	3-69, 3-70
		Shin-Etsu Chemical Co., Ltd.	3-88 ~ 3-90	3-88 ~ 3-90	3-88 ~ 3-90
		Nippon Paper Industries Co., Ltd.	3-94 ~ 3-96	3-94 ~ 3-96	3-94 ~ 3-96
		Mitsui Mining & Smelting Co., Ltd.	3-111	3-111	3-111
		UACJ Corporation	3-126, 3-127	3-126, 3-127	3-126, 3-127
	Agriculture, Food, and Forest Products	Maruha Nichiro Corporation	3-142	—	3-142
	Electronic Equipment	YASKAWA Electric Corporation	3-155, 3-156	3-155, 3-156	3-155, 3-156
	Information Technology	SCSK Corporation	3-170, 3-171	3-170, 3-171	—
	Retailing	ASKUL Corporation	3-179, 3-180	3-179, 3-180	3-179, 3-180

【Cases of scenario analysis by sector (FY2020, FY2021)】
STEP3. Identify and define range of scenarios

Sector		Company	STEP3. Identify and define range of scenarios		
			Stage 1 Choosing scenarios	Stage 2 Obtaining forecast information on relevant parameters (viable)	Stage 3 Shaping worldview in consideration of stakeholders
Financial	Asset Management	ORIX Asset Management Corporation	3-15	3-16	3-17 ~ 3-21
Non-Financial	Energy	Fuji Oil Company, Ltd.	3-33 1.5℃	3-38	3-34 ~ 3-37
	Transportation	Kyushu Railway Company	3-46	3-49	3-47, 3-48
		Nishi-Nippon Railroad Co., Ltd.	3-57 1.5℃	3-58	3-59, 3-60
	Materials	GUNZE LIMITED	3-71 1.5℃	3-76	3-72 ~ 3-75
		Shin-Etsu Chemical Co., Ltd.	3-84	—	—
		Nippon Paper Industries Co., Ltd.	3-97 1.5℃	3-100	3-98, 3-99
		Mitsui Mining & Smelting Co., Ltd.	3-112	—	3-113 ~ 3-116
		UACJ Corporation	3-129 1.5℃	3-130, 3-131	3-132, 3-133
	Agriculture, Food, and Forest Products	Maruha Nichiro Corporation	Partially 1.5℃ —	3-143	3-144 ~ 3-147
	Electronic Equipment	YASKAWA Electric Corporation	3-157	3-158	3-159 ~ 3-162
	Information Technology	SCSK Corporation	1.5℃ 3-172	—	3-173, 3-174
	Retailing	ASKUL Corporation	3-181	3-182	3-183, 3-184

【Cases of scenario analysis by sector (FY2020, FY2021)】
STEP4. Evaluate business impacts

Sector		Company	STEP4. Evaluate business impacts		
			Stage 1 Identifying potential financial indicators affected by risks and opportunities	Stage 2 Considering calculation formula and estimating financial impact	Stage 3 Being aware of the gap between future outlook and financial indicators in the business as usual
Financial	Asset Management	ORIX Asset Management Corporation	3-22	3-22	3-23 ~ 3-26
Non-Financial	Energy	Fuji Oil Company, Ltd.	3-39	—	3-39
	Transportation	Kyushu Railway Company	3-50	—	3-50
		Nishi-Nippon Railroad Co., Ltd.	3-61	3-62	3-63, 3-64
	Materials	GUNZE LIMITED	3-76	3-77	3-77
		Shin-Etsu Chemical Co., Ltd.	—	3-85	—
		Nippon Paper Industries Co., Ltd.	3-101	—	3-102, 3-103
		Mitsui Mining & Smelting Co., Ltd.	3-117, 3-118	—	3-117, 3-118
		UACJ Corporation	—	—	3-134 ~ 3-136
	Agriculture, Food, and Forest Products	Maruha Nichiro Corporation	—	3-148	3-149, 3-150
	Electronic Equipment	YASKAWA Electric Corporation	3-163	3-163	—
	Information Technology	SCSK Corporation	3-176		3-176
	Retailing	ASKUL Corporation	3-185, 3-186	—	3-185, 3-186

【Cases of scenario analysis by sector (FY2020, FY2021)】

STEP5. Identify potential responses

Sector		Company	STEP5. Identify potential responses			STEP6. Document and disclose information	
			Stage 1 Understand company's current status on risk management	Stage 2 Consider future countermeasures for climate-related risk management and seizing opportunities	Stage 3 Establish an organizational structure and consider practical countermeasures and how to proceed scenario analysis	Stage 1 Describe the relationship between the TCFD's recommended disclosure items and the scenario analysis	Stage 2 Describe the results obtained from each step
Financial	Asset Management	ORIX Asset Management Corporation	—	3-26	—	—	3-27
Non-Financial	Energy	Fuji Oil Company, Ltd.	—	3-40	—	—	—
	Transportation	Kyushu Railway Company	—	3-51	—	3-52	3-52
		Nishi-Nippon Railroad Co., Ltd.	—	3-65	3-66	—	—
	Materials	GUNZE LIMITED	3-78	3-78	—	—	—
		Shin-Etsu Chemical Co., Ltd.	—	3-89, 3-90	3-83	—	3-89, 3-90
		Nippon Paper Industries Co., Ltd.	3-104	3-104	—	—	—
		Mitsui Mining & Smelting Co., Ltd.	—	3-119	3-120 ~ 3-122	—	3-108, 3-109, 3-111 ~ 3-119, 3-122
		UACJ Corporation	—	3-138	3-137	—	—
	Agriculture, Food, and Forest Products	Maruha Nichiro Corporation	3-151	3-151	—	—	—
	Electronic Equipment	YASKAWA Electric Corporation	—	3-164	3-164	—	3-164
	Information Technology	SCSK Corporation	—	3-177	—	—	—
	Retailing	ASKUL Corporation	—	3-187, 3-188	3-189 ~ 3-192	—	3-189 ~ 3-192

【Cases of scenario analysis by sector (FY2018, FY2019)】

For beginning scenario analysis

Sector		Company	For beginning scenario analysis			
			Preparation① Gaining understandings from managements	Preparation② Establishing an organizational structure for scenario analysis	Preparation③ Setting target analysis	Preparation④ Setting timeline for analysis
Financial	Banks	Development Bank of Japan Inc.	—	—	the practical guide ver3.0 3-10, 3-11	the practical guide ver3.0 3-10
Non-Financial	Energy	ITOCHU Corporation	—	—	the practical guide ver2.0 3-22	the practical guide ver2.0 3-24
		Chiyoda Corporation	—	—	the practical guide ver3.0 3-42	the practical guide ver3.0 3-42
	Transportation	Mitsui O.S.K. Lines, Ltd.	—	—	—	the practical guide ver2.0 3-39
		Japan Airlines Co., Ltd.	—	—	—	the practical guide ver2.0 3-50
		Mitsubishi Motors Corporation	—	—	—	the practical guide ver2.0 3-55, 3-58
	Buildings/ Forest Products	Kajima CORPORTAION	—	—	the practical guide ver3.0 3-62	the practical guide ver3.0 3-64
		Sumitomo Forestry Co., Ltd.	—	—	—	the practical guide ver2.0 3-74
		Tokyu Fudosan Holdings Corporation	—	—	the practical guide ver2.0 3-86	the practical guide ver2.0 3-86
	Construction Materials	LIXIL Group Corporation	—	—	the practical guide ver3.0 3-73, 3-74	the practical guide ver3.0 3-74
	Materials	FUJIFILM Holdings Corporation	—	—	the practical guide ver3.0 3-98	the practical guide ver3.0 3-100
		Furukawa Electric Co., Ltd.	—	—	the practical guide ver3.0 3-110, 3-111	the practical guide ver3.0 3-114
	Food	Kagome CO.,LTD.	—	—	the practical guide ver3.0 3-139	the practical guide ver3.0 3-141
		Calbee, Inc.	—	—	the practical guide ver3.0 3-156	the practical guide ver3.0 3-158
		Meiji Holdings Co., Ltd.	—	—	the practical guide ver3.0 3-165	the practical guide ver3.0 3-165
	Electronic Equipment	KYOCERA Corporation	—	—	the practical guide ver3.0 3-182	the practical guide ver3.0 3-183
	Retailing	Seven & i Holdings Co., Ltd.	—	—	the practical guide ver3.0 3-222	the practical guide ver3.0 3-225
	Consumer Product	Lion Corporation	—	the practical guide ver3.0 3-235	the practical guide ver3.0 3-235	the practical guide ver3.0 3-235

Source: Ministry of the Environment, " Practical guide for Scenario Analysis in line with the TCFD recommendations 2nd / 3rd edition"

【Cases of scenario analysis by sector (FY2018, FY2019)】
STEP2. Assess materiality of climate-related risks

Sector		Company	STEP2. Assess materiality of climate-related risks		
			Stage 1 Listing risk items	Stage 2 Identifying potential impact on business	Stage 3 Assessing materiality of risks
Financial	Banks	Development Bank of Japan Inc.	the practical guide ver3.0 3-13	the practical guide ver3.0 3-13	the practical guide ver3.0 3-13
Non-Financial	Energy	ITOCHU Corporation	the practical guide ver2.0 3-23	the practical guide ver2.0 3-23	the practical guide ver2.0 3-23
		Chiyoda Corporation	the practical guide ver3.0 3-43	the practical guide ver3.0 3-43	the practical guide ver3.0 3-43
	Transportation	Mitsui O.S.K. Lines, Ltd.	the practical guide ver2.0 3-38	the practical guide ver2.0 3-38	the practical guide ver2.0 3-38
		Japan Airlines Co., Ltd.	the practical guide ver2.0 3-49	the practical guide ver2.0 3-49	the practical guide ver2.0 3-49
		Mitsubishi Motors Corporation	the practical guide ver2.0 3-56, 3-59	the practical guide ver2.0 3-56, 3-59	—
	Buildings/ Forest Products	Kajima CORPORTAION	the practical guide ver3.0 3-63	the practical guide ver3.0 3-63	the practical guide ver3.0 3-63
		Sumitomo Forestry Co., Ltd.	the practical guide ver2.0 3-72, 3-73	the practical guide ver2.0 3-72, 3-73	the practical guide ver2.0 3-72, 3-73
		Tokyu Fudosan Holdings Corporation	the practical guide ver2.0 3-87	the practical guide ver2.0 3-87	the practical guide ver2.0 3-87
	Construction Materials	LIXIL Group Corporation	the practical guide ver3.0 3-75	the practical guide ver3.0 3-75	the practical guide ver3.0 3-75
	Materials	FUJIFILM Holdings Corporation	the practical guide ver3.0 3-99	the practical guide ver3.0 3-99	the practical guide ver3.0 3-99
		Furukawa Electric Co., Ltd.	the practical guide ver3.0 3-113	the practical guide ver3.0 3-113	the practical guide ver3.0 3-113
	Food	Kagome CO.,LTD.	the practical guide ver3.0 3-140	the practical guide ver3.0 3-140	the practical guide ver3.0 3-140
		Calbee, Inc.	the practical guide ver3.0 3-157	the practical guide ver3.0 3-157	the practical guide ver3.0 3-157
		Meiji Holdings Co., Ltd.	the practical guide ver3.0 3-166, 3-167	the practical guide ver3.0 3-166, 3-167	the practical guide ver3.0 3-166, 3-167
	Electronic Equipment	KYOCERA Corporation	the practical guide ver3.0 3-182	the practical guide ver3.0 3-182	the practical guide ver3.0 3-182
	Retailing	Seven & i Holdings Co., Ltd.	the practical guide ver3.0 3-223, 3-224	—	the practical guide ver3.0 3-223, 3-224
	Consumer Product	Lion Corporation	the practical guide ver3.0 3-236, 3-237	the practical guide ver3.0 3-236, 3-237	the practical guide ver3.0 3-236, 3-237

Source: Ministry of the Environment, " Practical guide for Scenario Analysis in line with the TCFD recommendations 2nd / 3rd edition"

【Cases of scenario analysis by sector (FY2018, FY2019)】
STEP3. Identify and define range of scenarios

Sector		Company	STEP3. Identify and define range of scenarios		
			Stage 1 Choosing scenarios	Stage 2 Obtaining forecast information on relevant parameters (viable)	Stage 3 Shaping worldview in consideration of stakeholders
Financial	Banks	Development Bank of Japan Inc.	the practical guide ver3.0 3-14, 3-15	the practical guide ver3.0 3-13 ~ 3-15	the practical guide ver3.0 3-16 ~ 3-19
Non-Financial	Energy	ITOCHU Corporation	the practical guide ver2.0 3-24	the practical guide ver2.0 3-25	the practical guide ver2.0 3-26, 3-27
		Chiyoda Corporation	the practical guide ver3.0 3-42	the practical guide ver3.0 3-44	the practical guide ver3.0 3-45, 3-46
	Transportation	Mitsui O.S.K. Lines, Ltd.	the practical guide ver2.0 3-39	the practical guide ver2.0 3-40, 3-41	the practical guide ver2.0 3-42 ~ 3-45
		Japan Airlines Co., Ltd.	the practical guide ver2.0 3-50	—	the practical guide ver2.0 3-51, 3-52
		Mitsubishi Motors Corporation	—	the practical guide ver2.0 3-56, 3-59	the practical guide ver2.0 3-55, 3-58
	Buildings/ Forest Products	Kajima CORPORTAION	the practical guide ver3.0 3-64	the practical guide ver3.0 3-65	the practical guide ver3.0 3-66, 3-67
		Sumitomo Forestry Co., Ltd.	the practical guide ver2.0 3-74	the practical guide ver2.0 3-81	the practical guide ver2.0 3-75 ~ 3-80
		Tokyu Fudosan Holdings Corporation	—	—	the practical guide ver2.0 3-88, 3-90
	Construction Materials	LIXIL Group Corporation	the practical guide ver3.0 3-74	the practical guide ver3.0 3-80	the practical guide ver3.0 3-76 ~ 3-79
	Materials	FUJIFILM Holdings Corporation	—	the practical guide ver3.0 3-100	the practical guide ver3.0 3-101 ~ 3-104
		Furukawa Electric Co., Ltd.	—	—	the practical guide ver3.0 3-115 ~ 3-117
	Food	Kagome CO.,LTD.	the practical guide ver3.0 3-141	the practical guide ver3.0 3-142	the practical guide ver3.0 3-143 ~ 3-145
		Calbee, Inc.	the practical guide ver3.0 3-158	the practical guide ver3.0 3-159	the practical guide ver3.0 3-160, 3-161
		Meiji Holdings Co., Ltd.	the practical guide ver3.0 3-165	the practical guide ver3.0 3-168	the practical guide ver3.0 3-169, 3-170
	Electronic Equipment	KYOCERA Corporation	the practical guide ver3.0 3-183	the practical guide ver3.0 3-184	the practical guide ver3.0 3-185 ~ 3-188
	Retailing	Seven & i Holdings Co., Ltd.	the practical guide ver3.0 3-225	the practical guide ver3.0 3-226	the practical guide ver3.0 3-227, 3-228
	Consumer Product	Lion Corporation	the practical guide ver3.0 3-238	the practical guide ver3.0 3-239	the practical guide ver3.0 3-240 ~ 3-243

Source: Ministry of the Environment, " Practical guide for Scenario Analysis in line with the TCFD recommendations 2nd / 3rd edition"

【Cases of scenario analysis by sector (FY2018, FY2019)】
STEP4. Evaluate business impacts

Sector		Company	STEP4. Evaluate business impacts		
			Stage 1 Identifying potential financial indicators affected by risks and opportunities	Stage 2 Considering calculation formula and estimating financial impact	Stage 3 Being aware of the gap between future outlook and financial indicators in the business as usual
Financial	Banks	Development Bank of Japan Inc.	—	the practical guide ver3.0 3-16 ~ 3-20	—
Non-Financial	Energy	ITOCHU Corporation	—	—	the practical guide ver2.0 3-28
		Chiyoda Corporation	the practical guide ver3.0 3-47	the practical guide ver3.0 3-47	the practical guide ver3.0 3-48
	Transportation	Mitsui O.S.K. Lines, Ltd.	the practical guide ver2.0 3-46, 3-47	—	the practical guide ver2.0 3-46, 3-47
		Japan Airlines Co., Ltd.	the practical guide ver2.0 3-53	—	—
		Mitsubishi Motors Corporation	—	—	the practical guide ver2.0 3-56, 3-59
	Buildings/ Forest Products	Kajima CORPORTAION	the practical guide ver3.0 3-68	—	the practical guide ver3.0 3-69
		Sumitomo Forestry Co., Ltd.	—	—	the practical guide ver2.0 3-83, 3-84
		Tokyu Fudosan Holdings Corporation	—	—	the practical guide ver2.0 3-89, 3-91
	Construction Materials	LIXIL Group Corporation	the practical guide ver3.0 3-81	—	the practical guide ver3.0 3-82, 3-83
	Materials	FUJIFILM Holdings Corporation	the practical guide ver3.0 3-105	the practical guide ver3.0 3-105	the practical guide ver3.0 3-106, 3-107
		Furukawa Electric Co., Ltd.	—	—	the practical guide ver3.0 3-118, 3-119
	Food	Kagome CO.,LTD.	the practical guide ver3.0 3-146	the practical guide ver3.0 3-146	the practical guide ver3.0 3-147 ~ 3-148
		Calbee, Inc.	—	the practical guide ver3.0 3-162	the practical guide ver3.0 3-162
		Meiji Holdings Co., Ltd.	the practical guide ver3.0 3-171, 3-178	the practical guide ver3.0 3-171, 3-178	the practical guide ver3.0 3-172, 3-179
	Electronic Equipment	KYOCERA Corporation	—	—	the practical guide ver3.0 3-189
	Retailing	Seven & i Holdings Co., Ltd.	the practical guide ver3.0 3-229, 3-230	—	the practical guide ver3.0 3-229, 3-230
	Consumer Product	Lion Corporation	the practical guide ver3.0 3-244	the practical guide ver3.0 3-244	the practical guide ver3.0 3-245, 3-246

Source: Ministry of the Environment, " Practical guide for Scenario Analysis in line with the TCFD recommendations 2nd / 3rd edition"

【Cases of scenario analysis by sector (FY2018, FY2019)】
STEP5. Identify potential responses

Sector		Company	STEP5. Identify potential responses			STEP6. Document and disclose information	
			Stage 1 Understand company's current status on risk management	Stage 2 Consider future countermeasures for climate-related risk management and seizing opportunities	Stage 3 Establish an organizational structure and consider practical countermeasures and how to proceed scenario analysis	Stage 1 Describe the relationship between the TCFD's recommended disclosure items and the scenario analysis	Stage 2 Describe the results obtained from each step
Financial	Banks	Development Bank of Japan Inc.	—	the practical guide ver3.0 3-22	the practical guide ver3.0 3-23	—	—
Non-Financial	Energy	ITOCHU Corporation	—	—	—	—	—
		Chiyoda Corporation	—	the practical guide ver3.0 3-48	—	—	—
	Transportation	Mitsui O.S.K. Lines, Ltd.	—	—	—	—	—
		Japan Airlines Co., Ltd.	—	—	—	—	—
		Mitsubishi Motors Corporation	—	—	—	—	—
	Buildings/ Forest Products	Kajima CORPORTAION	—	the practical guide ver3.0 3-70, 3-71	—	—	—
		Sumitomo Forestry Co., Ltd.	—	—	—	—	—
		Tokyu Fudosan Holdings Corporation	—	—	—	—	—
	Construction Materials	LIXIL Group Corporation	—	—	the practical guide ver3.0 3-84	—	—
	Materials	FUJIFILM Holdings Corporation	the practical guide ver3.0 3-108	the practical guide ver3.0 3-108	—	—	—
		Furukawa Electric Co., Ltd.	—	the practical guide ver3.0 3-118 ~ 3-120	—	—	—
	Food	Kagome CO.,LTD.	—	the practical guide ver3.0 3-149 ~ 3-152	—	—	—
		Calbee, Inc.	the practical guide ver3.0 3-163	the practical guide ver3.0 3-163	—	—	—
		Meiji Holdings Co., Ltd.	the practical guide ver3.0 3-173, 3-180	the practical guide ver3.0 3-173, 3-180	—	—	—
	Electronic Equipment	KYOCERA Corporation	the practical guide ver3.0 3-190 ~ 3-192	the practical guide ver3.0 3-190 ~ 3-192	—	—	—
	Retailing	Seven & i Holdings Co., Ltd.	—	the practical guide ver3.0 3-233	—	—	—
	Consumer Product	Lion Corporation	the practical guide ver3.0 3-247	the practical guide ver3.0 3-247	—	—	—

Source: Ministry of the Environment, " Practical guide for Scenario Analysis in line with the TCFD recommendations 2nd / 3rd edition"

Financial Sector (Asset Management)

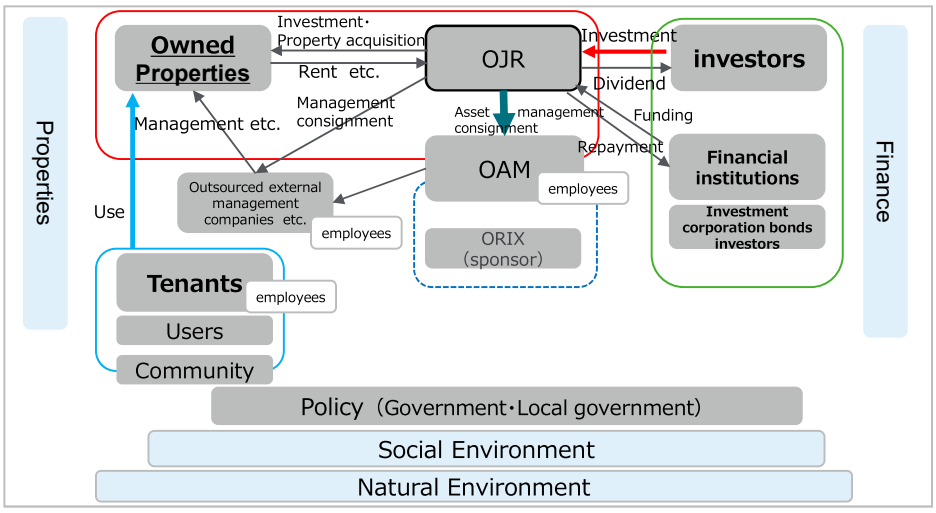
✓ Practice Case ① : ORIX Asset Management Corporation

2 [Covered business] We will cover OAM's management of REIT assets

ORIX Asset Management Corporation (OAM) is the asset management company of ORIX JREIT Inc. (OJR), a listed REIT. The scenario analysis will cover the management of OJR's assets.

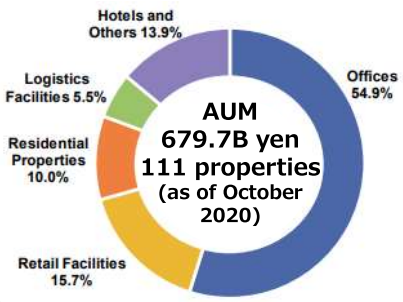
-OJR: Purchases real estate, etc. with funds procured from investors and financial institutions and leases it to tenants. OJR then distributes the money it has gained from rents to investors after deducting administrative fees, etc. The assets being managed are owned by the investment corporation, and thus OJR is subject to making disclosures in compliance with the TCFD. However, investment corporations are legally forbidden to hire employees, and must outsource management operations.

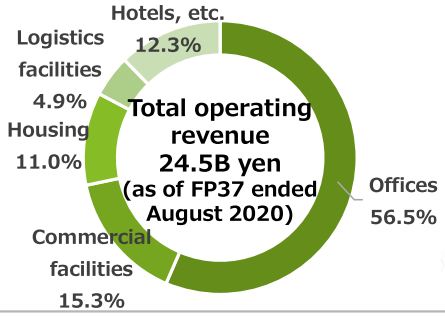
-OAM: OAM has been entrusted with the authority to manage OJR's assets, and makes investments in physical real estate and real estate trust beneficiary rights.
OAM is the entity that will consent to TCFD guidelines and participate in this support program.

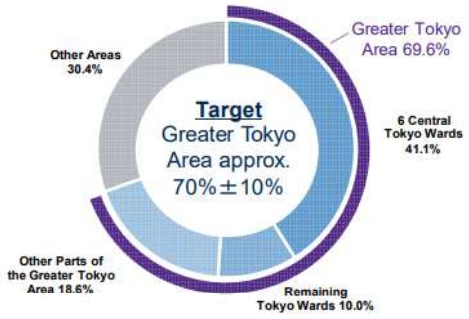


2 [Covered business]
We analyzed the ownership/management of all 111 properties in OJR's portfolio

OJR's portfolio







Key parameters in OJR's value chain

Funding

-Changes in evaluation and goals for investors, lenders, etc.,

Property acquisition

-Measures toward greenhouse gas (GHG) emission regulations
-Measures toward carbon taxes and carbon pricing
-Changes in tenant/user needs and behavior

Ownership/management

-Extreme weather conditions
-Increased average temperatures
-Measures toward GHG emission regulations
-Measures toward carbon taxes and carbon pricing
-Changes in tenant/user needs and behavior
-Elevated sea levels
-Spread of technology for renewable energy/energy conservation
-Changes in the energy mix
-Shifts in energy demand

Funding

Property dispositions

-Measures toward GHG emission regulations
-Measures toward carbon taxes and carbon pricing
-Changes in tenant/user needs and behavior

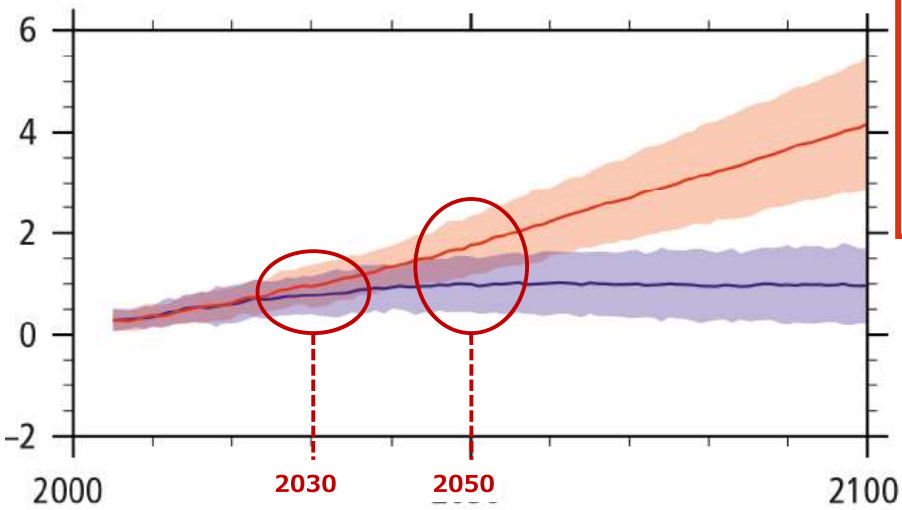
We will focus on initiatives here this time

2 [Risk significance assessment: risks and opportunities]
Value chain risks and opportunities in the real estate (REIT) industry

Transition risks	Carbon taxes / carbon pricing	Higher material procurement costs and fuel/electricity fees due to an increase in tax for climate change mitigation	High
		Increased comparative value for existing projects in cases where new development would result in increased costs	
		Increased fees for energy with a higher CO2 emission factor, incentives for adopting energy sources with low emissions	
	Greenhouse gas emission regulations	Strengthened greenhouse gas emission regulations, increased operating expenses due to the expansion of the cap and trade system	High
		Strengthened building energy efficiency regulations, increased operating expenses due to the need to meet energy conversation requirements for owned properties and a strengthened reporting system	
	Changes in customer behavior (customers/tenants)	A shift in customer demand toward buildings with high environmental performance	High
	Changes for investors/lenders (evaluation/goals)	Changes in how investors evaluate businesses, a strengthened platform for procuring funds through the expansion of the ESG investor base	High
		Expanded sources of funding through Green Bonds and loans	
	Other	Changes in the energy mix, shifts in energy demand, spread of technology for renewable energy/energy conservation, changes in employment competition	Med. - Low
Physical risks	Increased average temperatures	Higher operating expenses due to higher cooling demands at owned properties, a need for measures toward ensuring comfort	High
		Decreased work efficiency for employees and workers, restrictions on work attendance, difficulty performing construction operations during the summer	
	Extreme weather conditions	Damage from flooding and power outages at owned properties, increased costs for restoration and pre-emptive measures	High
		Limitations on which days business can be conducted and on usage	
		Decreased asset value for properties in areas with high risk of flooding/storm surge	
		Securing a competitive advantage through strengthening disaster responses, increased rental revenues and customer use	
		Increased property insurance premiums	
	Other	Changes in precipitation and weather patterns, elevated sea levels	Med. - Low

3 [Selected scenarios]
2˚C and 4˚C scenarios have been selected for transition risks as of 2030 and physical risks as of 2050

[Projected average global surface temperature change]
(compared with the average from 1986–2005)



Prior to 2030, the change in temperature is nearly the same in both the 2˚C and 4˚C scenarios. The gap between the scenarios widens after 2030.

Definition of 4˚C (2.7˚C+) scenarios

4˚C scenario:
3.2-5.4˚C higher than pre-Industrial Revolution levels if no additional measures against global warming are taken

Over 2˚C (2.7˚C-4˚C) scenario:
2.7-4.0˚C higher than pre-Industrial Revolution levels if no additional measures against global warming are taken

2˚C scenario:
0.9-2.3˚C higher than pre-Industrial Revolution levels if strict measures are taken

(Reference) 1.5˚C scenario:
We are highly likely to achieve an increase of less than 1.5˚C compared to pre-Industrial Revolution levels if a radical transition to a new system is made.

The TCFD recommendations for scenario analysis suggest that multiple temperature range scenarios be selected, including those below 2˚C

3 [Table of parameters used]
Definitions of various worldviews based on scientific evidence from IEA and other sources

*Exchange rate: 1 USD = 105 JPY (based on the November 12, 2020 rate)

Key risks/opportunities		Parameter	Currently	Transition risks: 2030 / Physical risks: 2050		Source
				4˚C (over 2˚C)	2˚C	
Transition risks	Carbon pricing	1. Carbon taxes	**2.6** USD/t	**2.6** USD/t	**100** USD/t	• IEA WEO2019 • We assume that levels in the 4˚C scenario will be equivalent to current levels
		[Added] power rates	**217** USD/MWh	**209** USD/MWh	**231** USD/MWh	• IEA WEO2018
	Responses toward GHG emission regulations	2. Energy consumption intensity for buildings	Global forecast (compared to 2014)	(**13.5** %)	(**20.5** %)	• IEA ETP2017
			Target for Japan (compared to 2013)	—	Commercial (**14** %) Home (**27** %)	• Ministry of Land, Infrastructure, Transport and Tourism
		3. Zero emission targets for Tokyo Metropolitan	CaT reduction target (compared to 2002 - 2007)	—	(**35** %)	• Tokyo Metropolitan
		4. Grid emission factors	**0.46** kg-CO2/kWh (2019)	**0.31** kg-CO2/kWh	**0.16** kg-CO2/kWh	• IEA WEO2020
		5. Mandatory adoption of ZEB/ZEH (government target)	ZEB total floor space **0** billion ㎡ (2014)	**2.5** billion ㎡	**1.65** billion ㎡	• IEA ETPAgency for Natural Resources and Energy: Basic Energy Plan 2017
			Target for Japan	—	**ZEB 100%** for new buildings **ZEH 100%** for new housing	• Agency for Natural Resources and Energy: Basic Energy Plan (July 2018) • Ministry of Economy, Trade and Industry
	Changes in customer behavior	6. Increases/decreases in rent based on environmental performance	**+3.64 – 5.9**%	—	An additional **+1 - 5**%	• Smart Wellness Office Research Committee, xymax, Japan Real Estate Institute, DBJ
Physical risks	Increased average temperatures	[Added] AC costs	**19** USD/person	**61** USD/person	**35** USD/person	• IEA "The Future of Cooling"
	Extreme weather conditions	7. Flood damage costs	**3.3** billion USD/year	**7.3** billion USD/year (2030)	—	• WRI "The Aqueduct Global Flood analyzer"
		8. Changes in volume of rainfall/flow and frequency of flooding in Japan	Frequency of flooding (compared to 2018)	Approx. **4**x (2040)	Approx. **2**x (2040)	• Review Meeting of Technologies Related to Flood Control Planning Based on Climate Change: "A proposal for flood planning based on climate change" (2019)
		9. Typhoons/cyclones	26/year (2016)	There is a possibility that the frequency will decrease while the intensity increases		• Japan Meteorological Agency, Ministry of the Environment, others
		10. Elevation of the average global sea level	Compared with the 1986 – 2005 average	**+0.25** m	**+0.20** m	• Ministry of the Environment, Japan Meteorological Agency

3 [Selected scenarios]

Overview of selected scenarios (hypotheses for transitional risks as of 2030, and physical risks as of 2050)

Item	4 ºC scenario	2 ºC scenario
Carbon taxes	Carbon taxes are not introduced, and there is no stimulation of activities such as emission credit trading	Carbon prices are expected to soar
Energy consumption intensity for buildings	No active investment occurs, and energy consumption rates do not improve beyond a certain level	Significant improvements are made globally, with an up to 30% reduction of building energy consumption in Japan
Zero emission targets for Tokyo Metropolitan	Total CO2 emissions are reduced by 35% by 2030	Total CO2 emissions are reduced by 35% by 2030, and similar systems are implemented on a nationwide scale
Grid emission factors	Improvements are limited	Efforts such as the promotion of initiatives lead to significant improvement in emission factors
Mandatory implementation of ZEB/ZEH	Regulations remain weak, penetration is limited, and costs remain high	Related markets are stimulated by ZEB/ZEH penetration. Implementation leads to increased competitiveness
Domestic electricity retail prices	Decrease	Increase
AC costs	Significantly increase	Increase
Increases/decreases in rent based on environmental performance	We hypothesize that rent will increase, but could vary depending on the scenario	
Flood damage costs	Flood damage costs in urban areas more than double	
Changes in volume of rainfall/flow and requency of flooding	There is increased rainfall/flow volume and flooding frequency over both scenarios	
Typhoons	(Precise figures could not be determined due to the high degree of uncertainty)	
Elevation of the average global sea level	We hypothesize that there will not be a significant increase in sea levels in 2050, and there are no major differences between either scenario on this. However, there are concerns about flood damage caused by storm surges from the synergistic effects of large typhoons and "guerrilla rainstorms"	

3 [Scenario group definition]

4°C 2°C

No progress is made in low-carbonization trends, resulting in the need for responses toward emerging physical risks

4°C worldview

: Actions for responding to risks

: Actions for seizing opportunities

Properties

- Damage from inland flooding caused by large typhoons and storm surges due to extreme weather conditions
- Higher restoration costs due to higher frequency of damage from extreme weather conditions
- Higher cooling demands and a need for more/stronger cooling equipment due to an increase in average temperatures

-Update the scope of asset valuation to include physical risks, optimize portfolios
-Strengthen disaster preparedness for owned properties

Tenants

Carbon tax fees are kept at their current levels, and there are no significant changes in utility costs by unit

- Low interest in the environmental performance of tenanted properties, and no increase in the number of companies preferring "green buildings"
- Increased costs due to higher cooling demands and more/stronger cooling equipment due to an increase in average temperatures
- Reduced number of days where business can be conducted and reduced numbers of users due to damages

Property rental/REIT/OJR

- Movement toward low-carbonization is slow, and there is little incentive for reducing GHG emissions from new buildings
- Energy-saving costs remain high due to limited progress in energy-saving technologies, and there is no increase in demand for "green buildings"
- Disaster preparedness for held assets will become necessary due to an increased frequency of damage caused by large typhoons and inland flooding
- Accelerated deterioration for held assets and reduced asset value due to elevated average temperatures and an increased amount of rainfall
- Emergence of REITs that actively promote the disaster resistance of properties

Natural environment

- Increased flood damage due to extreme weather conditions (e.g. concentrated rainfall, typhoons, floods)
- Elevated average temperatures, increased number of heat waves

Funding sources (investors/financial institutions)

- Low-carbonization measures have no effect on investment activities
- Properties with high physical risk are avoided as investment targets

-Devise measures against physical risks and perform an external disclosure

Policy

- There is no increase in petroleum or coal taxes, and carbon tax fees are kept at their current levels
- Emissions credit trading does not become more widespread than it is currently due to slow movement toward low-carbonization and no increase in external pressure from the international community
- There is progress in government-led strengthening of disaster preparedness in building codes and disaster prevention/mitigation plans, including mandatory measures against flooding in coastal areas

-Promptly obtain information on policies concerning disaster preparedness
-Strengthen disaster prevention/mitigation plans

4℃ 2℃

3 [Scenario group definition]
While there is an increase in low-carbonization costs, there are also increasing business opportunities for contributing to GHG reduction

2℃ worldview

: Actions for responding to risks

: Actions for seizing opportunities

Properties

- Increased costs for fuel used in owned facilities due to expensive carbon taxes being set
- Increase in companies preferring "green buildings" from the perspective of GHG emissions reductions and lowered costs
- While the impact is less than in the 4℃ scenario, sites may be damaged to a certain extent by extreme weather conditions

-Expand ZEB/ZEH assets and renovate owned properties to make them energy efficient

-Update the scope of asset valuation to include transition risks/opportunities, optimize portfolios

Tenants

- Increased costs for fuel used in owned facilities due to expensive carbon taxes being set
- On the other hand, cost effectiveness is improved due to increased energy efficiency
- Increase in companies preferring "green buildings" from the perspective of GHG emissions reductions and lowered costs

Property rental/REIT/OJR

- Impact is felt from the taxation of GHG emissions introduced to promote decarbonization
- The ratio of "green buildings" in owned properties increases in response to the increase in demand
- It will be necessary to renovate existing held assets to make them energy efficient in order to respond to tenants who are concerned about environmental performance
- While the impact is less than in the 4℃ scenario, held assets may be damaged to a certain extent by extreme weather conditions
- Emergence of REITs that actively promote the environmental performance of properties

Natural environment

- Compared to the 4℃ scenario, the increase in damage caused by extreme weather conditions has been curbed

Funding sources (investors/financial institutions)

- Properties' environmental performance (whether or not they have received a certification label) will have increasing importance as a matter for basing investment decisions on
- Track records for areas such as GHG emission reductions will have increasing importance as factors for basing investment decisions on
- The impact of physical risks on property investment decisions are limited

-Use certification obtained for environmental performance as a point for appealing to funding sources

Policy

- The "cap and trade" system expands to include all of Japan (stimulating emissions credit trading), and progress is made toward introducing carbon taxes
- Subsidies related to ZEH and ZEB are expanded as ZEH is made mandatory for new buildings and ZEB is implemented
- While a certain amount of progress is made in government-led strengthening of disaster preparedness in building codes and disaster prevention/mitigation plans, it is limited compared to the 4℃ scenario

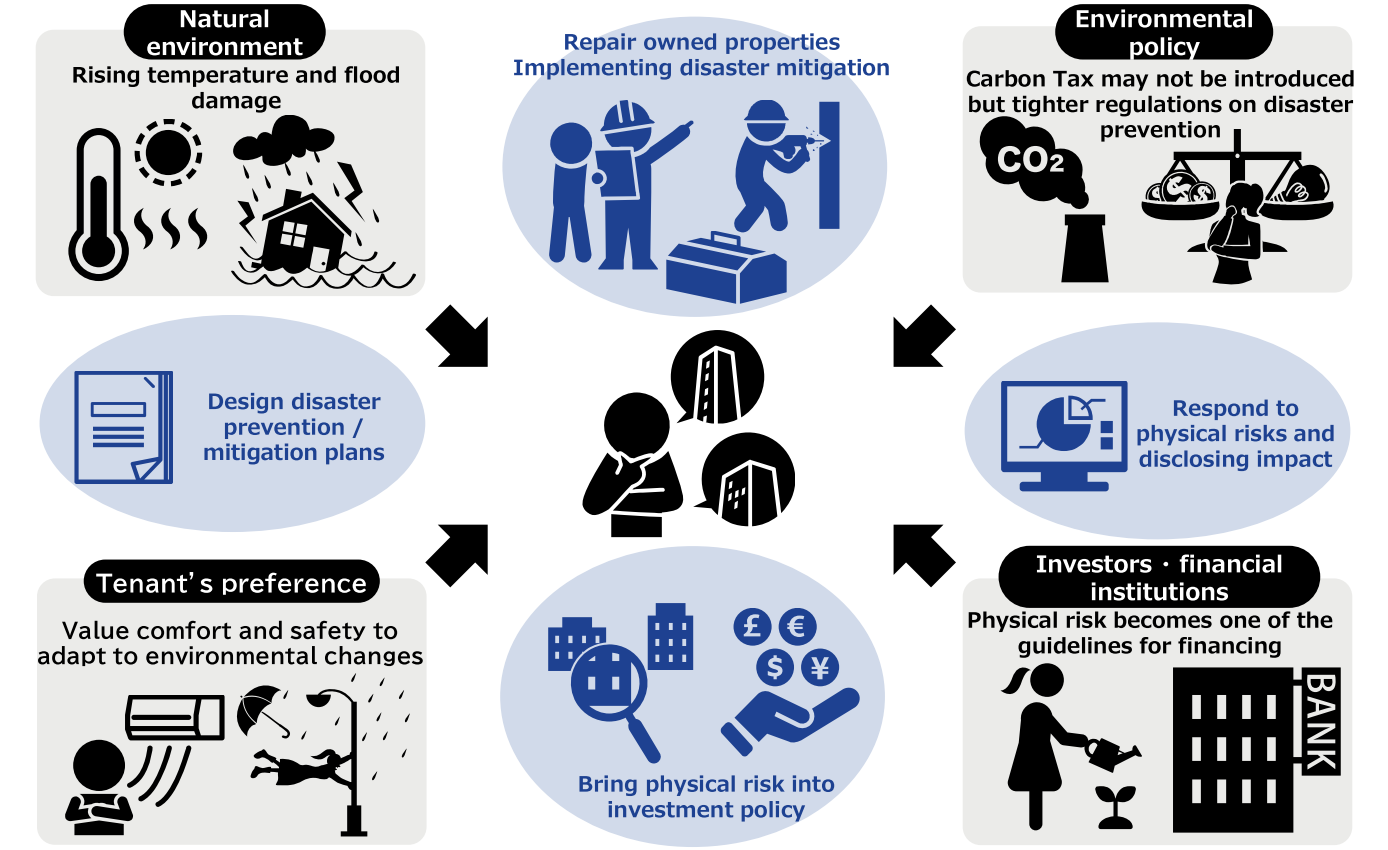
-Promptly obtain information on policies (including subsidies) concerning decarbonization and disaster preparedness

-New buildings: acquire ZEB/ZEH properties

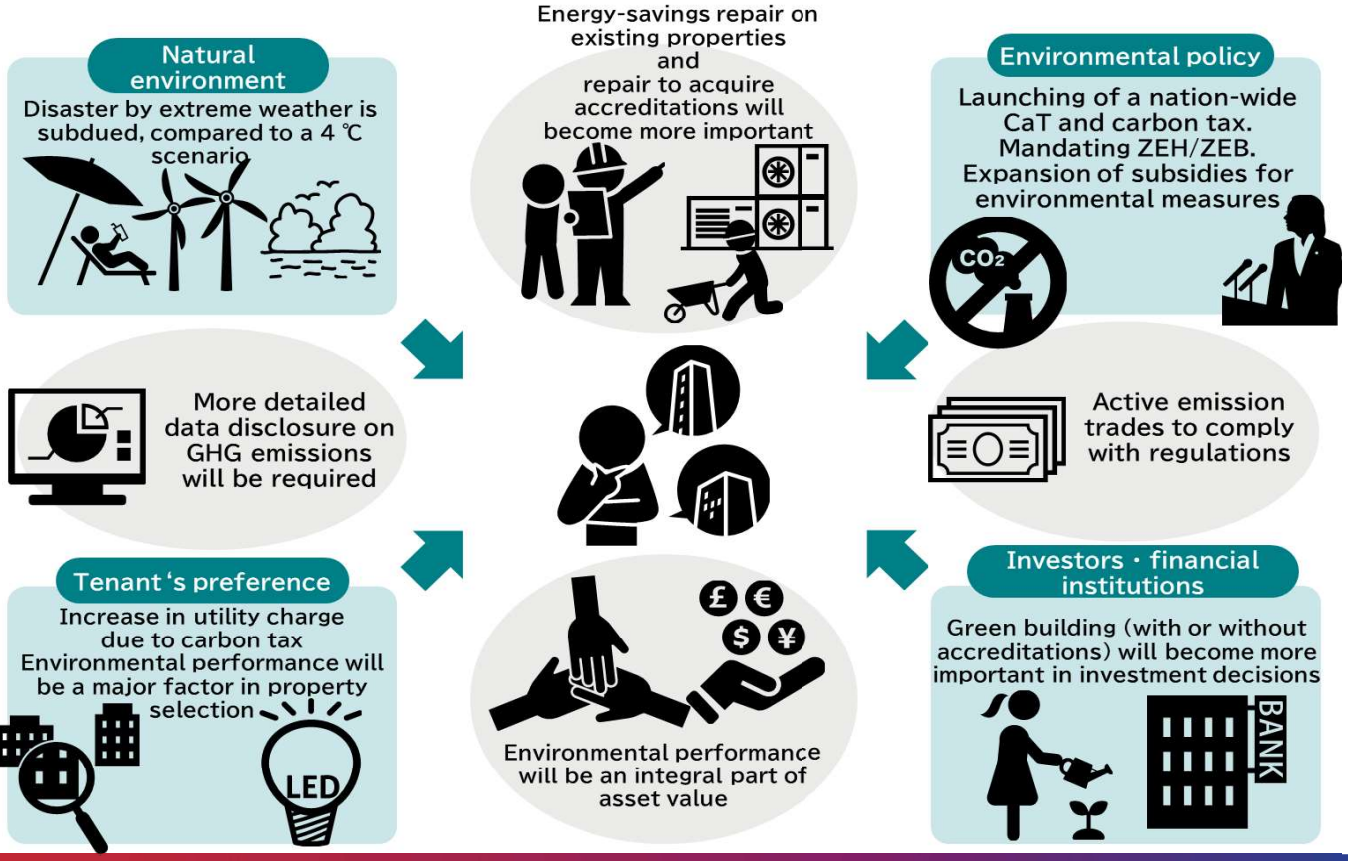
-Existing buildings: implement energy-saving/renewable energy facilities

4℃ 2℃

3 [Future social image in a 4℃ scenario]
Further reduction of disaster risks in asset portfolio will be required

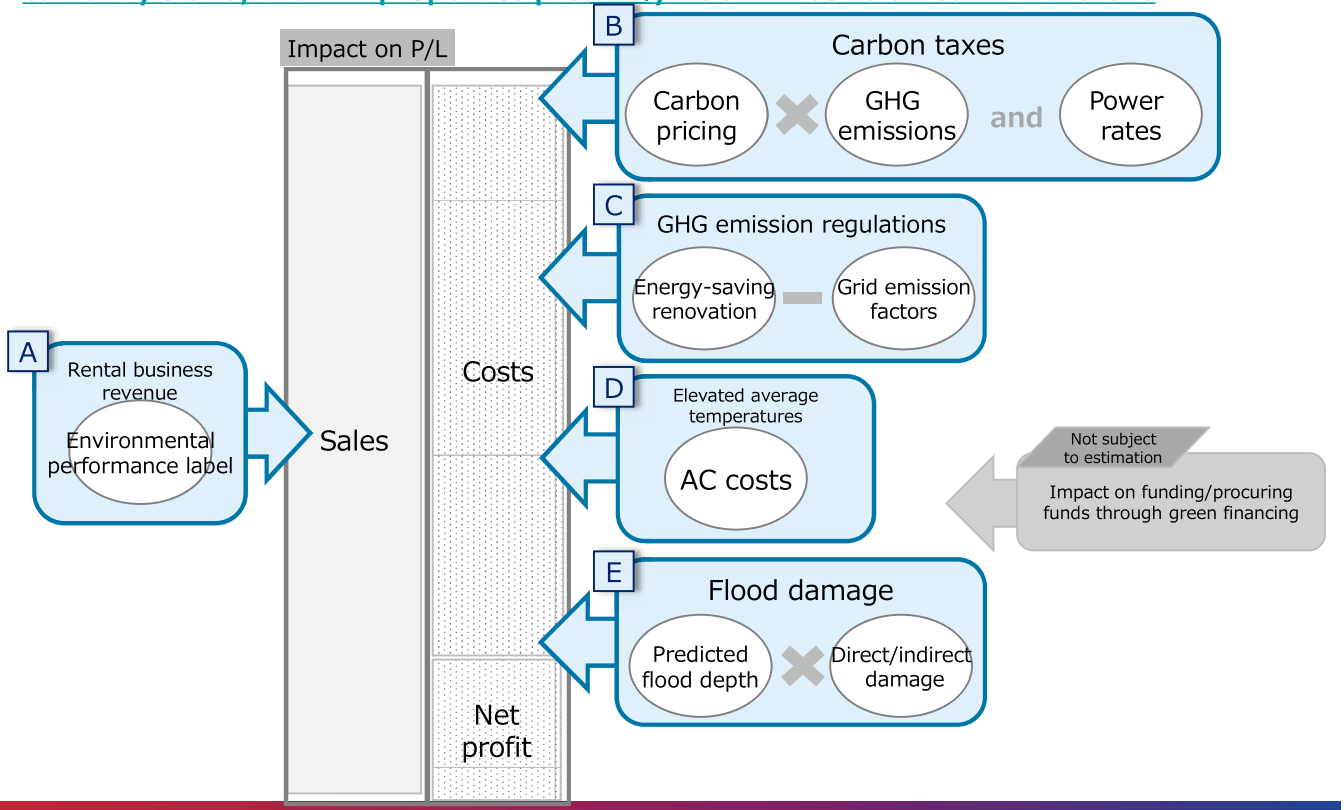


3 [Future social image in a 2℃ scenario]
Agenda will be to optimize energy efficiency across the portfolio.



4 [Business impact evaluation]
We investigate the impact of each risk item on the profit and loss statement (P/L)

[Hypothesis] We make no changes in the portfolio and assume that, based on how things currently stand, the 111 properties presently held will be retained in the future



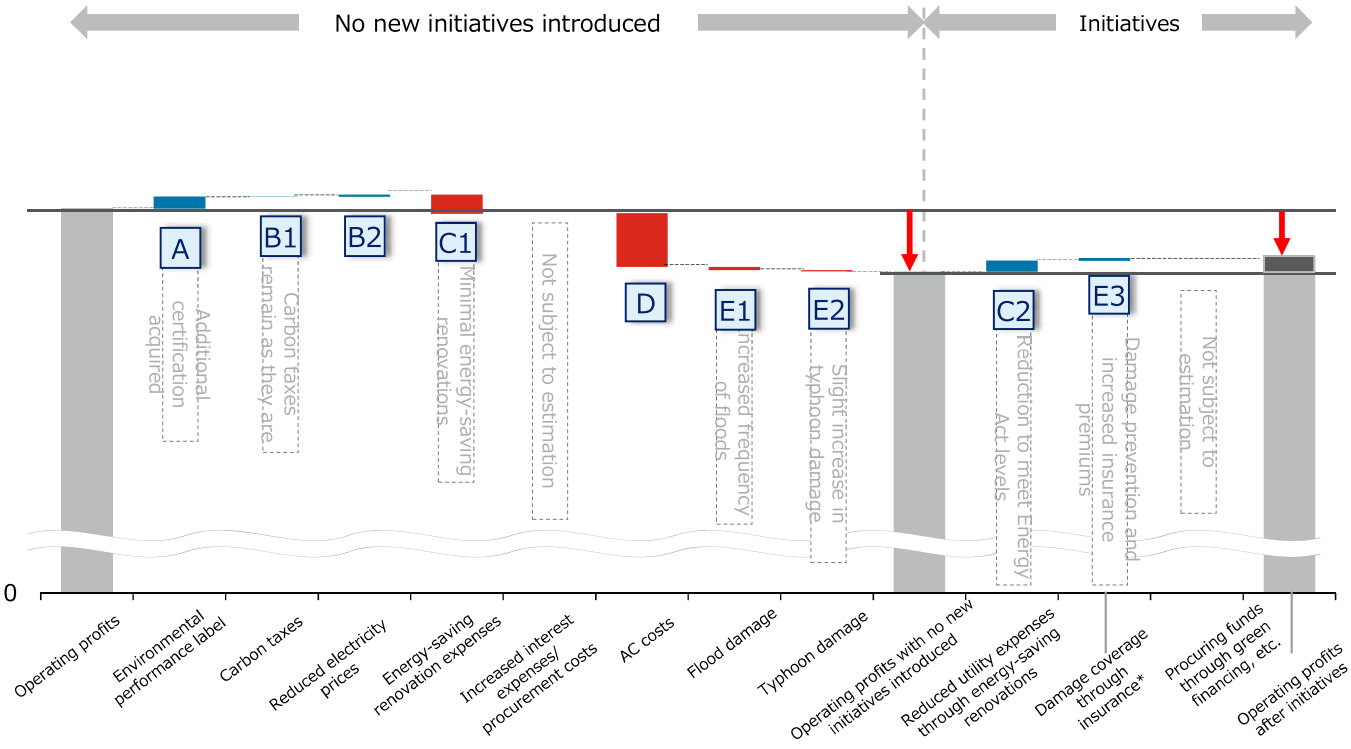
4 [Calculation results for each risk]
We hypothesize that there will be significant financial impact from changes in customer behavior, GHG regulations, increased average temperatures, and extreme weather conditions

		Risk	Scenario 4˚C	Scenario 2˚C
Transition risk	A	Changes in customer behavior (environmental performance label)	Rental fee premiums are created through additional certification	Premiums are added to rents, causing rents for certified properties to increase
		Carbon pricing (carbon taxes)	Current measures remain as they are (tax for climate change mitigation)	Increased operating expenses from taxation of GHG emissions
	B	Carbon pricing (exemption from carbon taxes through energy-saving renovations)	(Not subject to estimation) N/A	Reduced carbon tax fees through using renovations to reduce GHG emissions
		Electricity prices	Operating expenses are kept in check by reduced electricity prices	Electricity prices go up, but electricity expenses are reduced due to less of it being used
	C	Responses toward GHG emission regulations (energy-saving renovation)	Energy-saving renovations are implemented to reduce emissions to meet the levels specified by the Act on the Rational Use of Energy (1%/year)	Energy-saving renovations are implemented to reduce emissions to meet government target levels
		Responses toward GHG emission regulations (reduced utility expenses through energy-saving renovation)	Utility expenses are kept in check by the energy-saving renovations listed above	Utility expenses are kept in check by the energy-saving renovations listed above
	D	Changes for investors and lenders (increased interest expenses / procurement costs)	(Not subject to estimation) N/A	(Not subject to estimation) N/A
Physical risk		Elevated average temperatures (AC costs)	Summer air conditioning costs increase due to increased temperatures	Summer air conditioning costs increase due to increased temperatures
	E	Extreme weather conditions (flood damage)	Emergency measures become necessary for hazard areas, and there is a loss of profits	Emergency measures become necessary for hazard areas, and there is loss of profits
		Extreme weather conditions (typhoon damage)	In the past three years, we have seen the arrival of some of the biggest typhoons ever recorded	In the past three years, we have seen the arrival of some of the biggest typhoons ever recorded
		Extreme weather conditions (insurance coverage for damages)	Flood damage can be handled by insurance, but insurance premiums increase	Flood damage can be handled by insurance, but insurance premiums increase slightly

4 [Business impact evaluation: 4˚C scenario]

4˚C 2˚C

In the 4˚C scenario, initiatives are used to keep the impact of reduced revenue down to approximately 20 percent

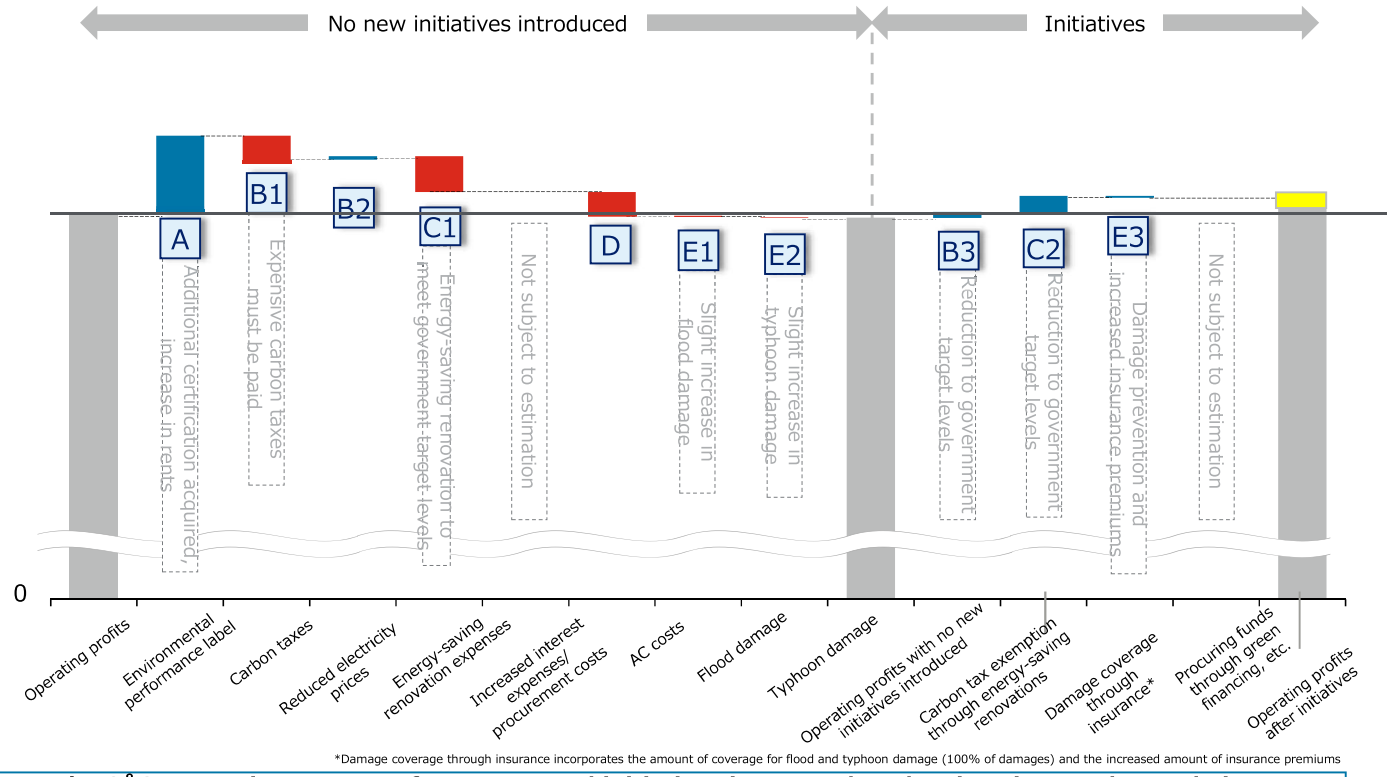


*Damage coverage through insurance incorporates the amount of coverage for flood and typhoon damage (100% of damages) and the increased amount of insurance premiums

In the 4˚C scenario, there is a significant increase in expenses from air conditioning costs, but the reduction in utility expenses makes up for a portion of this

4 [Business impact evaluation: 2˚C scenario]
In the 2˚C scenario, initiatives can be used to turn the impact of reduced revenue into a positive situation

4˚C 2˚C

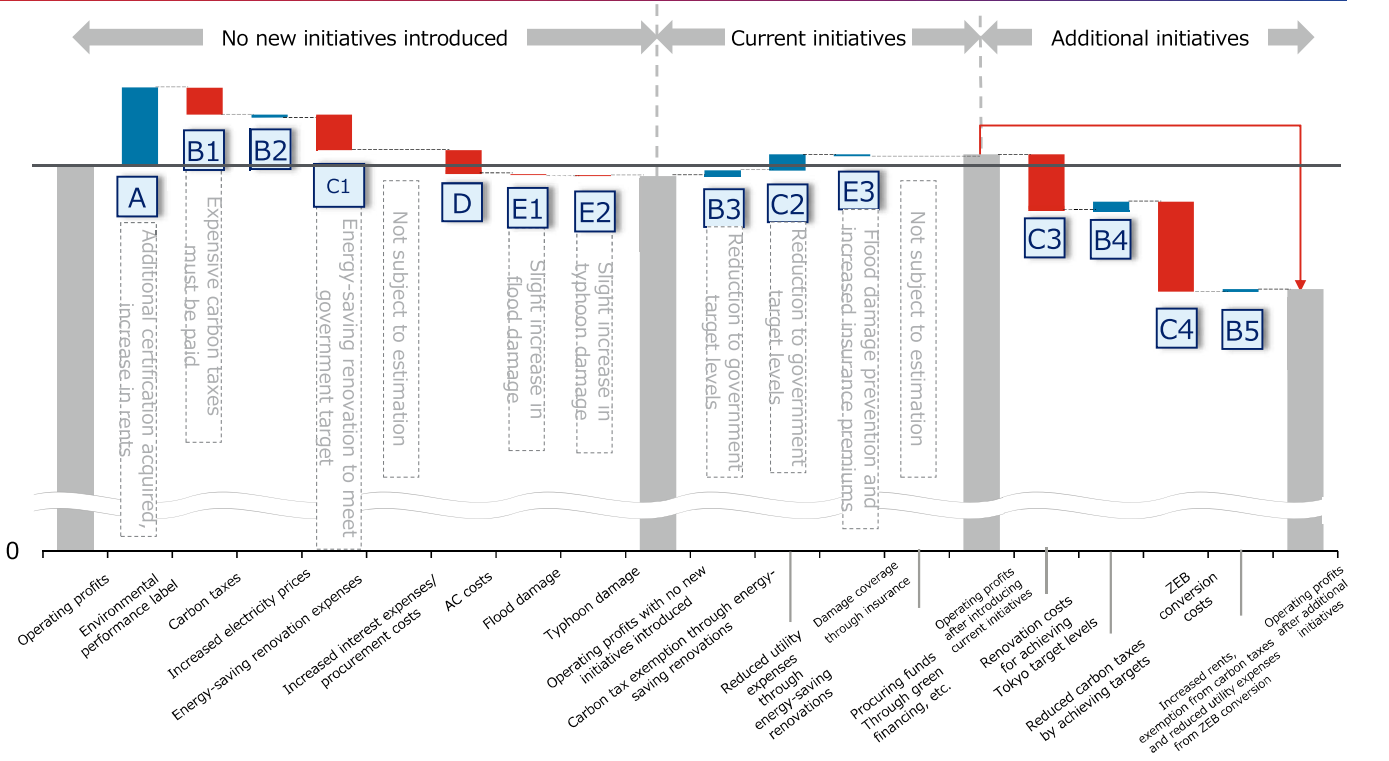


*Damage coverage through insurance incorporates the amount of coverage for flood and typhoon damage (100% of damages) and the increased amount of insurance premiums

In the 2˚C scenario, expenses from taxes and initiatives increase, but the situation can be made into a positive one through environmental performance labels and energy efficiency

5 [Impact from additional initiatives: 2˚C scenario]
In the 2˚C scenario, additional initiatives make further carbon reduction possible, but the outcome is negative from the perspective of benefits that can be quantifiably measured

4˚C 2˚C



We hypothesize even demanding emission reduction targets and stronger ZEB implementation in 2030 in preparation for the goal of net-zero emissions by 2050

6 [Considerations in preparing for disclosure]
What should be disclosed, and how much information should be given? Start by moving ahead with the disclosure, and make improvements based on investor reactions/evaluations

<Period> <Disclosed items>

Website

(updated as necessary)

Feb. Accounts settled

(revision of website)

Apr. Earning release

- Summary of financial statements
- Financial results presentation materials

May

- Asset management report
- Securities report

Aug. Accounts settled

ESG report

(once annually)

Oct. Earning release

- Summary of financial statements
- Financial results presentation materials

Nov.

- Asset management report
- Securities report

- OJR settles its accounts twice annually
- At present, we assume that it will make disclosures using the following media:
  -Website
  "ESG initiatives" page
  -ESG report (once annually)
  -Financial results presentation materials
- Start by disclosing items such as recognized risks/opportunities, scenarios, and worldviews, then have discussions with investors and flesh out responses while confirming their reactions.
- Management is aware of scenario analysis results and investor evaluations, etc., and uses these to improve value.
- We will give further consideration to disclosure methods for business impact, given the limited scope of the current analysis.

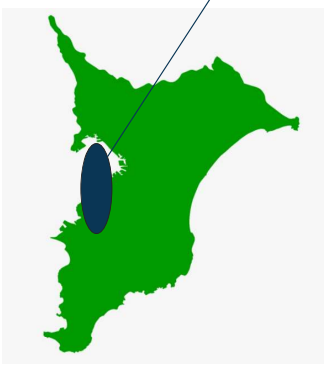
Energy

✓ Practice Case ①: Fuji Oil Company, Ltd.

Outline of Fuji Oil Company, Ltd.

Company Profile（As of March 31, 2021）

- Company name：Fuji Oil Company, Ltd.
- Established：April 1964
- Office：（Head office）Shinagawa-ku, Tokyo
  （Sodegaura Refinery）Sodegaura-city, Chiba
- Capital Stock：24.4 billion JPY
- Net sales（consolidated）：344.6 billion JPY
- Employees（consolidated）：704



Sodegaura Refinery

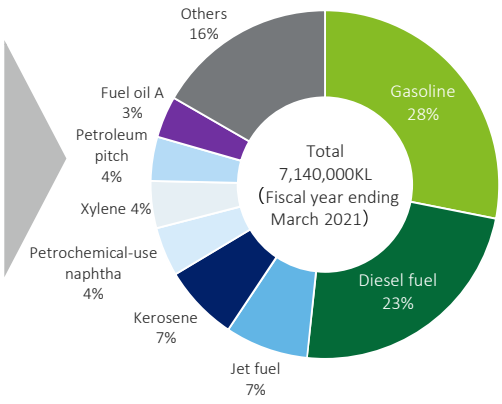
Selection of Business covered

Crude oil imports → Storage → Refining/ production → Storage → Shipping/sales

Main products produced in refineries

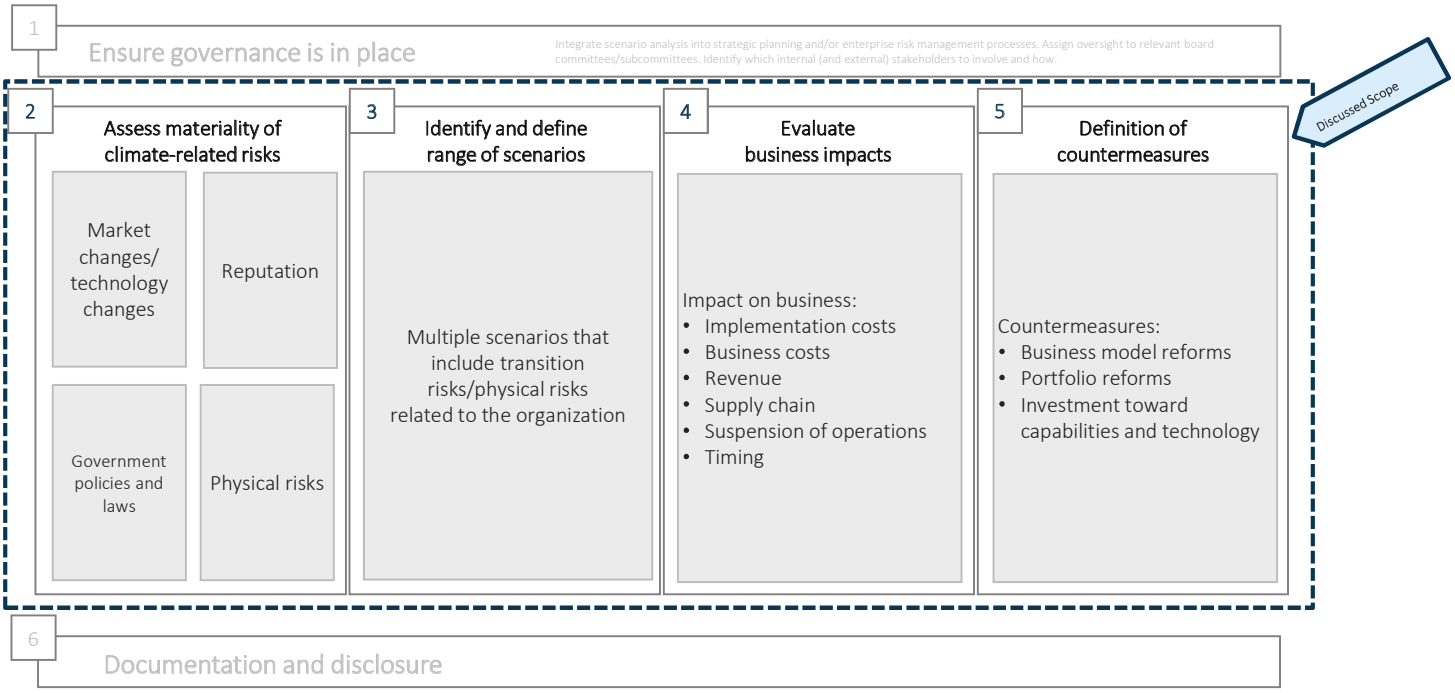
Product	Main applications ~~use~~
LPG	Industrial-use propane gas, taxi fuel
Gasoline	Car fuel
Petrochemical-use naphtha	Feedstock for petrochemical products
Benzene	Feedstock for plastics
Xylene	Feedstock for synthetic resins
Kerosene	Fuel for household heating appliances
Jet fuel	Fuel for jet powered passenger aircraft
Diesel fuel	Bus and truck fuel
Fuel oil A	Building heating fuel, small ship fuel
Fuel oil C	Power plant fuel, large ship fuel
Petroleum pitch	Feedstock for coke used to make steel, boiler fuel

Breakdown of petroleum product sales volume



We have made the **petroleum refining/sales business** the scope of this investigation (it is the only segment FOC operates)

Steps to implement scenario analysis



Source：TCFD Recommendations Technical Supplement: The Use of Scenario Analysis in Disclosure of Climate-related Risks and Opportunities

Step 2 3 4 5 Scenario 4℃ 1.5℃

Assess materiality of climate-related risks

Extract the climate-related risks and opportunities, assess materiality on a large, medium, or small scale

[Overview of risk/opportunity items (excerpt including only significant items)]

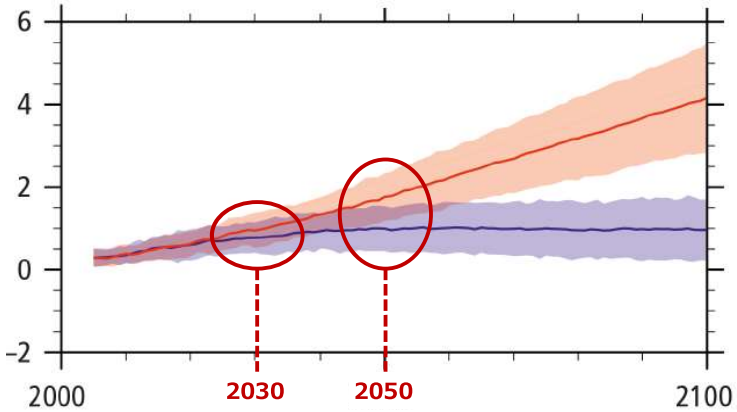
Types	Large classification	Small classification	Assumed impact on business		Materiality ~~Significance~~
			Risks	Opportunities	
Transition	Policy/Regulation	Introduction of carbon price such as carbon tax etc.	• Increased costs from introduction of measures such as a carbon tax, etc. • Reduced sales due to decreased demand for petroleum products, etc. accompanying the increased costs mentioned above	–	Large
	Technology	Technology Progress	• Decreased demand for petroleum products due to further advancement of EV technology and energy conservation technology	• Further improvements in energy efficiency through the introduction of cutting-edge energy conservation technologies • Introduction of decarbonization technologies and supply of synthetic fuels, etc.	
	Market and Reputation	Changes in customer behavior/ Product demand	• Decreased demand for petroleum products due to increased environmental awareness (spread of EVs, expanded introduction of renewable energy, decreased use of petroleum-based plastics, etc.)	• Increased demand for energy with low environmental impact (renewable energy, ammonia, hydrogen, biofuels, synthetic fuels, etc.) • Expanding demand for chemical recycling products that leverage conversion of waste plastic into oil, etc.	
Physical	Acute	Increasing severity and frequency of natural disaster	• Decline in utilization rates of production facilities and increase in costs needed for repair, etc., due to increasingly severe and frequent natural disasters	• Increased demand for fuel oil due to reevaluation of the usefulness of liquid oils (portability, ease of storage, mobility) in times of disaster	

Step 2 3 4 5 Scenario 4℃ 1.5℃

Identify and define range of scenarios

We will use two scenarios (1.5℃, 4℃) to study society in 2050

【Projected average global surface temperature change】（compared with the average from1986～2005）



The TCFD recommendations for scenario analysis suggest that multiple temperature range scenarios be selected, including those below 2℃

Definition of 2.7～4℃ scenario

4℃ scenario ：
3.2～5.4℃ higher than pre-industrial Revolution levels if no additional measures against global warming are taken

Over 2℃（2.7℃～4℃）scenario ：
2.7～4.0℃ higher than pre-industrial Revolution levels if no additional measures against global warming are taken

Below 2℃ scenario ：
0.9～2.3℃ higher than pre-industrial Revolution levels if strict measures are taken

1.5℃ scenario ：
We are highly likely to achieve an increase of less than 1.5℃ compared to pre-industrial Revolution levels if a radical transition to a new system is made

Sources : AR5 SYR SPM.6、IEA, "ETP2017"、UNEP, "The Emission Gap Report 2015"、Global Warming of 1.5℃（IPCC）

Step 2 3 4 5 Scenario 4℃ 1.5℃

Identify and define range of scenarios

4℃ worldview @2050s (Example)

Low carbonization/decarbonization does not progress, and physical risks increase

: Direction for measures

Petroleum Industry

Sellers (Raw materials Supplier)
- Carbon tax introduction does not move forward, and the current oil supply status continues
- Natural disasters become more severe and frequent, and physical risks at supplier sites become manifest

Sourcing diversification

Sellers (Energy etc.)
- Demand for renewable energy increases to a certain degree, but the cost remains high
- Dependence on fossil fuels continues

New entrants
- New entrants are not assumed in this scenario

Industries
- Energy conservation / renewable energy initiatives are promoted in line with established trends
- Physical risks to refineries, business sites, and logistics become manifest
- Costs for disaster prevention and recovery costs when affected by a disaster increase
- Procurement costs increase due to disruptions in the supply chain

Strengthening refinery resilience through disaster preparedness / insurance coverage

Substitute products
- Penetration of renewable energy and decarbonized fuels is limited (hydrogen, ammonia, biofuels, synthetic fuels, etc.)

Buyers (Customers)
- Spread of EVs, etc., does not progress, and demand for internal combustion engine fuels continues
- Awareness toward low carbonization / decarbonization does not increase, and use of plastic products made from petroleum-based raw materials continues
- Adoption of renewable energy and decarbonized fuels by petroleum product user companies is limited
- Due to increasing physical risks, petroleum is reassessed as being a useful energy source in times of disaster

Continuing high refinery utilization rates and maintaining sales volume of petroleum products

Government
- External pressure toward low carbonization / decarbonization is not as strong as in the 2℃ / 1.5℃ scenarios, and a carbon tax is not introduced
- Regulations on sales of internal combustion engine vehicles are not introduced, and fuel efficiency regulations are not tightened significantly
- Subsidies are established as sea levels rise and water stress increases
- Regulations on the use of petroleum-based plastics are not introduced

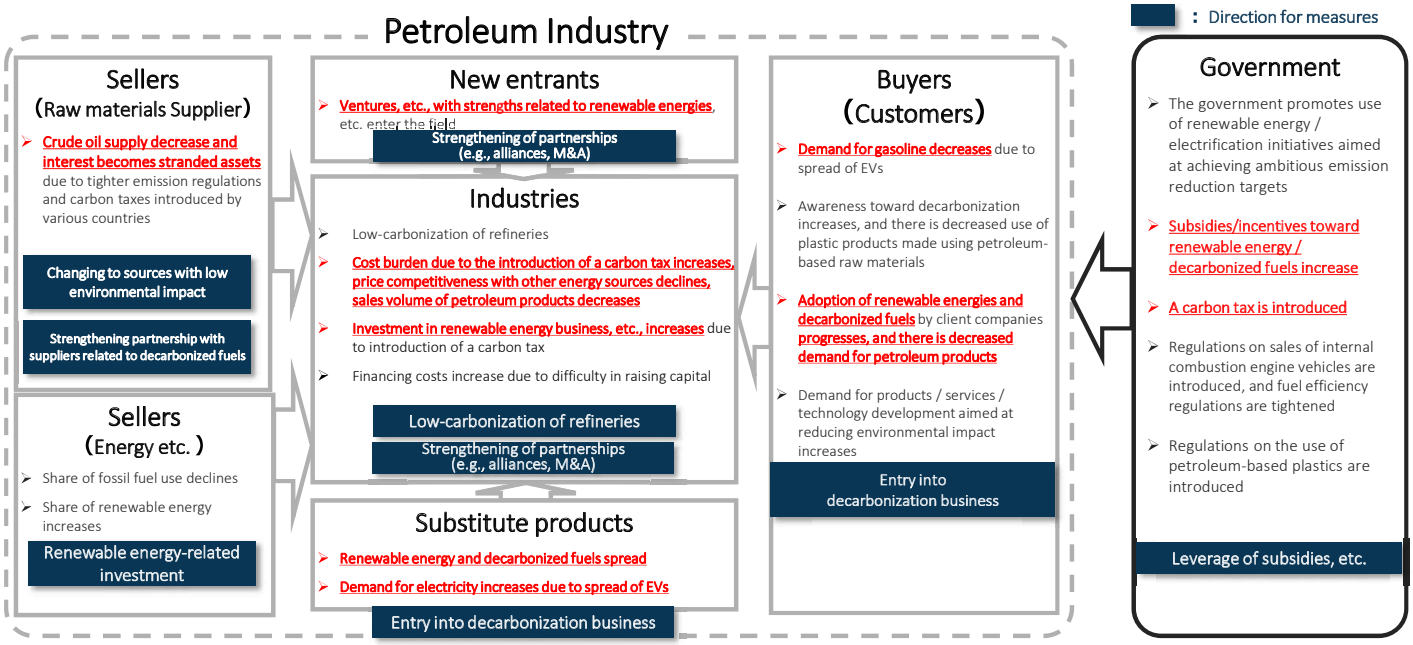
Leveraging of subsidies, etc. (Proactive collaboration with the government, mainly concerning physical risks)

Step 2 3 4 5 Scenario 4℃ 1.5℃

Identify and define range of scenarios

1.5℃ worldview @2050s (Example)

As external pressure to decarbonize increases, refineries shift to low carbonization and decarbonized fuels

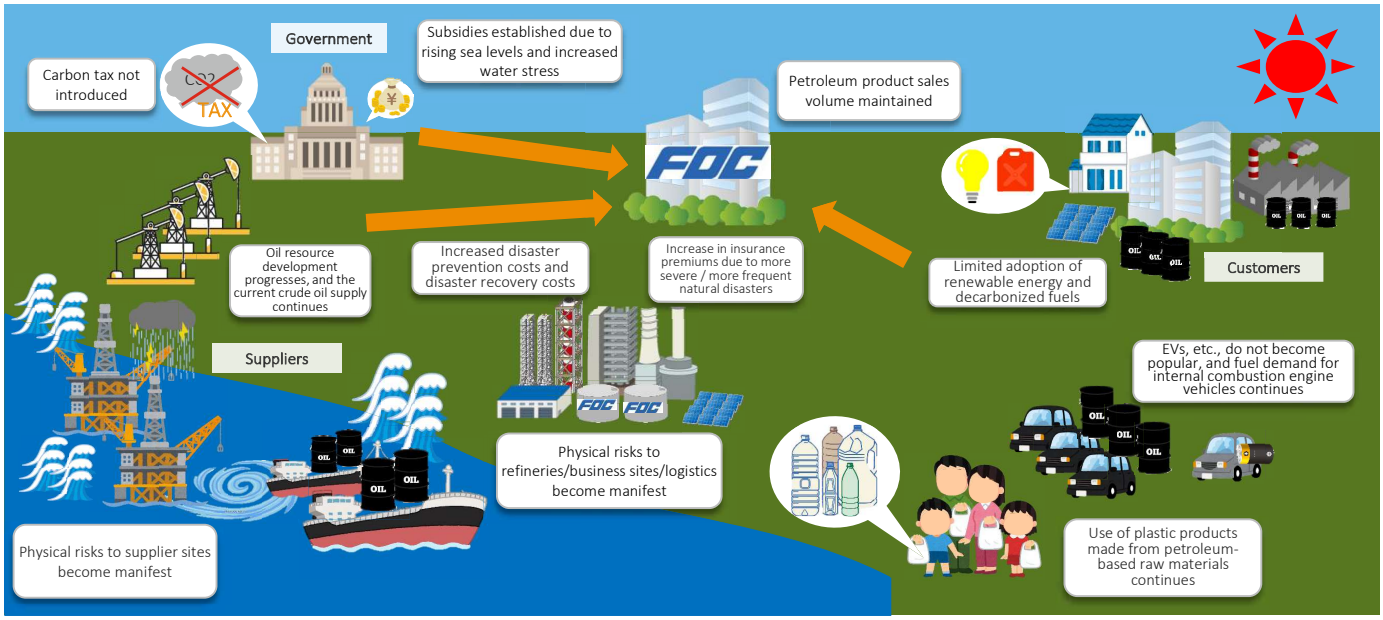


Step 2 3 4 5 Scenario 4℃ 1.5℃

Identify and define range of scenarios

4℃ worldview @2050s (Example)

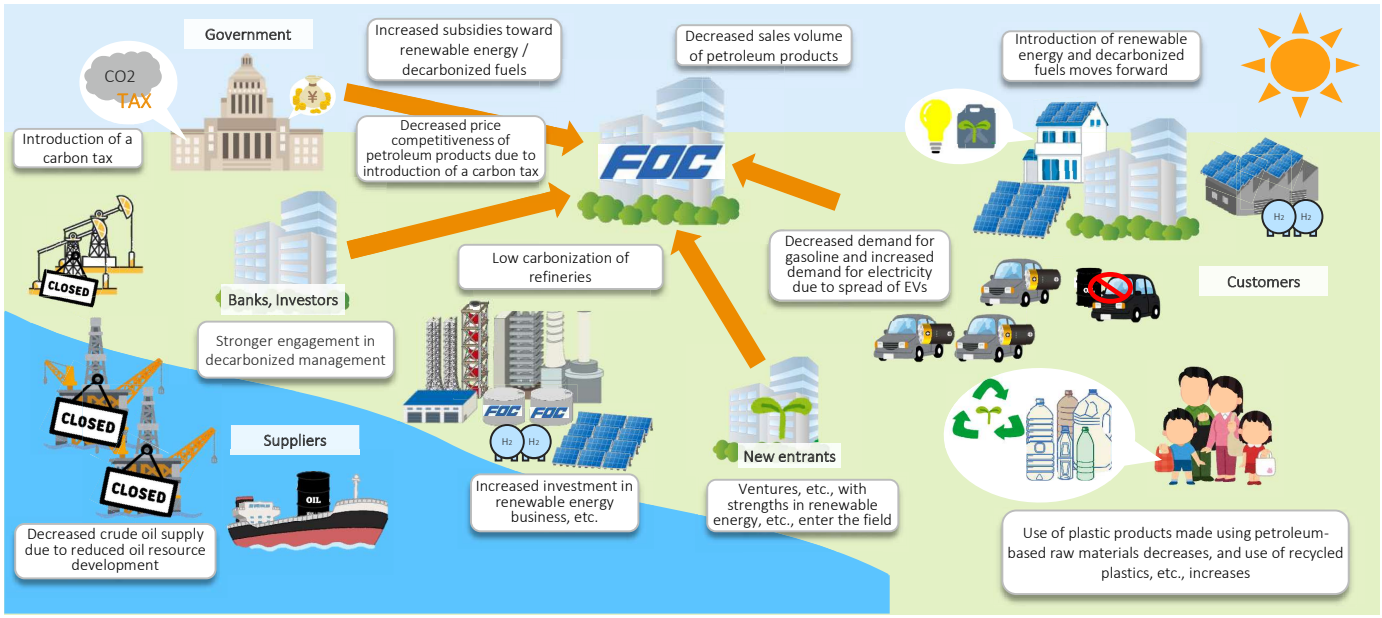
Low carbonization/decarbonization does not progress, and physical risks increase



Identify and define range of scenarios

1.5℃ worldview @2050s (Example)

As external pressure to decarbonize increases, refineries shift to low carbonization and decarbonized fuels



Identify and define range of scenarios

Definition of each of the worldviews based on scientific evidence, etc., from IEA and other sources

Key items	Assumed parameters	Parame-ter area	Unit	At present	4℃		1.5℃		Sources
					2030	2050	2030	2050	
Policy/ Regulation	Carbon tax	Advanced countries	USD/t-CO2	0	-	-	130	250	• IEA World Energy Outlook 2021
Changes in product demand	Petroleum supply amount	World	EJ	171	199	198	137	42	• IEA World Energy Outlook 2021
	GHG emission factor for electricity	Japan	Kg-CO2/kWh	0.45	0.27	0.10	0.34	0.03	• Agency for Natural Resources and Energy “Strategic Energy Plan” • RITE "Scenario Analyses for 2050 Carbon Neutrality in Japan"
Changes in customer behavior	Number of vehicles equipped with engines on the road	World	100 million cars	13.9 (12.7)	15.1	11.5	15.1	3.9	• IEA Energy Technology Perspectives 2017
	Recycled plastic usage rate	World	%	10.6%	10.6%	10.6%	16.1%	26.0%	• Plastic Waste Management Institute Plastic Strategy in Europe, JPCA
Increasing severity and frequency of natural disasters	Increase in flooding frequency	Japan	%	Baseline	+40%	+120%	+20%	+60%	• Ministry of Land, Infrastructure, Transport and Tourism

Step 2 3 4 5 Scenario 4℃ 1.5℃

Evaluate business impacts

We estimate the impact on P/L of each of the risk/opportunity categories evaluated as "highly significant" based on the parameters described previously

: Expansion : Shrinkage

Items	Outline of impacts	Impact		
		4℃	1.5℃	
		2050	2030	2050
Changes in product demand	Changes in FOC's petroleum product sales volume accompanying changes in demand for petroleum products	+	▲	▲
	Expanded demand for energy sources with low environmental impact (biofuels, hydrogen, synthetic fuels)	N/A	+	+
Increase in costs	Increased costs related to CO2 emitted by FOC's business due to the introduction of carbon pricing from carbon taxation, etc.	N/A	▲	▲
	Increased insurance premiums due to more frequent natural disasters	▲	▲	▲

Step 2 3 4 5 Scenario 4℃ 1.5℃

Countermeasure definition

We consider directions for future initiatives based on the previously described impact estimate items

Items	Countermeasure examples
Changes in product demand Increase in costs	● Entry into decarbonized fuel business (ammonia, hydrogen, biofuels, synthetic fuels, etc.) ● Expansion of renewable energy businesses ● Further deepening of energy conservation activities and investments ● Promotion of changing fuels used in refining processes ● Leveraging of renewable energy sources ● R&D/leveraging of decarbonization technologies (CCU/CCUS, etc.) ● Reviewing of CO2 emission levels to aim for in the medium to long-term *Consideration based on technological development progress and economic viability
	● Promotion of refinery resilience by strengthening facilities and improving the viability of the BCP (business continuity plan) ● Continuous review of insurance

Transportation

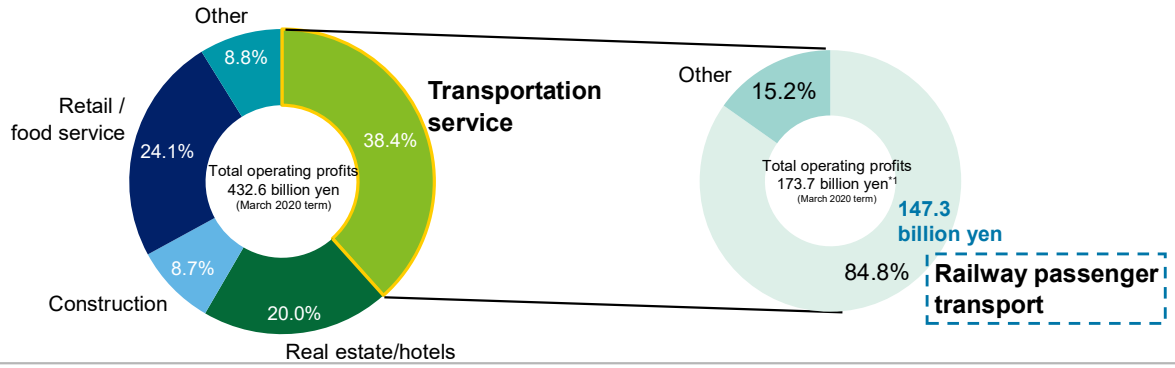
✓ Practice Case ① : Kyushu Railway Corporation

✓ Practice Case ② : Nishi-Nippon Railroad Co., Ltd.

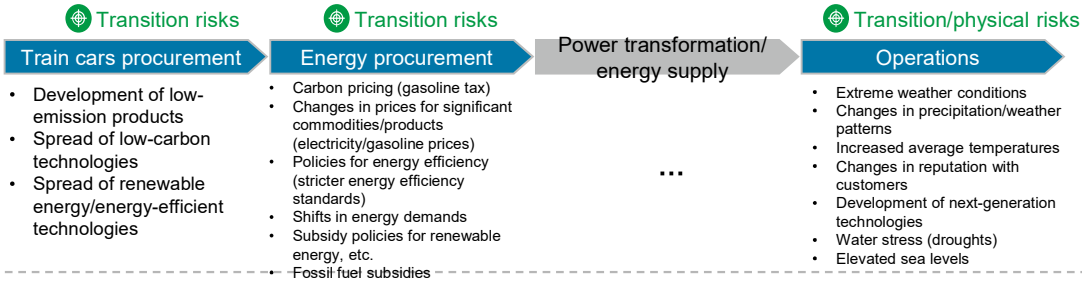
1. Covered business

[Selection of businesses covered in this project]
We assume that the railway business in the "transportation" service group, which is significant in the company's portfolio, will be covered

Business portfolio

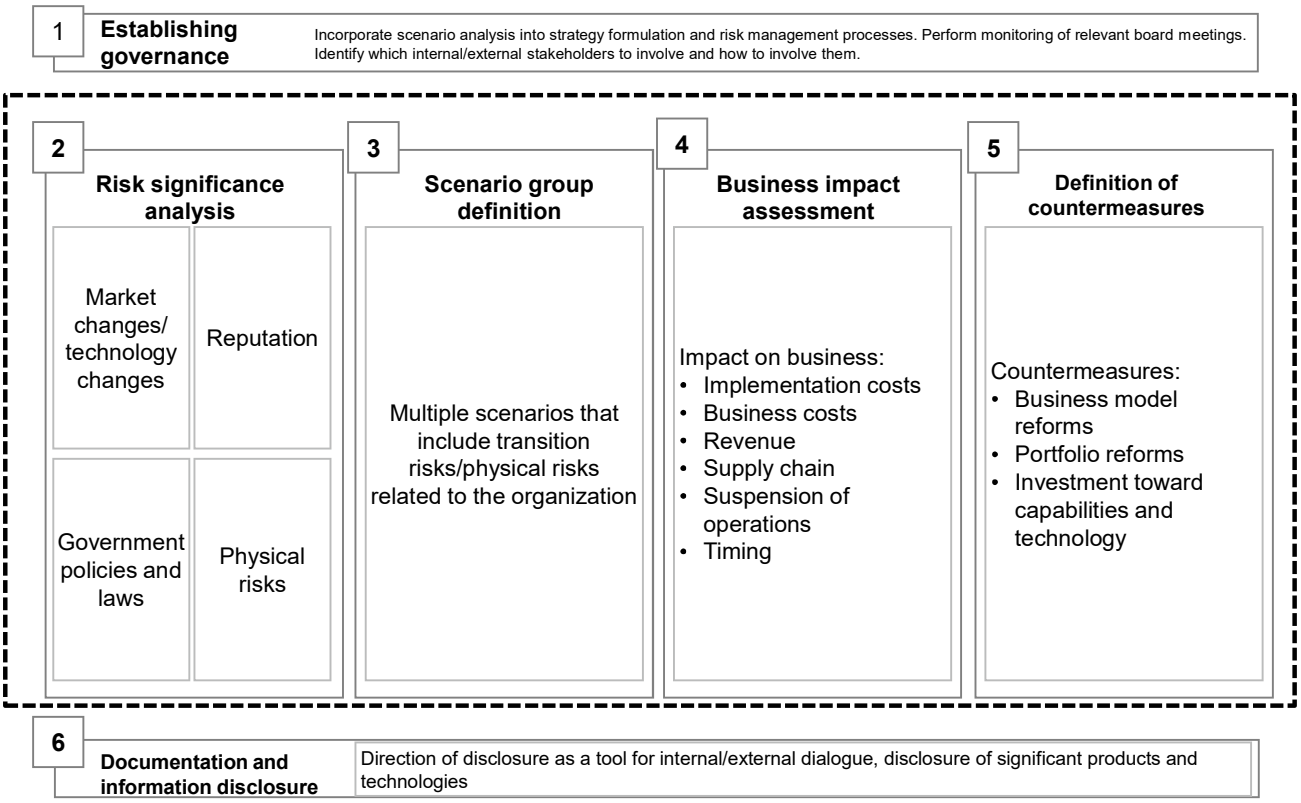


Value chain for the covered business (hypothesized)



Source: Created using JR Kyushu's website and integrated report (2020)
Note 1: Prior to the elimination of inter-segment transactions

Scenario analysis steps



Source: TCFD – Technical Supplement: The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities

Step 2 3 4 5

2. Significance assessment of risks/opportunities

Climate-related risks and opportunities in JR Kyushu's railway business

Type			Evaluation	Risks	Opportunities
Transition	Policy/regulation	Increase in carbon tax (Increase in carbon price)	Large	(Medium to long term) ・Energy procurement cost increase ・Materials procurement cost increase due to rise in price of iron and steel ・Decrease in sales due to passing of procurement costs on to wages	(Medium to long term) ・Insignificant influence on energy procurement costs from measures to address trend toward energy saving and de-carbonization
		Regulations related to carbon emissions and the use of fossil fuels	Moderate	(Medium to long term) ・Increase in development/manufacturing costs for rolling stock to address regulations (Long term) ・Difficulty in operating diesel rolling stock if unable to address regulations	(Medium to long term) ・Increase in sales accompanying maintenance of environmental superiority of railways resulting from early adoption of de-carbonization
	Market	Change in energy mix Change in energy prices	Large	(Medium to long term) ・Energy procurement cost increase ・Decrease in sales due to passing of energy procurement costs on to wages	(Medium to long term) ・Lower costs and higher sales due to introduction/expansion of renewable energy businesses accompanying advances in photo-voltaic power generation and electricity storage technologies
	Technologies	Adoption of next-generation technologies	Large	(Medium to long term) ・Decline in sales due to decrease in environmental superiority of railways resulting from adoption of electric vehicles, etc. ・Failure of investment in new technologies for environmentally friendly rolling stock, etc. (Long term) ・Decrease in sales following loss of railway superiority due to adoption of self-driving technologies for automobiles, etc.	(Short to medium term) ・Lower costs due to adoption of self-driving technologies for railways (Medium to long term) ・Decrease in costs due to efficient inspection operations accompanying advances in weather forecasting ・Increase in sales accompanying active use of public transportation due to adoption of MaaS (Long term) ・Decrease in maintenance costs and increase in environmental superiority due to introduction of next-generation rolling stock, increase in sales due to increased environmental superiority
	Reputation	Changes in customer preferences	Large	(Short to medium term) ・Decline in sales if the environmental superiority of railways decreases, resulting from a shift to alternative means of transportation due to higher environmental consciousness among customers	(Short to medium term) ・Increase in sales if the environmental superiority of railways is maintained, resulting from a shift to the use of railways due to higher environmental consciousness among customers
		Change in reputation among investors	Small	(Short to medium term) ・Decline in reputation among investors if environmental measures are not considered to be aggressive	(Short to medium term) ・Attraction of ESG investment due to shift to low-carbon, environmentally friendly businesses

2. Significance assessment of risks/opportunities

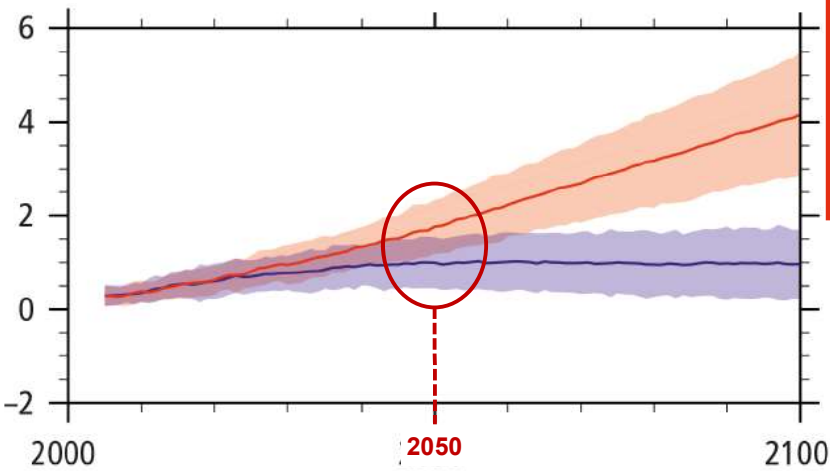
Business risks and opportunities in JR Kyushu's railway business

Physical	Acute	Increased frequency/severity of natural disasters	Large	(Short term) ・ Decrease in sales due to disaster recovery cost increases and service suspensions accompanying increased or longer incidents of rain/strong winds (Short to medium term) ・ Influence on business continuity due to supply chain interruption ・ Decline in asset value in regions with high disaster risk	(Medium to long term) Decrease in disaster restoration costs and increase in sales due to operation of a railway business that is disaster resilient.
	Chronic	Rise in average atmospheric temperature	Large	(Short term) ・ Increase in air-conditioning costs ・ Increase in costs to address heatstroke ・ Increase in costs due to breakdown of electrical equipment and other railway assets and to rail buckling (Short to medium term) ・ Decline in sales due to trend toward refraining from going out	-

3. Scenario group definition

[Selected scenarios]
2˚C and 4˚C scenarios as of 2050 have been selected for this project in consideration of long-term risks. For a portion of the parameters in the 4˚C scenario, we employed the IEA DRS scenario, which incorporates a delay in recovery from the COVID-19 pandemic

[Projected average global surface temperature change]
(compared with the average from 1986-2005)



Definition of 4˚C (2.7˚C+) scenarios

4˚C scenario:
3.2-5.4˚C higher than pre-Industrial Revolution levels if no additional measures against global warming are taken

Over 2˚C (2.7 ˚C-4˚C) scenario:
2.7-4.0 ˚C higher than pre-Industrial Revolution levels if no additional measures against global warming are taken

2˚C scenario:
0.9-2.3˚C higher than pre-Industrial Revolution levels if strict measures are taken

(Reference) 1.5˚C scenario:
We are highly likely to achieve an increase of less than 1.5˚C compared to pre-Industrial Revolution levels if a radical transition to a new system is made.

Prior to 2030, the change in temperature is nearly the same in both the 2˚C and 4˚C scenarios.
The gap between the scenarios widens after 2030.

The TCFD recommendations for scenario analysis suggest that multiple temperature range scenarios be selected, including those below 2˚C

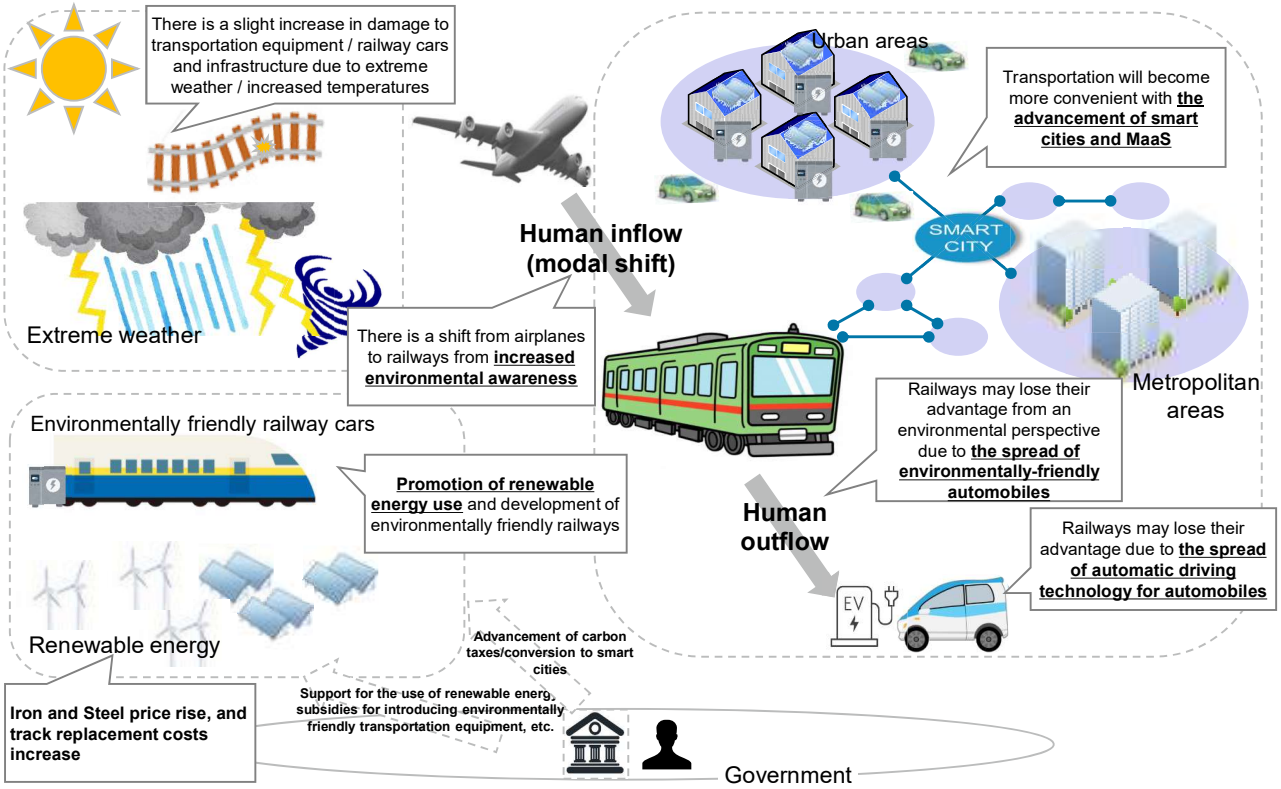
3. Scenario group definition

Step 2 3 4 5

[Visual representation of a 2˚C scenario future society (assumed as 2050)]

Low-carbonization moves forward and modal shifting occurs; renewable energy and smart cities become popular

2˚C 4˚C



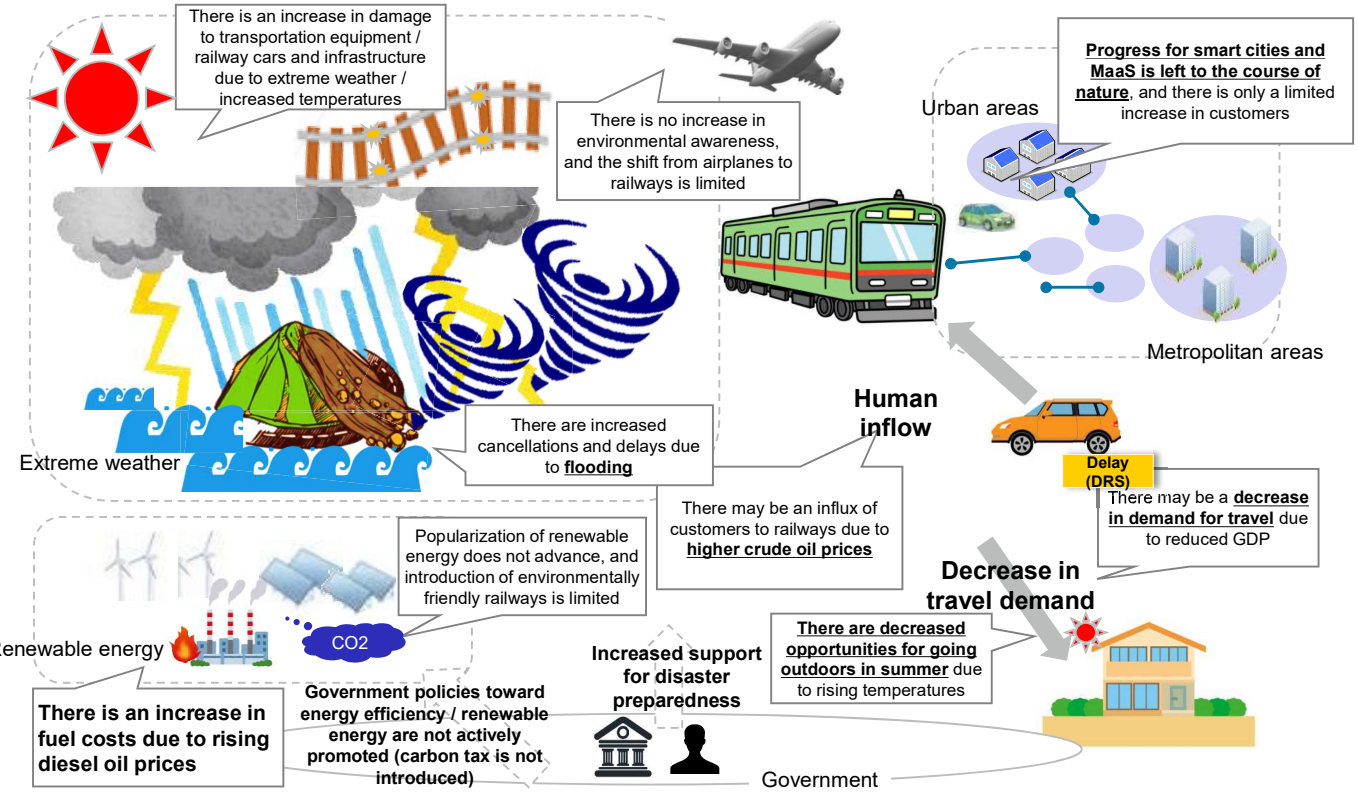
3. Scenario group definition

Step 2 3 4 5

[Visual representation of a 4˚C scenario future (assumed as 2050) society]

Extreme weather becomes more severe, and progress for smart cities is left to the course of nature

2˚C 4˚C



4. Business impact assessment

Step 2 3 4 5

[Table of parameters used]

*Exchange rate: 1 USD = 105 JPY (based on the October 1, 2020 rate)

We performed an estimate based on scientific evidence from IEA and other sources

		Currently	2050		Source
			4°C	2°C	
Transition risks (increase in expenses)	Carbon tax	---	---	$191/t-CO2	• IEA: "World Energy Outlook 2020" • We assume that levels in the 4°C scenario will be equivalent to current levels
	Electricity price	$216/MWh	$184/MWh	$242/MWh	• IEA: "World Energy Outlook 2018"
	Crude oil price	$63/Barrel	$96/Barrel	$48/Barrel	• IEA: "World Energy Outlook 2020」
	Iron and Steel price	$350/t	$382/t	$506/t	• 2ii: "The Transition Risk-o-Meter Reference Scenarios for Financial Analysis"
Transition risks (spread of low-carbon technologies)	Air passenger volume growth rate	6,290 billion/pkm	Domestic/international: 158%	Domestic/international: 80% Domestic: 47%, International: 99%	• 2ii: "The Transition Risk-o-Meter Reference Scenarios for Financial Analysis"
	Number of automobiles with low-carbon technology	—	1,525,850,630	1,339,099,724	• Estimated using IEA: "Energy Technology Perspective 2017"
	Number of EVs/fuel cell vehicles in use	—	380,981,575	963,804,456	• Estimated using IEA: "Energy Technology Perspective 2017"
	Number of self-driven vehicles in use	—	641,900,000	641,900,000	• Estimated using Fuji Chimera Research Institute: "2020: Future prospects for the automated driving/AI car market"
Physical risks	Increase in temperature	—	Average +2.04°C	Average +1.2°C	• World Bank: "Climate Change Knowledge Portal"
	Flood frequency	1x	4x	2x	• Review Meeting of Technologies Related to Flood Control Planning Based on Climate Change: "A proposal for flood planning based on climate change"
	Probability of landslides	10%	12%	12%	• A-PLAT: An information platform adapted to climate change
	Probability of track buckling	0.6 - 0.63%	0.94%	0.65%	• ELSEVIER: "Impacts of climate change on operation of the US rail network" 2017

4. Business impact assessment

Step 2 3 4 5

2°C world: There will be increased costs associated with the transition, but we expect that opportunities will be created if the environmental advantages of railways are maintained
4°C world: There will be increased costs due to greater severity of natural disasters

Risks		expected event	Impact amount 2℃	Impact amount 4℃
Transition Risks	Increase in carbon tax (Increase in carbon price)	(2℃) Carbon tax will be introduced.(emission factor will be reduced) (4℃) No carbon tax will be introduced.		
	Increase/decrease in procurement costs (Electricity)	(2℃) Renewable energy will advance and electricity prices will rise (4℃) Renewable energy will not advance, and electricity retail competition will lower prices.		
	Increase/decrease in procurement costs (Diesel oil)	(2℃) Crude oil prices down, diesel oil prices down (4℃) Crude oil prices will soar, diesel oil prices will also rise.		
	Increase/decrease in procurement costs (Price of iron and steel)	(2℃) Iron and steel prices rise as carbon tax introduced (4℃) No carbon tax will be introduced.		
	Adoption of next-generation technologies (Adoption of automated driving and ZEVs)	(2℃) EVs, fuel cell vehicles, and self-driving cars will become popular, and Customer outflow from railroads will occur. (4℃) Widespread adoption of EVs and fuel cell vehicles x self-driving cars will be limited.		
	Changes in customer preferences (Change in aviation quantity)	(2℃) Modal shift occurs, Inflow from aircraft will occur. (4℃) Changes in aviation quantity will be left to the course of nature.		
Physical Risks	Rise in average atmospheric temperature (Decrease in the number of users)	(2℃) Travel demand will decrease slightly due to rising temperatures. (4℃) Travel demand will decrease due to rising temperatures.		
	Increased frequency/severity of natural disasters (Increased flood damage)	(2℃) Flood damage will increase slightly at each site. (4℃) Flood damage will increase at each site.		
	Increased frequency/severity of natural disasters (Increase in landslides)	(2℃) Damage caused by sediment will increase slightly at each site. (4℃) Damage caused by sediment will increase slightly at each site.		

5. Countermeasure definition

Step 2 3 4 5

[Future countermeasures against individual risks (planned)]
We expect the main countermeasure to be "promoting the use of renewable energy sources", including wind power, while "setting long-term targets for reducing CO2 emissions"

Risk initiatives / Opportunity initiatives / Countermeasures toward organizational issues

Item		Category	Risk countermeasures (initial plan)	Category	Initiatives for seizing opportunities (initial plan)
Carbon pricing / energy	Targets For CO2 emissions reductions	Adapted	✓ **Set long-term targets for reducing CO2 emissions** ✓ Set long-term targets for reducing energy usage	Established	✓ **Implement long-term targets for reducing CO2 emissions** ✓ Plant trees to achieve disaster preparedness while acquiring emissions credits for absorbing CO2 at the same time
Advances in low-carbon technologies	Promoting energy efficiency	Adapted	✓ Invest in energy-efficient technologies ✓ Continue introducing energy-efficient train cars		
	Promoting use of renewable energy	Adapted	✓ Develop and introduce renewable energy train cars ✓ Use renewable energy to achieve BCP measures (emergency power generation) while achieving decarbonization at the same time	Adapted/ established	✓ Promote the use of private power generation and sell electricity
Advances in next-gen technologies		Adapted	✓ Develop and introduce of renewable energy train cars	Established	✓ Land prices will increase due to development around stations from the progress of smart cities / MaaS
Extreme weather conditions		Retained	✓ Utilize data to increase the sophistication of risk models	Established	✓ Plant trees to achieve disaster preparedness while acquiring emissions credits for absorbing CO2 at the same time

6. Direction for information disclosure

Start the disclosure by referring to the TCFD's four recommended items for disclosure "Governance", "Strategy", "Risk management" and "Parameters and targets" and disclosing what you are able to in line with these

- Governance
- **Strategy**
  - **1 Risks and opportunities**
  - **2 Scenario Analysis and Future Policies and Initiatives**
- Risk management
- Parameters and targets

2. Scenario Analysis and Future Policies and Initiatives

We analyzed the effect of climate change on our railway business, based on 2℃ to 4℃* scenarios outlined by specialist institutions, such as the IPCC (Intergovernmental Panel on Climate Change) and IEA (International Energy Agency). Under the 2℃ scenario, which anticipates an increase in carbon taxes and cost increases due to the adoption of renewable energy, if the environmental superiority of railways can be maintained, then there will be a shift of customers from other means of transportation, and we will be able to secure opportunities to increase sales.

In addition, under the 4℃ scenario, due to the increasing frequency/severity of natural disasters caused by climate change, there will be damage to railway assets and an increase in maintenance costs, as well as a decline in sales due to the suspension of operations.

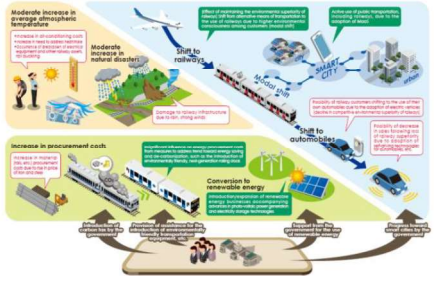
For society and for the Company, The Group will work to advance initiatives for the achievement of the 2℃ world to facilitate the realization of a sustainable society.

* Including IEA 2020 scenario of 2.7℃ or higher

<Major scenarios used in scenario analysis>

Used primarily to analyze transition risks	IEA: SDS, STEPS, DRS
Used primarily to analyze physical risks	IPCC: RCP2.6, RCP8.5

◇Global outlook under 2℃ scenario (2050)



Transportation

✓ Practice Case ① : Kyushu Railway Corporation

✓ **Practice Case ② : Nishi-Nippon Railroad Co., Ltd.**

【Covered business】

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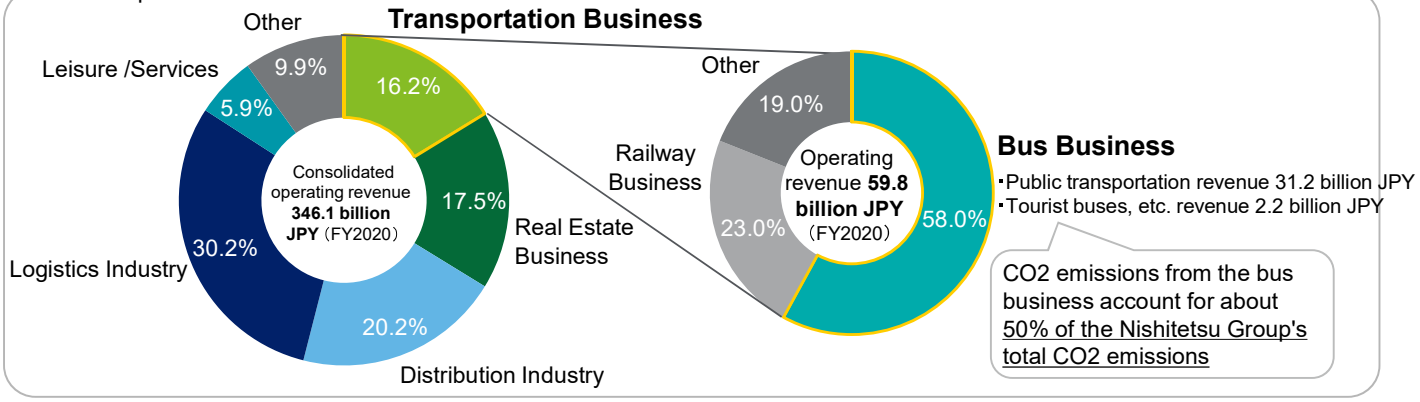
Assumes that the bus business, which has the highest percentage of CO2 emissions among all Nishitetsu Group businesses, is the target.

Business portfolio



Value chain for the covered business (hypothesized)

Transition risks	Transition risks		Transition／Physical risks
Train cars procurement	Energy procurement	Power transformation / energy supply	Operations
• Carbon emissions targets/policies in each country • Changes in important products/prices • Spread of low-carbon technologies • Development of next-generation technologies • Changes in customer reputation / behavior • Changes in investor's reputation	• Carbon price (including gasoline tax) • Carbon emissions targets/policies in each country • Changes in energy mix • Spread of low-carbon technologies • Development of next-generation technologies • Changes in customer reputation / behavior • Changes in investor's reputation	…	• Carbon emissions targets/policies in each country • Spread of low-carbon technologies • Development of next-generation technologies • Changes in customer reputation / behavior • Changes in investor's reputation • Changes in rainfall and weather patterns • Increase in average temperature • Increasing severity of extreme weather conditions

【Step2：Significance assessment of risks/opportunities】

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

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

【Step2：Significance assessment of risks/opportunities】

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

Type			Evaluation	Risks	Opportunities
Transition Risk	Reputation	Changes in customer reputation／behavior	Large	-Reduced sales due to increased customer environmental awareness if active environmental measures are not taken -Reduced sales due to decline in the environmental superiority of buses as a result of increased use of EVs, etc. -Reduced sales due to more people working from home	-Increased sales due to customers' increasing environmental awareness causing them to shift to buses, which have low CO2 emissions per unit of transportation volume, -Increased sales due to a shift to using buses caused by increased fuel burden for private automobiles
		Changes in investor's reputation	Medium	-Decline in stock price and increased cost of capital if active environmental measures are not taken	-Decreased cost of capital due to expanded ESG investment if transition to low-carbon and environmentally friendly business is succeeded
Physical Risk	Chronic	Increase in average temperature	Medium	-Increased cooling costs and capital investment costs -Increased costs for measures against heat stroke -Response costs incurred due to reduced operating capacity associated with impacts on road surfaces and vehicles -Reduced sales due to people being reluctant to go outdoors	
	Acute	Increasing severity of extreme weather conditions	Large	-Reduced sales due to traffic stoppages on roads and in tunnels, etc. -Costs incurred for repairing vehicle damage and for measures toward the safety and health of on-site employees -Reduced sales due to people being reluctant to go outdoors	-Improved reputation through the provision of storage batteries as an emergency power source during blackouts -Trust gained from customers through the development of disaster-resilient operating structure, such as planning multiple detours

【Step3：Identify and define range of scenarios】

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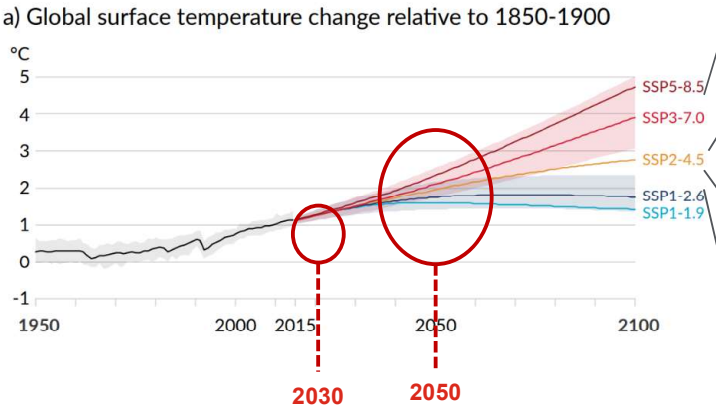
4℃ and 1.5℃ scenarios as of 2030 and 2050 are assumed from the viewpoint of the range of impact of climate change

【Projected average global surface temperature change】（compared with the average from 1850～1900）



Definition of 4℃（2.7℃～）scenario

4℃（3.2～5.4℃）scenario：
3.2～5.4℃ higher than pre-industrial Revolution levels if no additional measures against global warming are taken
※SSP3-7.9：+2.8～4.6℃（about 3.6℃）

Over 2℃（2.7～4℃）scenario：
2.7～4.0℃ higher than pre-industrial Revolution levels if no additional measures against global warming are taken
※SSP2-4.5：+2.1～3.5℃（about 2.7℃）

2℃ scenario（SDS）：
0.9～2.3℃ higher than pre-industrial Revolution levels if strict measures are taken
※SSP1-2.6：+1.3～2.4℃（about 1.8℃）

1.5℃ scenario：
We are highly likely to achieve an increase of less than 1.5℃ compared to pre-industrial Revolution levels if a radical transition to a new system is made
※SSP1-1.9：+1.0～1.8℃（1.4℃）

The TCFD recommendations for scenario analysis suggest that multiple temperature range scenarios be selected, including those below 2℃

- ✓ Almost the same temperature changes would occur in the 2℃ and 4℃ scenario by 2030. The gap between the scenarios widens after 2030.
- ✓ A best estimate of equilibrium climate sensitivity (ECS) of 3℃, with a likely range of 2.5℃ to 4℃, and a very likely range of 2℃ to 5℃ in 2100.
- ✓ Global warming will exceed 1.5℃ and 2℃ during the 21st century unless CO2 and other greenhouse gas emissions decrease substantially in the coming decades.
- ✓ It is important to draw an appropriate transition path focusing on decarbonization by 2050 for each timeframe selected in the scenario analysis

Sources：AR6 WG Ⅰ SPM.29（IPCC）、AR5 SYR SPM.6、IEA, “ETP2017”、UNEP, “The Emission Gap Report 2015”、Global Warming of 1.5℃（IPCC）

【Step3：Identify and define range of scenarios】

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

*Exchange rate: 1 USD = 110 JPY (based on the Sept. 1, 2021 rate)
*Items in blue are items for which 2℃ parameters were used due to the 1.5℃ parameters not being available

Key items	Assumed parameter	Parameter area	Unit	BAU	2030		2050		Source
					4℃	1.5℃	4℃	1.5℃	
Carbon emissions targets/policies in each country	Carbon tax (Carbon border adjustment mechanism)	Developed countries	Yen/tCO2	-	-	14,300	-	27,500	• IEA WEO2020 • IEA NZE2050 • 4℃ scenario is assumed to be the same as the current level
	Spread of environmentally friendly vehicles (EV/FC buses)	World	%	-	2%	23%	6%	79%	• IEA WEO2020 • IEA NZE2050
Changes in the energy mix	Percentage change in price of fuel	World	%	-	21%	-5%	48%	-35%	• IEA WEO2020 • IEA NZE2050
	Electricity prices	Japan	Yen/MWh	23,760	22,880	25,410	19,360	25,850	• IEA WEO2018
Development of next-generation technologies	Changes in numbers of private automobile users / bus users due to decarbonization	World	%	-	-	-	-	20-50%	• IEA NZE2050 • 4℃ scenario is assumed to be the same as the current level
Increasing severity of extreme weather conditions	Rate of change in instances of rainfall continuing for 12 hours or more	Japan（Hokkaido、Northwestern Kyushu）	%	-	40%	15%	40%	15%	• ”Vision for Flood Control Planning that takes Climate Change into Account: Recommendations” (Technical Study Group on Flood Control Planning that takes Climate Change into Account)

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

【Step3：Identify and define range of scenarios】

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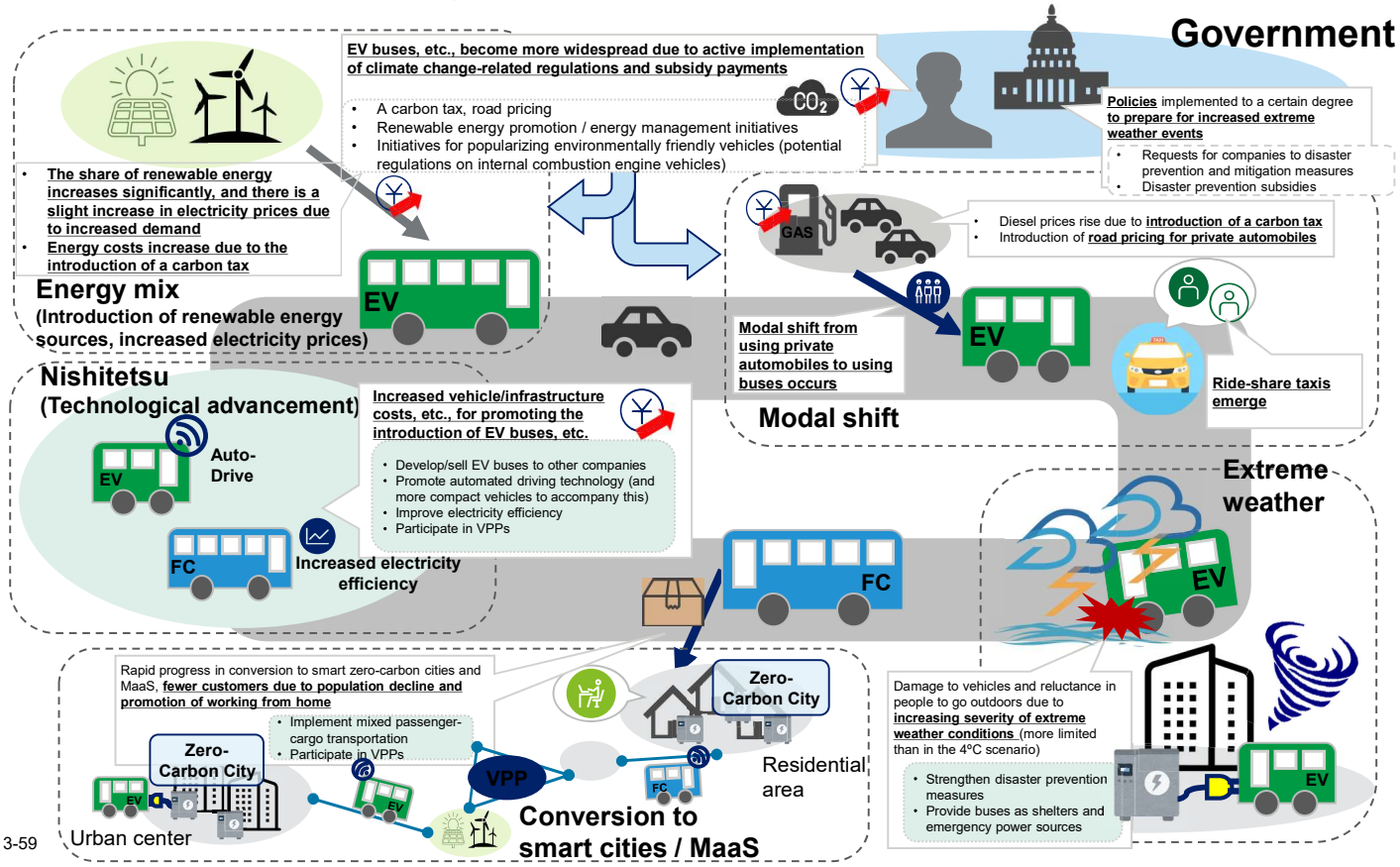
【1.5℃ Scenario】It will be important to address trends aimed at decarbonization such as the spread of renewable energy, conversion to zero-carbon cities, and modal shift



【Step3：Identify and define range of scenarios】

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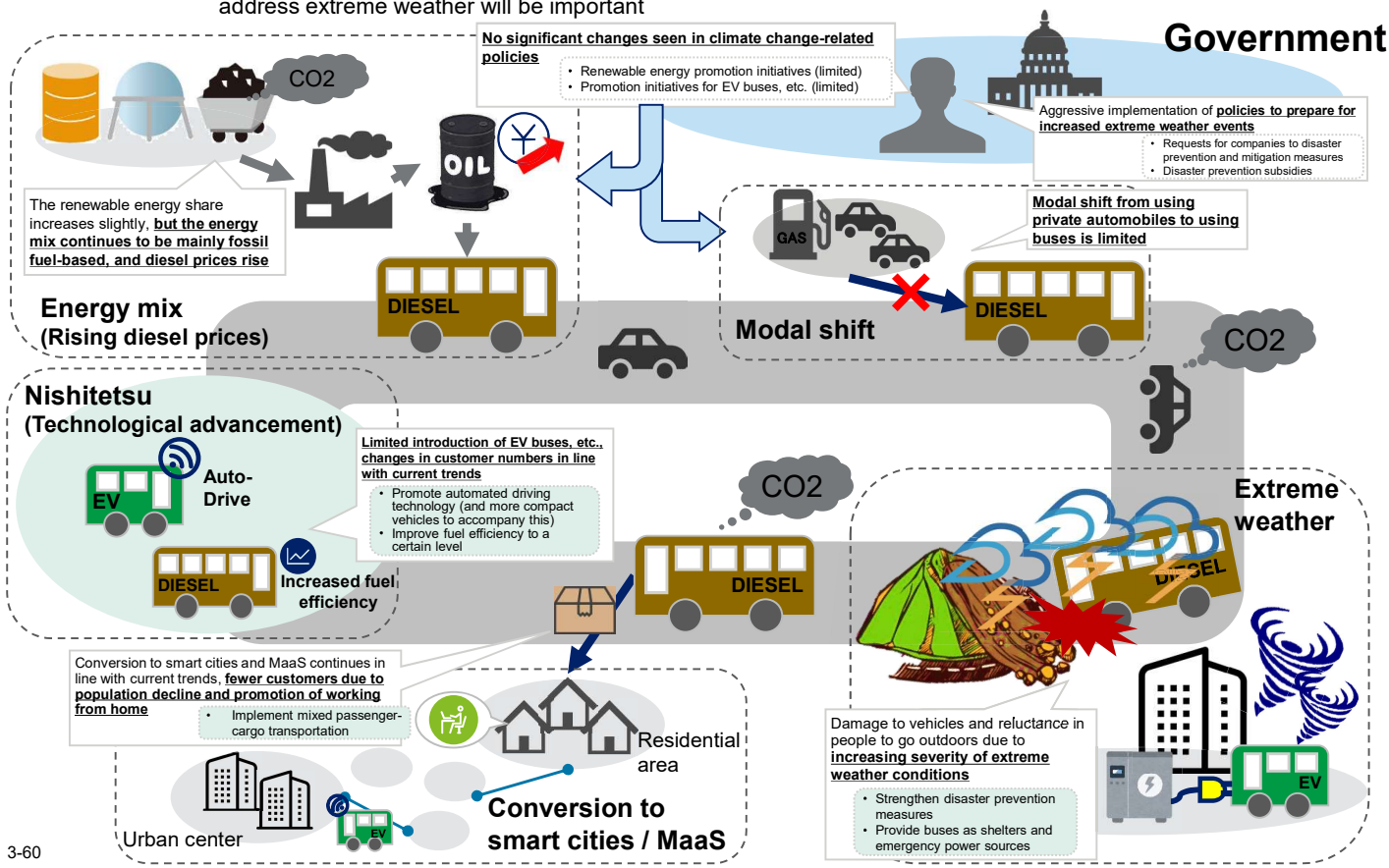
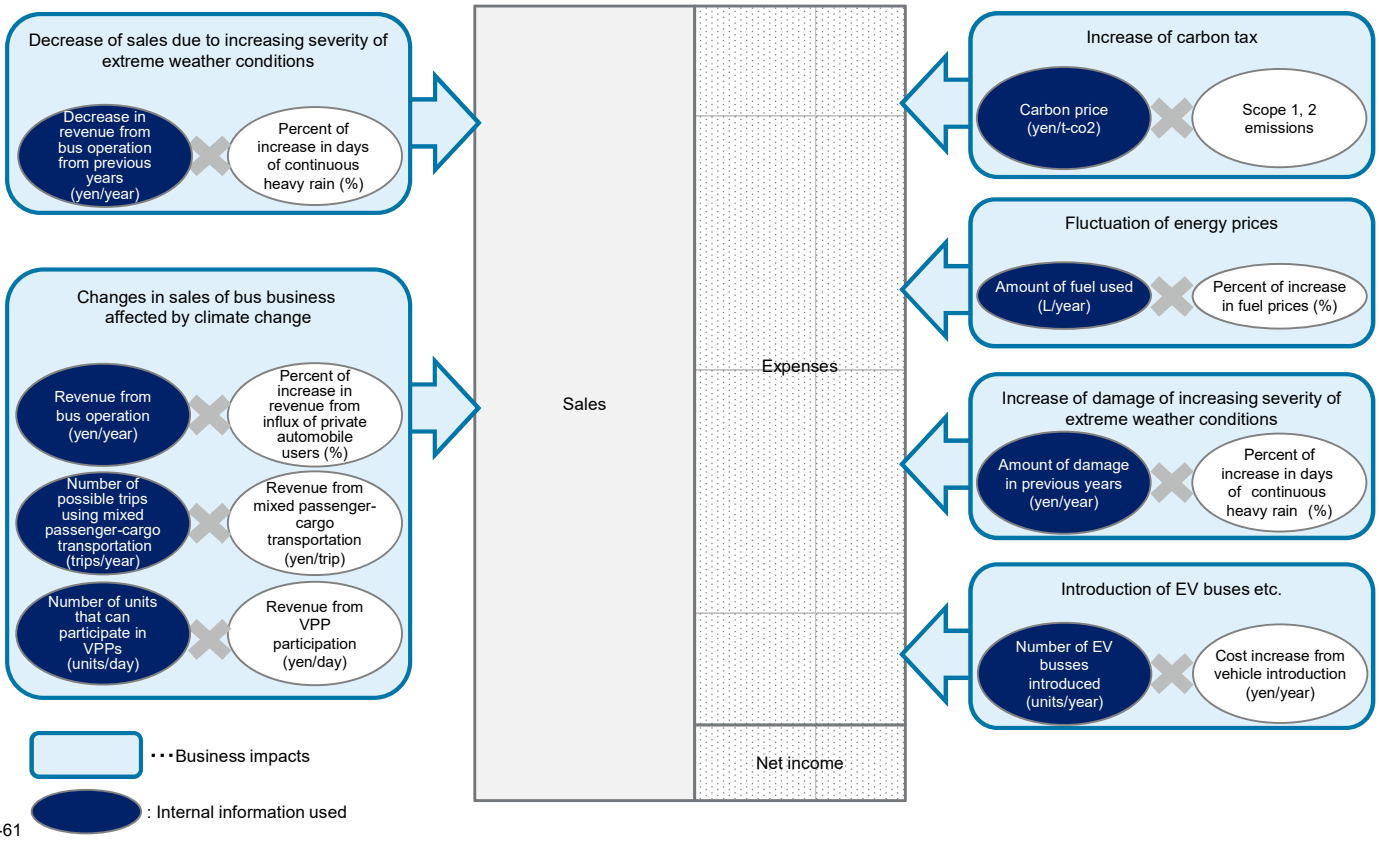
【4℃ Scenario】Significant modal shift does not occur, and customer numbers continue in line with current trends; measures to address extreme weather will be important



【Step4：Evaluate business impacts】

まちに、夢を描こう。 Nishitetsu Group

Considering the impact of each key driving force on the income statement (P/L)



【Step4：Evaluate business impacts】

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【1.5℃ Scenario】 Opportunity creation from bus superiority accompanying the introduction of EV buses, etc., can be expected
【4℃ Scenario】 Fuel procurement costs are expected to increase

Risk items		Assumed impacts	Degree of impact	
			1.5℃	4℃
Transition risk	Carbon price (Including gasoline tax etc.)	(1.5℃) Carbon prices rise due to introduction of a carbon tax (4℃) Carbon prices rise due to increased demand in developing countries	- - -	- -
	Carbon emissions targets/policies in each country (Introduction of EV buses etc.)	(1.5℃) Introduction increases due to government policies such as subsidies (4℃) Introduction is limited	+ + +	
	Spread of low-carbon technologies	(1.5℃) Spread of technology increases due to increased introduction of EV buses, etc. (4℃) Spread is limited	+ -	
	Development of next-generation technologies	(1.5℃) Use of MaaS and on-demand services, etc. increases (4℃) Spread of use is limited	+ -	
	Changes in customer behavior	(1.5℃) Modal shifts, etc. advance (4℃) Modal shifts, etc., are limited	+ +	
Physical risk	Increasing severity of extreme weather conditions	(1.5℃) Damage to facilities and suspended operations increase slightly (4℃) Damage to facilities and suspended operations increase	-	-

【Step4：Evaluate business impacts】

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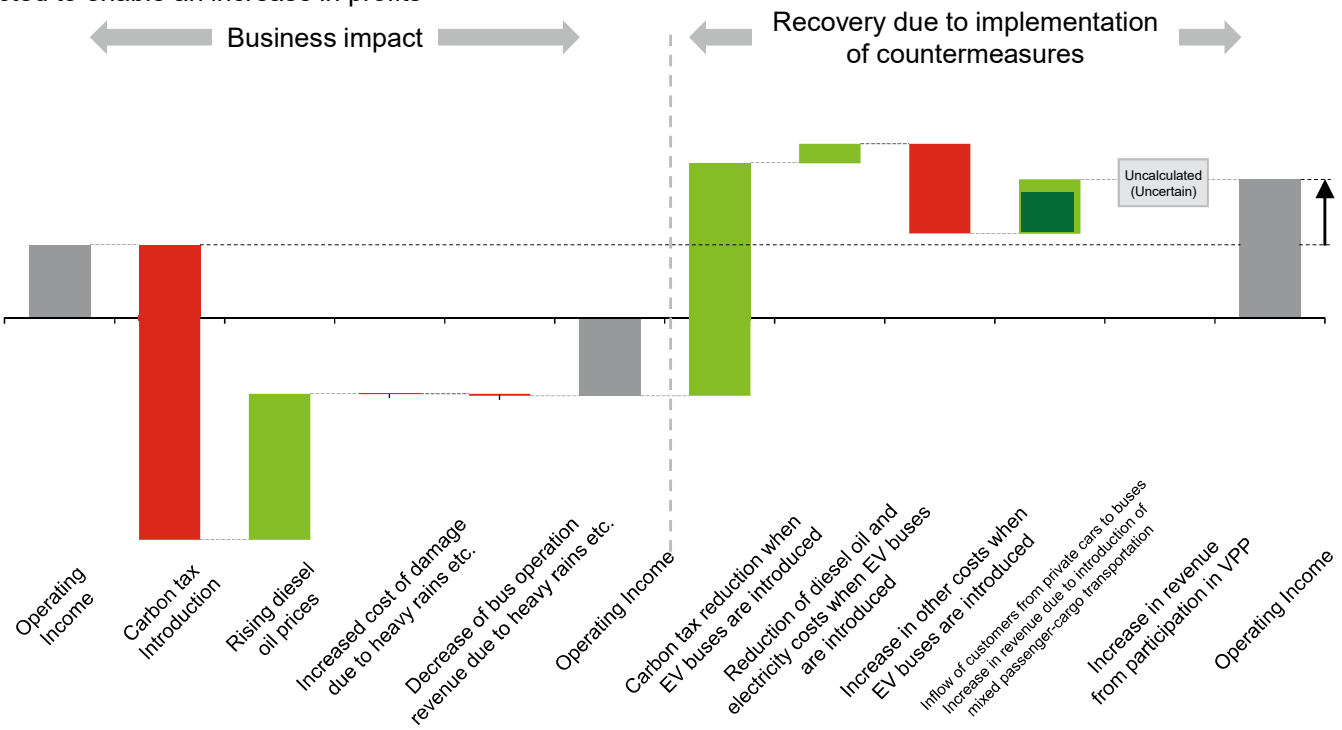
【1.5℃ Scenario（2050）】

Although the introduction of a carbon tax will result in a significant cost increase, implementation of countermeasures is expected to enable an increase in profits



In the 1.5ºC scenario, it will be important to aim to recover from the impact of carbon tax through countermeasures such as the introduction of EV buses, etc.

【Step4：Evaluate business impacts】

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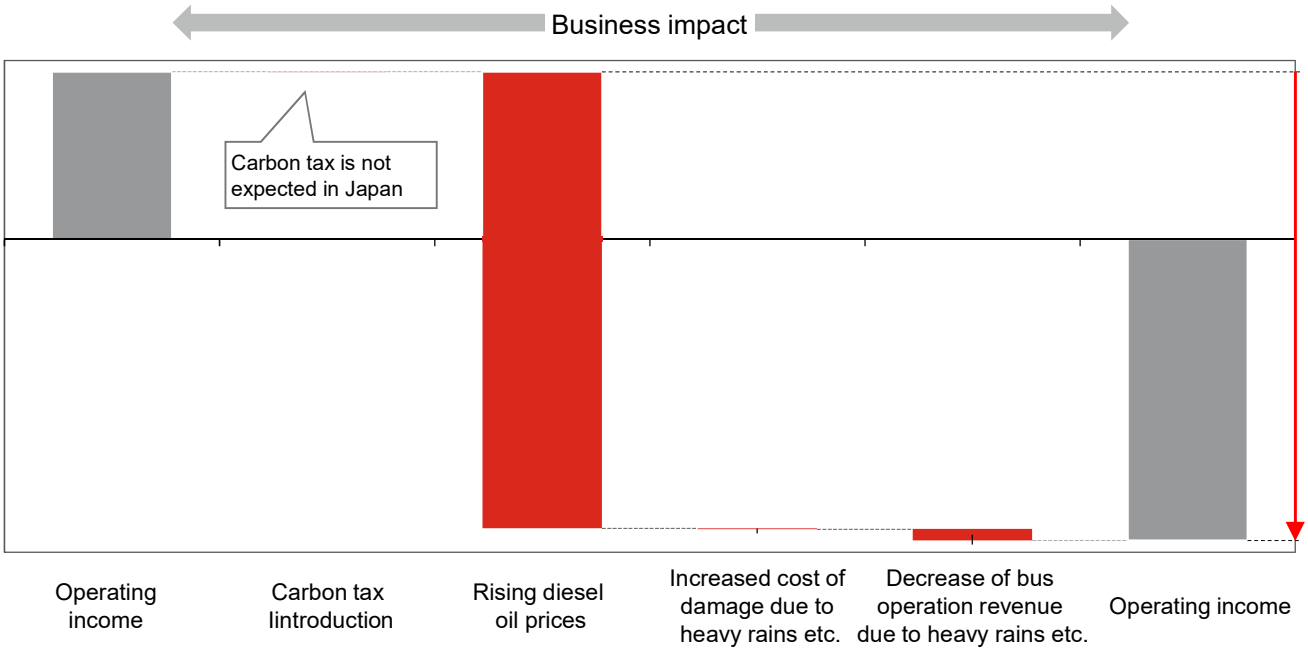
【4℃ Scenario（2050）】

It is expected that there will be a massive increase in costs due to rising diesel prices, which will ultimately result in a deficit great enough that it will become difficult to continue the business



In the 4ºC scenario, rising diesel prices and risks from extreme weather will become manifest

【Step5：Countermeasure definition】

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It will be important to develop targets based on sustainability, and use alliances with regional governments and energy-related companies to form business models and ecosystems while promoting the introduction of EV buses in the ride-sharing business

Items	Risk countermeasures		Initiatives for seizing opportunities	
	Category	Countermeasures	Category	Countermeasures
Carbon Price, Carbon emissions targets/ policies in each country	Adapted	✓ Set CO2 emission reduction targets ✓ Make a declaration for becoming carbon neutral (or carbon negative) ✓ **Clarify details of profitability assessment and lobby the government with the aim of obtaining subsidies** (e.g., establish a consortium with bus-related businesses)	Established	✓ Shift toward bus infrastructures adapted to zero carbon / compact cities ✓ **Promote goal development / actions based on sustainability** (e.g., community development that achieves mobility for local residents and makes business activities carbon neutral)
Changes in energy mix	Adapted	✓ Continue to invest toward increased fuel efficiency of diesel buses ✓ Shift from diesel to biodiesel, etc. ✓ **Shift to renewable electricity** ✓ Raise fares to make up for higher energy prices (pricing strategy)	Established	✓ **Implement private power generation / sell electricity**
Low-carbon・Next generation technologies	Adapted	✓ **Introduce EV buses in the ride-sharing business** ✓ Consider charter business initiatives (express buses, etc.)	Established	✓ Implement mixed passenger-cargo transportation ✓ **Maximize use of storage batteries through alliances with other companies** ✓ Continue to invest toward manufacturing/sales of modified EV buses, etc.
Changes in customer reputation／behavior	Retained	✓ Sell eco-company commuter passes / continue to provide operating information via bus location system ✓ Continue on-demand bus operations	Established	✓ Promote behavioral change toward use of decarbonized transportation
Increasing severity of extreme weather conditions	Adapted・Retained	✓ Prepare a bus operating structure that plans multiple detour routes, etc. ✓ Review contracts with insurance companies / vehicle manufacturers in anticipation of extreme weather events	Established	✓ Build and test an emergency power supply plan using EV buses

【Direction for TCFD Scenario Analysis】

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It will be important to apply scenario analysis across the company and incorporate it into medium-term management plans, and to make policy statements to external parties

Response period	Most recent action plans	
	For internal	For external
Present～ for a few months	・Establish an **implementation structure to promote climate change-related initiatives**, including scenario monitoring	**-Make disclosures of / endorsements for TCFD information (e.g., scenario analysis results)** **-State CO2 emission reduction targets**
～a year	**-Apply scenario analysis across the company** -Set CO2 emission reduction targets and renewable energy targets for each division -**Formulate portfolios** based on multiple scenarios **(medium-term management plan)** -**Formulate future business that contribute to maintaining and expanding revenue** based on sustainability **(medium-term management plan)**	-Announce a business policy that includes measures to address climate change as part of medium-term management plan
Others	>**Make approaches toward the government** with the aim of securing a position for each business in the 1.5ºC scenario -In the case of the bus business, clarify details of EV buses profitability assessment and lobby the government, etc. >**Build partnerships** with the aim of creating a market in the 1.5ºC scenario -In the case of the bus business, form alliances, etc., with other companies, etc., aimed at introducing EV buses	

Materials

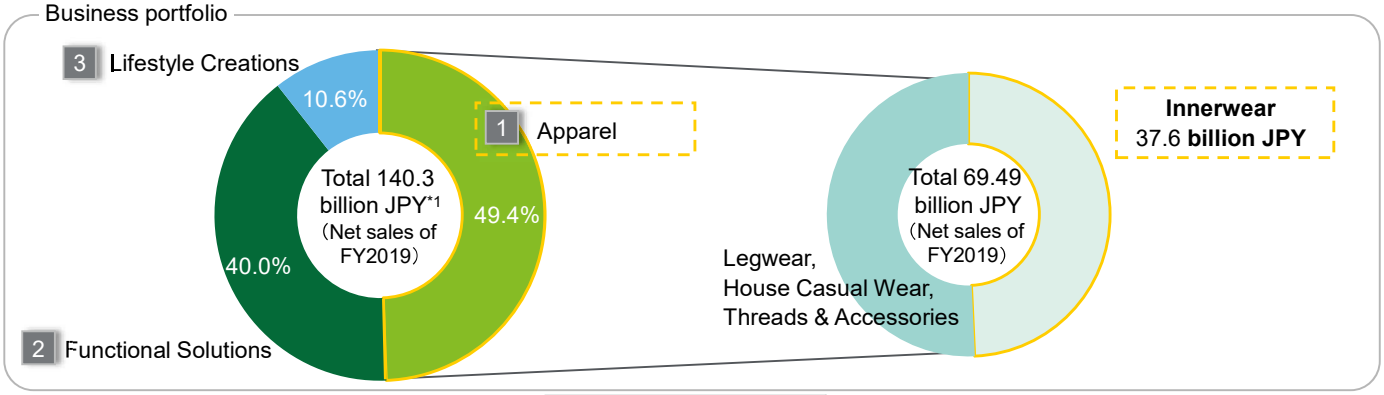
- ✓ **Practice Case① : GUNZE LIMITED**
- ✓ Practice Case② : Shin-Etsu Chemical Co., Ltd.
- ✓ Practice Case③ : Nippon Paper Industries Co., Ltd.
- ✓ Practice Case④ : Mitsui Mining & Smelting Co., Ltd.
- ✓ Practice Case⑤ : UACJ Corporation

1. Covered business

GUNZE

【Selection of businesses covered in this project】
We assume that the innerwear business in the apparel business, which is significant in the company's portfolio, will be covered

Business portfolio



Covered sector and discussed risks（Example）

Sector①	Sector②	Product example
1 Apparel business	Innerwear	

Risk items

Transition risks
- Policy
  - ✓ Carbon price, other regulations（Water、Plastic etc.）
- Market
  - ✓ Changes in price, Increase in raw materials
- Technologies
  - ✓ Development of low-carbon technologies
- Reputation
  - ✓ Changes in customer behaviors, Changes in investor's reputation

Physical risks
- Chronic
  - ✓ Increase in average temperature, Changes in weather patterns
- Acute
  - ✓ Extreme weather conditions

2. Significance assessment of risks/opportunities Step 2 GUNZE

Apparel industry risk and opportunity items in processes spanning raw materials manufacturing to sales

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

2. Significance assessment of risks/opportunities Step 2 GUNZE

Apparel industry risk and opportunity items in processes spanning raw materials manufacturing to sales

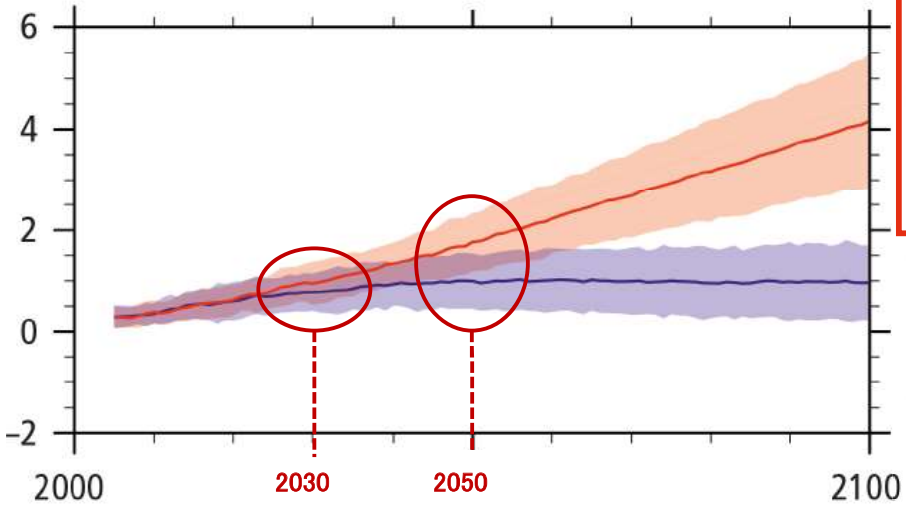
Physical risk item	Business Impact			Assessment
Small classification	Index	Discussion: Risks	Discussion: Opportunities	
Changes in rainfall and weather patterns	Revenue Spending	➢ There is a risk that rising temperatures will affect raw material yields, resulting in lower production and decreased revenue ➢ Costs are incurred for enhancing the cooling capacity in production processes, etc.	➢ By developing and selling functional products that address climate change, GUNZE can differentiate ourselves from competitors and connect this with increased sales ➢ Strengthening initiatives toward energy conservation will reduce greenhouse gas emissions, leading to reduced costs	Large
Rising sea level	Revenue Spending	➢ There is a chance that areas bordering or near the coast may carry a risk of disruptions in employee attendance or in the entire supply chain, thereby increasing costs	➢ Establishing a network that ensures operations across multiple locations could reduce operational failures and prevent decreases in revenue	Medium
Water Stress (Drought)	Revenue Spending	➢ There is a chance that access to critical freshwater will be threatened for farms providing materials for products, resulting in decreased revenue due to lower production ➢ Raw material prices may rise due to rising water prices, resulting in increased production costs	➢ Working to reduce the environmental impact in the supply chain and mitigating water access risks will enable stable production and reduced costs over the long term	Large
Increasing severity of extreme weather conditions (Flood)	Revenue Spending	➢ There is a risk that sales will decrease if business activities stop or shrink due to typhoons, flooding, or other extreme weather conditions ➢ There may be increased input costs for materials such as cotton and for polyester and other petroleum-related materials due to flooding and other climate change-related events	➢ Establishing disaster prevention sites and strengthening the supply chain in terms of products and logistics will enable GUNZE not only to minimize damage, but also to demonstrate its business continuity capability, leading to reduced costs	Large
Increasing severity of extreme weather conditions (Heavy rains, storms and cyclones)	Revenue	➢ The production of raw materials such as cotton may be affected, leading to lower production and decreased sales	➢ Initiatives such as those for improving corporate image through the provision of emergency relief supplies could contribute to enhancement of the company's corporate value in terms of finances, branding, etc., leading to increased revenue	Large

3. Scenario group definition

Step 3 GUNZE

【Selected scenarios】
1.5℃・4℃ scenario as of 2050 have been assumed for this project in consideration of conducting a wide range of scenario analysis with a view to carbon neutrality in 2050

【Projected average global surface temperature change】
（compared with the average from 1986～2005）



- ✓ Almost the same temperature changes would occur in the 2℃ and 4℃ scenarios in the 2030
- ✓ It is important to draw an appropriate transition path focusing on decarbonization by 2050 for each timeframe selected in the scenario analysis

Definition of 4℃（2.7℃～）scenarios

4℃ scenario ：
3.2～5.4℃ higher than pre-industrial Revolution levels if no additional measures against global warming are taken

Over 2℃（2.7℃～4℃）scenario ：
2.7～4.0℃ higher than pre-industrial Revolution levels if no additional measures against global warming are taken

2℃ scenario ：
0.9～2.3℃ higher than pre-industrial Revolution levels if strict measures are taken

（Reference）1.5℃ scenario ：
We are highly likely to achieve an increase of less than 1.5℃ compared to pre-industrial Revolution levels if a radical transition to a new system is made

The TCFD recommendations for scenario analysis suggest that multiple temperature range scenarios be selected, including those below 2℃

Sources：AR5 SYR SPM.6、IEA, “ETP2017”、UNEP, “The Emission Gap Report 2015”、Global Warming of 1.5℃（IPCC）

3. Identify and define range of scenarios

Step 3 GUNZE

Physical risks will become manifest, and raw material prices and product manufacturing are expected to be impacted

4℃ 1.5℃

4℃ worldview @2050s (Example)

: Actions for addressing risks
: Actions for seizing opportunities

Sellers
(Raw materials)
- Plastic production amounts increase, and use of recycled plastic is not promoted, resulting in lower raw material prices
- Crude oil prices rise or remain flat, and prices of raw materials derived from crude oil increase
- Raw material prices fluctuate due to slight increases in cotton production amounts
- Raw material prices soar due to the impact of extreme weather on raw material production areas
- Measures are needed for plants and resource suppliers with a high risk of drought and extreme weather

Changing of raw material suppliers, review of portfolios related to the use of each raw material

(Energy)
- The spread of renewable energy continues on its current course, and electricity prices fall slightly

New entrants
- Entry into competition by companies that develop functional underwear products (cooling, UV protection, etc.) which address rising average temperatures

Strengthening development and sales of functional products

GUNZE Industries
(Transition risks)
- Product manufacturing costs and procurement costs increase due to increased raw material prices
- Operating costs decrease due to falling electricity prices as a result of renewable energy / energy conservation measures remaining the same as current ones (slight increase for China)

(Physical risks)
- Costs for addressing flooding at plants increase
- Costs increase for responding to shutdowns and logistics delays caused by extreme weather at manufacturing plants and sales outlets

(Substitute products)
- No special measures needed

Buyers
(Customers/retailers)
- Demand for functional underwear increases due to rising average temperatures and an increased number of extremely hot days in summer
- Demand for thermal underwear decreases due to rising average temperatures and warmer winters
- Increased demand for all-seasons products with long wear periods that are less affected by temperature
- Demand toward ethical consumption continues on its current course, and there is no significant change
- There is increased need to ensure stable logistics and product supply during disasters caused by extreme weather

Establishment of a logistics network for times of disaster, introduction of BCP measures such as battery storage

Reconsideration of disaster responses and locations of sites with high physical risk

Government
- Renewable energy policies do not progress due to weakening external pressure from the international community as low-carbon/decarbonization trends weaken
- A carbon tax is not introduced
- Regulations concerning the use of recycled plastics are not introduced
- Subsidies are established due to increases in extreme weather and water stress

Timely acquirement of policy information

3. Identify and define range of scenarios

Step 3 GUNZE

Transition risks increase due to the need to move forward with disclosure and certification addressing the use of new materials and ethical consumption

4℃ 1.5℃

1.5℃ worldview @2050s (Example)

: Actions for addressing risks
: Actions for seizing opportunities

Sellers

(Raw materials)

- There is an increased shift toward recycled materials. Procurement and manufacturing costs increase due to the use of recycled plastics, etc.
- Crude oil prices drop, and prices of raw materials derived from crude oil decrease
- Raw material prices fluctuate due to increases in cotton production amounts
- Measures are needed for plants and resource suppliers with a high risk of drought and extreme weather (less than in the 4℃ scenario)

R&D related to use of recycled materials

(Energy)

- Use of renewable energy increases, and electricity prices fall
- Introduction of a carbon tax increases the burden of electricity expenses and manufacturing expenses, and procurement costs rise

Securing a power supply for self-consumption, investment in renewable energy

New entrants

- Entry into competition by companies that use alternate materials (cellulose, biomaterials, recycled materials)
- Entry into competition by companies that address disclosure and certification related to carbon footprints and traceability

Strengthening of partnerships (Alliances, M&A)

GUNZE Industries

(Transition risks)

- Costs increase due to increased recycled materials prices. There is increased R&D activity related to recycled materials
- Industry costs increase for addressing traceability and addressing ethical consumption
- There are increased operating costs due to renewable energy use and promotion of electrification at plants
- Promotion of a build-to-order production system

(Physical risks)

- Costs for addressing flooding at plants increase slightly
- Costs increase slightly for responding to shutdowns and logistics delays caused by extreme weather at manufacturing plants and sales outlets

(Substitute products)

- No special measures needed

Buyers

(Customers/retailers)

- Demand for functional underwear increases slightly due to rising average temperatures and an increased number of extremely hot days in summer
- Demand for thermal underwear deceases slightly due to rising average temperatures and warmer winters
- Demand for all-seasons products increases slightly
- Demand toward disclosure and certified products addressing ethical consumption increases, and sales for related products increase. Meanwhile, sales for products that do no address these decrease
- Recycling policies increase the need (especially in retailers) for products made from recycled materials and products that can be recycled

Strengthening disclosure of ethical consumption measures and acquirement of certification

R&D related to recycling and the use of recycled materials

Government

- Measures for renewable energy promotion and electrification are implemented with the aim of achieving CO2 reduction targets. Subsidies are improved
- A carbon tax is introduced. Plants and other facilities with high carbon emissions are subject to regulations
- Regulations are introduced related to the use of recycled plastic (usage rate settings, environmentally friendly design)

Timely acquirement of policy information

Collaborative measures with the government toward material-related regulations

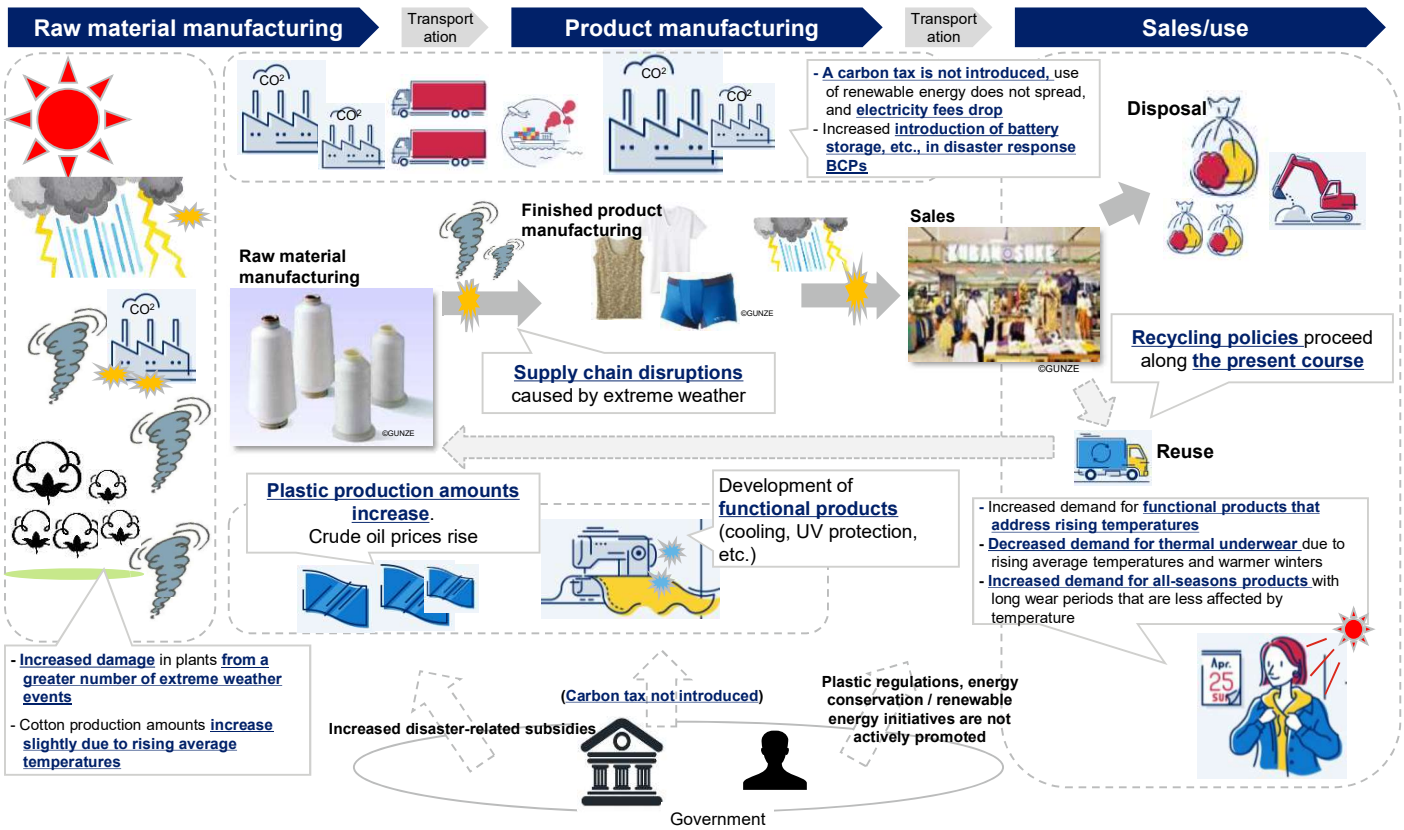
3. Identify and define range of scenarios

Step 3 GUNZE

[View of a future society in the 4℃ scenario]

Physical risks such as extreme weather and rising temperatures become manifest, and recycling policies proceed along the present course

4℃ 1.5℃



 Source: A portion of the illustration from “Sustainable Fashion” on the Ministry of the Environment website was used

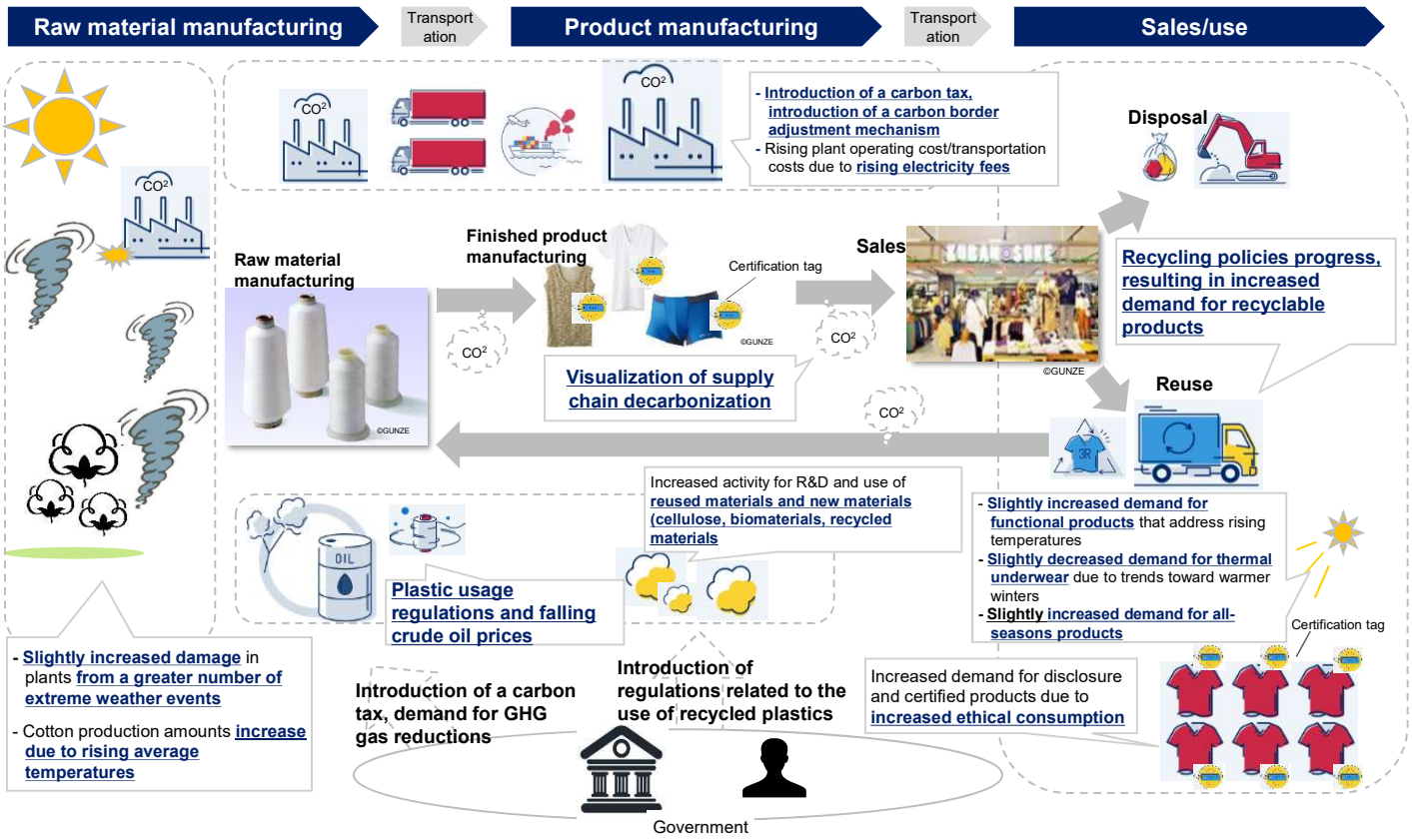
3. Identify and define range of scenarios

Step 3 GUNZE

[View of a future society in the 1.5ºC scenario]

Carbon tax and recycled plastic regulations are introduced, and ethical consumption increases

4℃ 1.5℃



3-75 Source: A portion of the illustration from "Sustainable Fashion on the Ministry of the Environment website was used

4. Evaluate business impacts

Step 4 GUNZE

[List of parameters used]

Definition of each of the worldviews based on scientific evidence, etc., from IEA and other sources

		At present	2050		Source
			4℃(2℃ or above)	1.5℃	
Transition risks Cost increase	(1) Carbon price	–	–	Japan $250/t-CO2 China $200/t-CO2 Thailand・Vietnam $55/t-CO2	• IEA NZE2050 • 4℃ scenario is assumed to be the same as the current level
	(2) Carbon emission targets/policies for each country : Plastic reusage rates	–	–	• 100%	• EU Technical Expert Group (TEG) "Taxonomy Report: Technical Annex"
	(3) Changes in the energy mix : Electricity prices	Japan $216/MWh China $86/MWh	Japan $176/MWh China $118/MWh	Japan $235/MWh China $131/MWh	• IEA WEO2018
	(4) Changes in the energy mix : Crude oil prices (5) Changes in key products / finished product prices : Raw material prices	Global • Oil prices(1.5℃): $37/barrel • Oil prices(4℃): $63/barrel	Global • Oil prices: $96/barrel	Global • Oil prices: $24/barrel	• IEA WEO2020、NZE2050 • Agency for Natural Resources and Energy "Strategic Energy Plan"
Transition risks Profit decrease	(6) Changes in customer behavior : Ethical consumption		–		
Physical risks Profit increase・decrease	(7) Rising temperatures : Cotton production	• $154 billion ($billion) (Commodity balance production, 2012)	• $222 billion ($billion) (Commodity balance production)	• $235 billion($billion) (Commodity balance production)	• FAO "The future of food and agriculture Alternative pathways to 2050"
	(8) Rising temperatures : Underwear sales pattern	—	• Average +2.04℃	• Average +1.15℃	• World Bank "Climate Change Knowledge Portal"
Physical risks Cost increase	(9) Increased occurrence of extreme weather : Drought	—			• Estimated from WRI "Aqueduct Water Risk Atlas"
	(10) Increased occurrence of extreme weather : Flooding	• 1x	• 4x	• 2x	• "A proposal for flood policy based on climate change"

4. Evaluate business impacts

Step 4 GUNZE

In Japan, financial impact from risks such as carbon tax, regulations on recycled plastics, and the affect of rising crude oil prices on raw material prices is expected to be significant

	Risk item		Overall	Country	
				1.5℃	4℃
Transition risks	(1) Carbon price	A	1.5ºC: There will be significant impact from carbon taxes, and operating costs will increase 4ºC: We predict that a carbon tax will not be introduced	▲＊＊ JPY 100 million	― ― ―
Transition risks	(2) Carbon emission targets/policies for each country : Plastic reusage rates	E	1.5ºC: Recycled plastic regulations are introduced, and costs increase 4ºC: We predict that recycled plastic regulations will not be introduced	▲＊＊ JPY 100 million	― ― ―
Transition risks	(3) Changes in the energy mix : Electricity prices	B	1.5ºC: Electricity unit prices rise due to an increased renewable energy ratio, and manufacturing costs increase 4ºC: Electricity unit prices fall, and manufacturing costs decrease	▲＊＊ JPY 100 million	＊＊ JPY 100 million
Transition risks	(4) Changes in the energy mix : Crude oil prices	C	Crude oil prices change, and fluctuations occur in CO2 emissions and manufacturing costs	＊＊ JPY 100 million	＊＊ JPY 100 million
Transition risks	(5) Changes in key products / finished product prices : Raw material prices	D	1.5ºC: Manufacturing costs for synthetic fibers derived from crude oil decrease 4ºC: Manufacturing costs for synthetic fibers derived from crude oil increase	＊＊ JPY 100 million	▲＊＊ JPY 100 million
Transition risks	(6) Changes in customer behavior : Ethical consumption	F	1.5ºC: Interest in ethical products increases 4ºC: We predict that there will be no change compared to the current situation	▲＊＊ JPY 100 million	― ― ―
Physical risks	(7) Rising temperatures : Cotton production	H	Cotton prices increase due to the relationship between increased production and price elasticity	▲＊＊ JPY 100 million	▲＊＊ JPY 100 million
Physical risks	(8) Rising temperatures : Underwear sales pattern (1) : Increased summer sales	G	Demand for functional products that address rising temperatures slightly increases	＊＊ JPY 100 million	＊＊ JPY 100 million
Physical risks	(8) Rising temperatures : Underwear sales pattern (2) : Reduced winter sales	G	Demand for thermal underwear due to trends for warmer winters slightly decreases	▲＊＊ JPY 100 million	▲＊＊ JPY 100 million
Physical risks	(9) Increased occurrence of extreme weather : Drought	I	Risks vary for each site	▲＊＊ JPY 100 million	▲＊＊ JPY 100 million
Physical risks	(10) Increased occurrence of extreme weather: Flooding	J	Occurrence will increase to twice the frequency in the 1.5ºC scenario, and four times the frequency in the 4ºC scenario	▲＊＊ JPY 100 million	▲＊＊ JPY 100 million

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5. Countermeasure definition

Step 5 GUNZE

We have selected companies based on the similarity of business activities and activities related to the environment and organized their statuses into a list

Risk countermeasures | Opportunity-seizing measures

	Item	Financial impact	Countermeasure example
A	Carbon tax (Reduction targets)	1.5℃ ▲＊＊JPY 100 million 4℃ ―(no carbon tax)	✓ Reduce CO2 emissions: Reduce emissions to 35% less than 2013 amounts by 2030 ✓ Total waste emissions: 12% reduction (Compared to 2012 BM)
E	Carbon emission targets/policies for each country (Energy efficiency・Renewable energy、Plastic reusage regulations)	1.5℃ ▲＊＊JPY 100 million 4℃ ―(no regulations)	✓ Increase the efficiency of utility equipment such as boilers and air conditioners ✓ Conserve energy by implementing high performance insulation and high airtightness in new buildings ✓ Promote renewable energy sources through the use of CO2-free menus ✓ Reduce electricity consumption by implementing self-consumption through increasing use of solar energy and introducing energy storage technology
B C	Changes in energy mix (Fuel and electricity prices)	1.5℃ ▲＊＊JPY 100 million 4℃ ＊＊JPY 100 million	✓ Transition from fuel oil A to fuels with lower emissions, such as city gas, LPG, and LNG ✓ Reduce electricity prices by promoting electrification instead of gasification ✓ Change over to LED lighting and use equipment with low energy consumption ✓ Reduce energy prices by promoting the use of renewable energy sources (CO2 coefficient of zero)
D H	Changes in important products/prices (Raw material prices)	1.5℃ ▲＊＊JPY 100 million 4℃ ▲＊＊JPY 100 million	✓ Transition from petroleum-sourced to natural-sourced materials
F	Changes in customer behavior	1.5℃ ▲＊＊JPY 100 million 4℃ ―(no changes)	✓ Use environmentally friendly raw materials and materials (organic cotton, recycled materials, etc.) ✓ Establish an environmental management system that complies with international certification standards (1SO 14001, etc.)
G	Increase in average temperature	1.5℃ ＊＊JPY 100 million 4℃ ＊＊JPY 100 million	✓ Develop functional underwear products with perspiration absorption and quick-drying functions
I J	Increasing severity of extreme weather conditions (Drought、Flood)	1.5℃ ▲＊＊JPY 100 million 4℃ ▲＊＊JPY 100 million	✓ Reduce the washing temperature in textile processing and establish environmentally friendly dyeing technology to significantly reduce the amount of water used

3-78